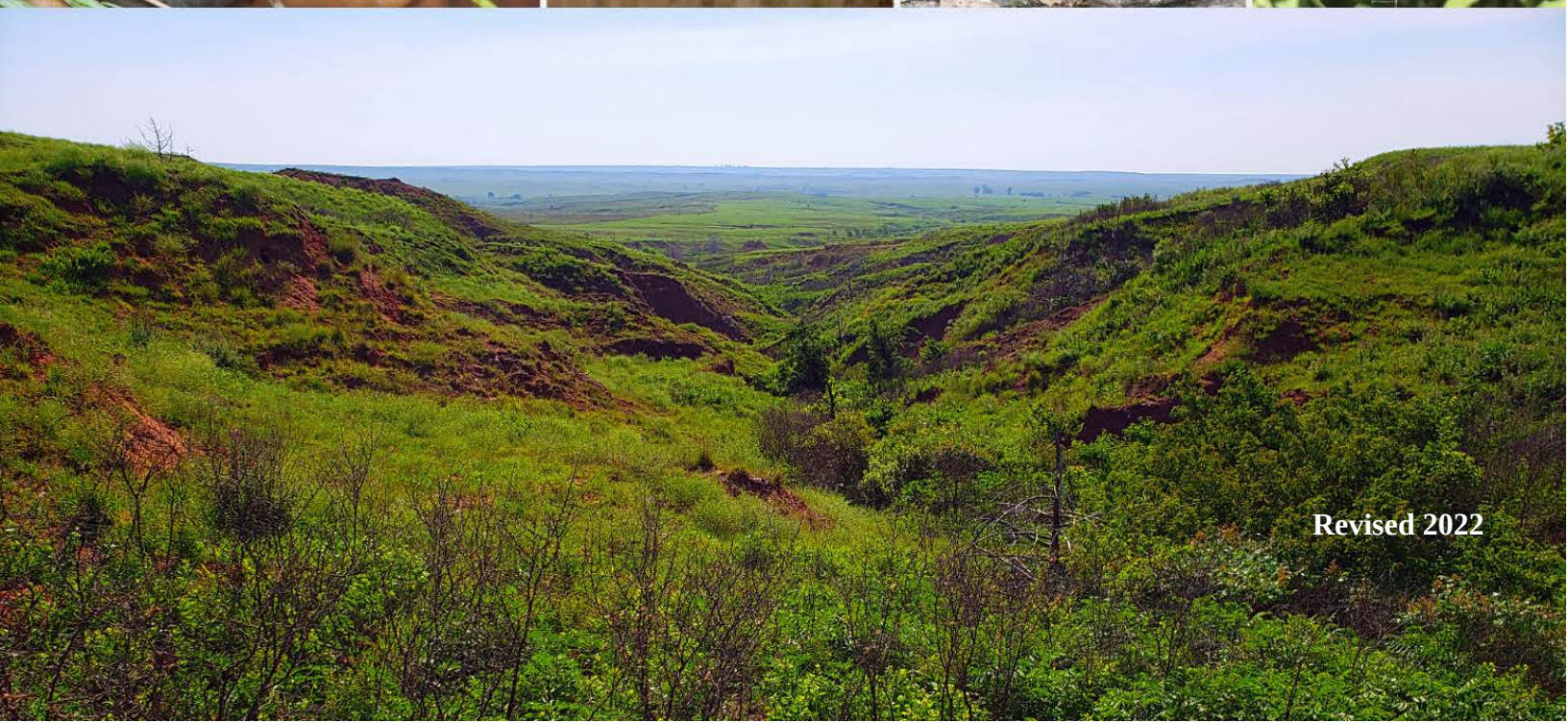
Kansas
Wildlife Action Plan



Revised 2022

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Executive Summary

The 2022 Kansas State Wildlife Action Plan (SWAP) revises and replaces the 2015 Kansas Wildlife Action Plan as the principle document guiding conservation of Kansas' rich wildlife diversity. This plan is not a compilation of specific management plans but was developed to be a dynamic, adaptive document that will guide Kansas Department of Wildlife and Parks (KDWP) as well as conservation partners in planning and implementation of conservation measures to address priority issues and actions as identified herein. The plan also highlights past projects and success stories implemented through State Wildlife Grants since the initial plan was developed.

The SWAP is built upon eight required elements identified by Congress, with an overall focus as a habitat based plan that began with the consideration of species. The plan is based on the best available information in accord with the intent established by Congress and echoed by the U.S. Fish and Wildlife Service and the Association of Fish and Wildlife Agencies. Information provided through projects implemented as a result of the original plan and data from conservation partners helped to fill important pieces of missing data for this revision.

All fish, wildlife and now plants in Kansas were re-evaluated using selection criteria, resulting in the identification of 429 Species of Greatest Conservation Need (SGCN). The species are prioritized into two tiers based on natural history data. There are 13 habitats identified as priority for the survival and health of the SGCN.

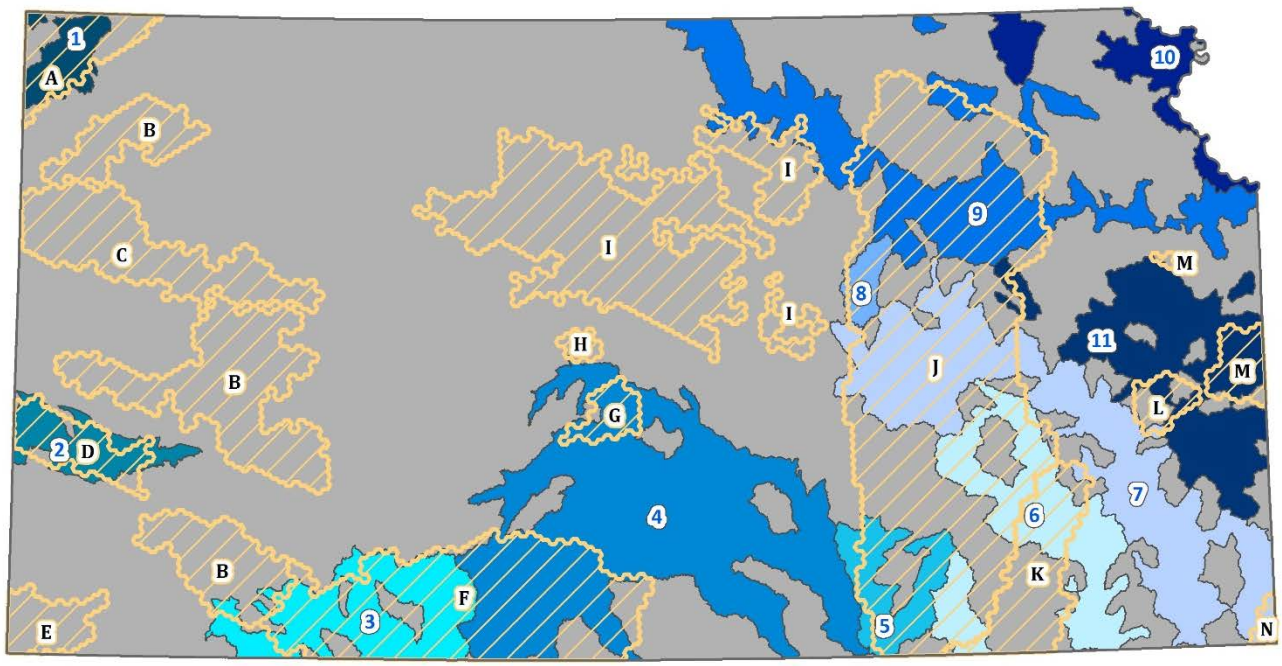
The SWAP uses a hierarchical classification system which divided Kansas into three conservation regions: (1) Shortgrass Prairie, (2) Central Mixed-Grass Prairie, and (3) Eastern Tallgrass Prairie. Within each region, geographically explicit areas in which to address conservation were established in a previous edition. These Ecological Focus Areas (EFA) represent landscapes where conservation actions can be applied for maximum benefits to Kansas wildlife (summary map found below). For each EFA, a suite of SGCN with ranking tiers, priority habitats, and a unique set of conservation actions designed to address the specific resource concerns have been provided in the plan. Due to data differences between ecosystems, EFAs have been separated into aquatic and terrestrial species and habitats.

Many issues affecting biodiversity are not specific to certain EFAs and occur across the entire state. The statewide conservation issues have been identified as: (1) residential and commercial development, (2) agriculture (farming and ranching), (3) energy production, (4) natural systems modification, (5) invasive species, (6) pollution, (7) climate change, and (8) compliance and enforcement of wildlife laws and regulation. Other issues that occur statewide but are not considered direct threats to biodiversity are; (9) existing data gaps and lack of knowledge, (10) inadequate coordination between government agencies, and (11) lack of outreach and education.

Building on the structure from previous editions, KDWP continues to collaborate with our conservation partners in academia and other state/federal agencies. The feedback and assistance from these groups, their willingness to participate in all aspects of the plan revision, and overall support is outstanding. Also of critical importance, is the support from Kansas residents for various programs and issues surrounding the protection and management of sensitive species as shown in the survey "Kansas Resident's Attitudes Regarding Threatened and Endangered Wildlife" (Duda 2021). The survey showed than an overwhelming majority of Kansas residents (94%) agree that KDWP should continue to identify and protect habitat critical to the existence of threatened and endangered wildlife.

The purpose of the SWAP is not to produce a plan – it is to implement actions and to improve fish and wildlife conservation in the future. It identifies broad priorities on species habitats, issues, and by inference, strategies and conservation actions. New funding will be focused on the priorities identified in this plan. Monitoring of new information and conservation progress will identify changes that need to be made. The KDWP will continue its on-going commitment, communication and coordination with all conservation stakeholders. Kansas' SWAP will remain a vital, adaptive template for future fish and wildlife conservation efforts in the state.

The development of Kansas' SWAP is based upon the guidance provided by the U.S. Fish and Wildlife Service, the Association of Fish and Wildlife Agencies, and many colleagues from other state fish and wildlife agencies.



Ecological Focus Areas

Kansas Boundary

Aquatic Focus Areas

Terrestrial Focus Areas

Terrestrial

A - Arikaree Breaks
B - Playa Landscape
C - Smoky Hill River Breaks
D - Arkansas River Sandsage Prairie
E - Cimarron Grasslands
F - Red Hills
G - Quivira
H - Cheyenne Bottoms
I - Smoky Hills
J - Flint Hills
K - Chautauqua Hills
L - Eastern Tallgrass Prairies
M - Eastern Forests
N - Ozark Plateau

Aquatic

1 - Upper Republican
2 - Upper Arkansas
3 - Cimarron
4 - Lower Arkansas
5 - Walnut
6 - Verdigris
7 - Neosho
8 - Smoky Hill
9 - Lower Republican
10 - Missouri
11 - Marais des Cygnes

EFAs can be found in corresponding chapters: Ch 4-ABCDE, 1 2 Ch 5-BCFGHI, 3 4 9 Ch 6-JKLMN, 5 6

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Chapter 1- INTRODUCTION AND PURPOSE

Purpose and Need

For years, fish and wildlife conservation in Kansas – and in the Nation – has been funded primarily by hunters and anglers. That funding was mainly through two sources: first, revenue from the sale of fishing and hunting and a few other types of licenses; second, federal excise tax revenue from sales of fishing and hunting equipment, apportioned back to States through the United States Fish and Wildlife Service according to set formulas (through the Pittman/Robertson, Dingell/Johnson, and Wallop/Breaux Acts). This system has been very effective at funding conservation of species that are hunted or fished. Through the Endangered Species Act, limited conservation of federally endangered and threatened species has also been possible. Although in the past, benefits have accrued to nongame species from projects and actions carried out for the benefit of hunted, fished and T&E species, with few exceptions (forage and prey species) there has been little federal funding specifically for nongame species. Federal funding sources for these species were not available until recently and those funds are relatively small compared to those available for game species. The State of Kansas does have a small nongame fund, financed through a checkoff on state income taxes to address the approximately 80% of species that are neither hunted, fished, endangered nor threatened but there was no comparable federal funding mechanism to match or supplement these funds.

To address this recognized inequity in funding, the Commerce, Justice and State Appropriations Act of Fiscal Year 2001, Title IX, Public Law 106-553 created the Wildlife Conservation and Restoration Program. Although this act provided only one year's appropriation of funds for fish and wildlife conservation, it identified the elements required to be included in the "wildlife conservation plan" that States committed to develop by October 2005. A second act, the Department of the Interior and Related Agencies Appropriations Act of 2002, Public Law 107-63, Title 1, created a "State Wildlife Grants Program" and required the states to develop "comprehensive wildlife conservation plans" by October 2005. To remain eligible for State Wildlife Grant funding, states were required to update their original plan every 10 years.

The 2015 planning effort titled Kansas' State Wildlife Action Plan, was that required revision. It was the first revision of a plan implemented in 2005 titled "A Future for Kansas Wildlife, Kansas' Comprehensive Wildlife Conservation Strategy" (Wasson et al. 2005). The revision occurred a decade after the original plan was adopted to guide State Wildlife Grant funding. Like the original plan, this revision allowed collaboration of stakeholders ranging from experts to interested citizens of the state. It was the result of a huge effort involving virtually all of Kansas' conservation agencies and organizations and coordinated by the Department of Wildlife and Parks.

This 2022 minor revision was done to incorporate new species information and address emerging issues affecting Kansas' biodiversity. This version is an improvement and refinement of the original plan that will aim State Wildlife Grant funding to target Species of Greatest Conservation Need (SGCN) within pre-identified wildlife habitats termed Ecological Focus Areas. This revision is evidence that this plan is dynamic and adaptive to new biological information and technical tools that

allow better assessments of wildlife habitat and population trends. It is funded in part by the State Wildlife Grants program, and meets the requirements of both Federal acts.

Eight Required Elements of State Wildlife Action Plan

The enabling legislation, along with regulations governing the State Wildlife Grants and related programs requires that Comprehensive Wildlife Conservation Plans include the following elements:

1. information on the distribution and abundance of species of wildlife, including low and declining populations as the Kansas Department of Wildlife and Parks deems appropriate, that are indicative of the diversity and health of Kansas' wildlife;
2. descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (a);
3. descriptions of issues which may adversely affect species identified in (a) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats;
4. descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions;
5. proposed plans for monitoring species identified in (a) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (d), and for adapting these conservation actions to respond appropriately to new information or changing conditions;
6. descriptions of procedures to review the Comprehensive Wildlife Conservation Plan at intervals not to exceed 10 years;
7. plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the Comprehensive Wildlife Conservation Plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within Kansas or administer programs that significantly affect the conservation of identified species and habitats; and
8. provisions to ensure public participation in the development, revision, and implementation of projects and programs. Congress has affirmed that broad public participation is an essential element of this process.

This plan is the result of a process that was specifically designed to meet the above required elements.

Value of a State Wildlife Action Plan to Kansas


Photo © Ed Miller

For years, forward-thinking ecologists and others have encouraged that plans be built around habitats rather than species. There are many reasons for this. Perhaps the best reason is that whatever happens to the habitat ultimately determines the suitability for species and the ability of the species to survive/thrive. This Wildlife Action Plan is a habitat-based plan. SGCN were identified, but only for purposes of linking sets of species to key habitats and priority conservation areas, termed Ecological Focus Areas, around the state. Issues and actions relate directly to those

focus areas within regions, and indirectly to SGCN which occupy those areas.
This is a strategic plan that identifies broad priorities for conservation of wildlife in the state. It is expected that projects will be developed that address actions aimed at the priority species, habitats, and issues identified in this plan and that these projects will be implemented by teams comprised of individuals representing diverse agencies and organizations with funding provided by multiple sources.

Approval of this plan allows cost-shared federal funding via State Wildlife Grants for projects that address issues and actions identified in the plan. In the last decade, State Wildlife Grants have cost-shared on more than 65 important research initiatives. These included research and assessments of both habitats and organisms. All of these projects have provided information to Kansans regarding the population status and best management of habitats for the wildlife community.

This intensive planning effort, with inputs from numerous conservation partners, meshes perfectly well with the mission statement of Kansas' Department of Wildlife and Parks. Within that mission statement there is one sentence that epitomizes the role of this strategic plan. It is: "*To conserve and enhance Kansas' natural heritage, its wildlife and its habitats to ensure future generations the benefits of the state's diverse living resources.*"

KDWP's Mission

*To conserve and enhance Kansas' natural heritage, its wildlife and its habitats to ensure future generations the benefits for the state's diverse, living resources.

*To provide the public with opportunities for use and appreciation of the natural resources of Kansas, consistent with the conservation of those resources.

*To inform the public of the status of the natural resources of Kansas to promote understanding and gain assistance in achieving this mission.

Chapter 2 - METHODS

Overview

The second edition (2015) of the SWAP involved an evaluation and revision of the list of SGCN and habitats developed for the 2005 Kansas Comprehensive Wildlife Conservation Plan, development of a simplified set of criteria for prioritizing SGCN, identification of spatially explicit priority areas for conservation, and identification of priority conservation issues and actions within these priority areas.

This 3rd edition (2022) involved a re-evaluation and revision of the SGCN list, a reassement of threats for species and habitats, identification of new or revised actions and monitoring programs for species and habitats, and the addition of new conservation success stories.

Evaluation and revision of lists of species and habitats

Species of Greatest Conservation Need

The list of SGCN identified in the 2015 Kansas Wildlife Action Plan was revised according to the following decisions and based on the existing selection and ranking criteria (Appendix 1):

- Changes to nomenclature since previous edition were updated
- Status assessments that have been updated since the previous edition were reviewed for changes that would affect a species' inclusion or priority rank.
- Changes made as part of the 2018 five-year review of threatened and endangered species were incorporated.
- Plants that met one or more of the selection criteria were added
- Terrestial and aquatic invertebrates recommended by species experts that met one or more of the selection criteria were added
- Experts were contacted to inquire whether any pollinators may be missing based on the selection criteria

Even though there is no state statute protecting plants in Kansas, plants were included in this revision because the SWAP is a statewide plan meant to used by any and all interested in the conservation of Kansas' biodiversity. The final list contains 429 SGCN. This list may change due to new information gleaned from inventory and monitoring activities, and emerging issues such as disease. Additionally, KDWP is required by State statute to evaluate the State Threatened and Endangered Species List, and the Species in Need of Conservation (SINC) list every five years. Similar to the Federal listing process, this requires extensive coordination with other agencies and groups concerned with the conservation of these species and the effects of this action on commerce and industry.

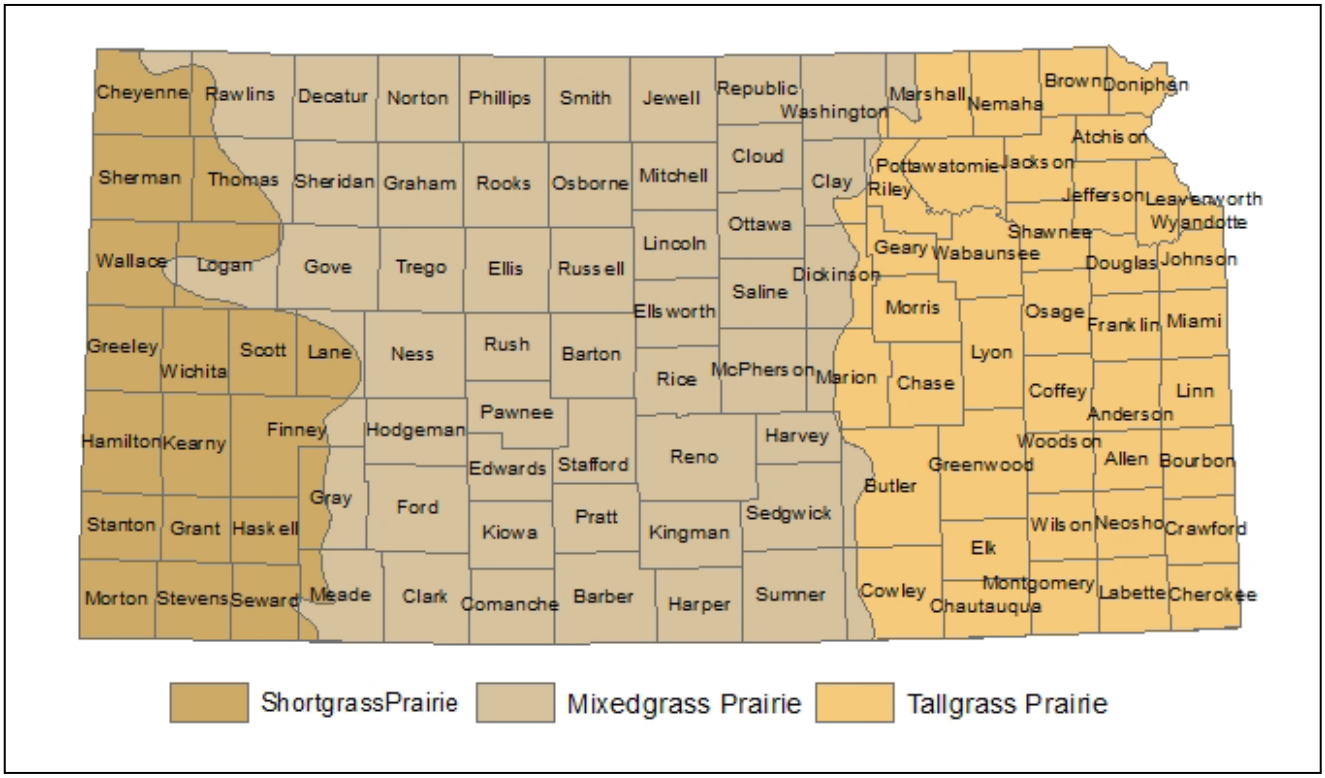
Habitats

The ecoregions defined by the North American Bird Conservation Initiative (2000) and refined by the Playa Lakes Joint Venture were adopted as the planning framework for this plan. The state is comprised of three Conservation Regions: Shortgrass Prairie, Central Mixed Grass Prairie, and Eastern Tallgrass Prairie (Figure 1).

Terrestrial habitats were identified from the Kansas Gap Land Cover Map (Egbert et al. 2001) which uses an alliance-level vegetation classification system based on the National Vegetation Classification system. For the purpose of this Plan, land cover types were generalized to reflect the habitat types and terminology used by conservation practitioners in the state (Figure 2A). New map products created since development of the first edition, such as the 2005 landcover map created by the Kansas Applied Remote Sensing Program (Peterson et al. 2010) and NatureServe's Ecological Systems classification (Comer et al. 2003), were evaluated for this revision. Although these products have some advantages over the GAP classification, it was decided that the overriding consideration should be familiarity with and ease of use by conservation practitioners in the state. Therefore, the GAP map has been retained as the basis for habitat classification.

Aquatic habitats were identified from the document "Fish Ecoregions of Kansas: Stream fish assemblage patterns and associated environmental correlates" (Hawks et al. 1986) with additional input provided by the staff of the Kansas Department of Wildlife and Parks (Figure 2B).

Figure 1. Kansas Conservation Regions based on the Bird Conservation Regions Map, U.S. NABCI Committee, September 2000.



Prioritizing SGCN and habitats

Species of Greatest Conservation Need were prioritized into two categories. Tier 1 includes species listed as endangered or threatened at the federal or state level, or with global conservation status rank of G1 or G2; all remaining SGCN were assigned to Tier 2. NatureServe's global conservation status ranks are a synthesis of factors relating to rarity, trends, and threats and offer a good assessment of a species' vulnerability throughout its range. These ranks capture several of the criteria used to rank SGCN in the first edition. State endangered species statuses are the result of consensus among Kansas wildlife professionals as to which species are in most critical need of conservation action in the state.

Of the 429 SGCN, 94 are classified as Tier 1 and 335 are classified as Tier 2. Tier 1 species include nine amphibians, one amphipod, six birds, 15 fish, eight gastropods, 21 insects, three isopods, five mammals, 14 mussels, one planarian, eight plants, three reptiles, and one plants. Tier 2 species include five amphibians, two amphipods, four arachnid, 82 birds, 12 crustaceans, 55 fish, eight gastropod, 93 insects, one isopod, 16 mammals, 16 mussels, 23 plants, 16 reptiles, and two turtles (see Appendix 2). The SGCN list will be modified and species of interest may change dependent upon acquisition of new information, the dynamic nature of many threats, and emerging issues such as disease.

Habitats are prioritized based on their dominance and importance to the conservation of SGCN in each Conservation Region. A list of priority habitats can be found in the chapters dedicated to each Region. Priority terrestrial habitats are the native vegetation communities that are dominant on the landscape in each ecoregion. Priority aquatic habitats include rivers and streams and their associated chutes, sloughs, and oxbows.

Ecological Focus Areas - Identification of priority areas for conservation

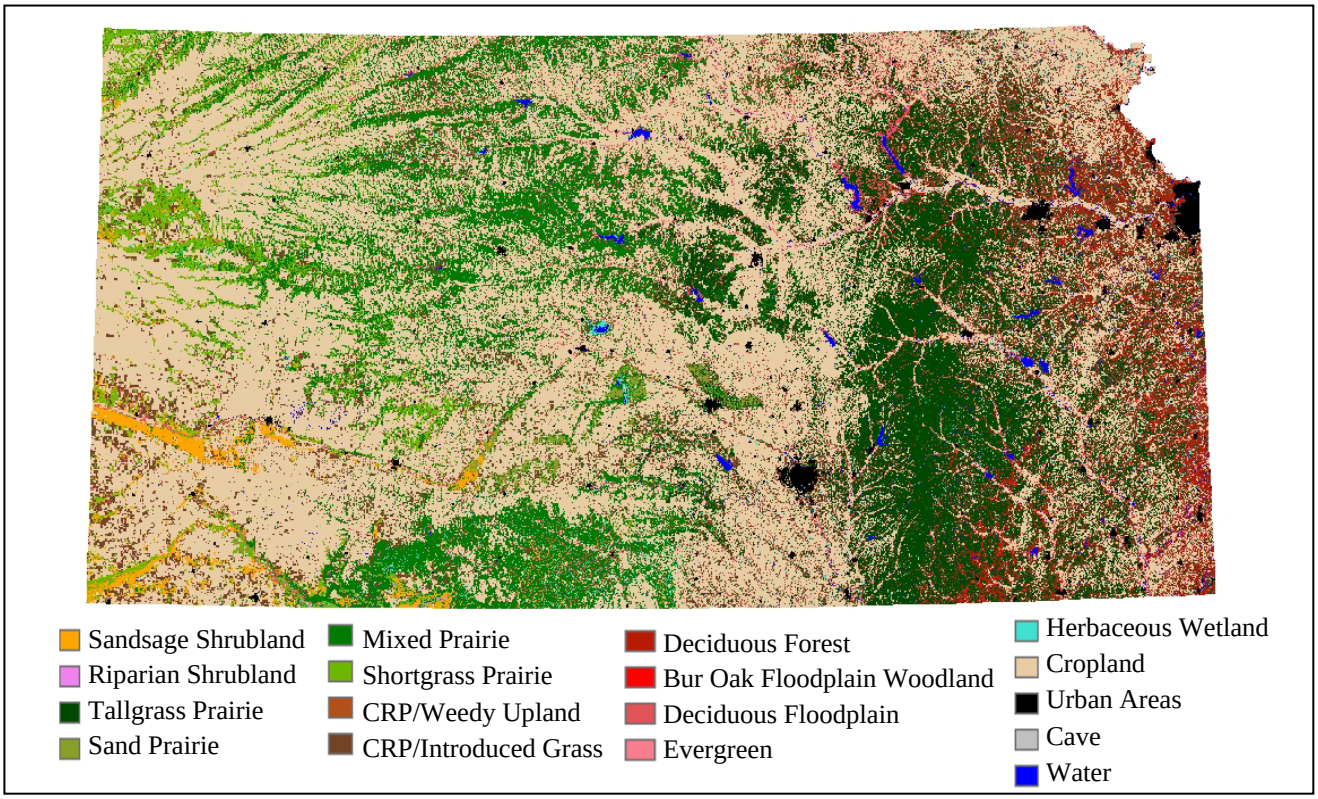
The Ecological Focus Areas (EFA) represent landscapes where conservation actions can be applied for maximum benefit to all Kansas wildlife. Each EFA includes a suite of SGCN and priority habitats and a unique set of conservation actions designed to address the specific resource concerns facing these species and habitats. Each EFA also includes one or more protected areas that can serve as demonstration sites for conservation actions. Although EFAs have been selected for the purpose of concentrating conservation measures, conservation actions will not be limited to EFAs if opportunities arise in other areas. A set of statewide conservation actions that are somewhat general in nature have been designed to address issues that plague the entire state or are not associated with any particular priority area.

The design of EFAs was based primarily on priority native habitats and refined using SGCN locations, and was built upon other planning efforts that address conservation priorities in the state. Aquatic EFAs were based on The Nature Conservancy's priority streams and by the Special Aquatic Life Use (SALU) streams defined by the Kansas Department of Health and Environment, with some exclusions based on expert opinion. The selected streams were buffered by 100 m; 12-digit HUCs that intersect the buffers comprise the EFAs.

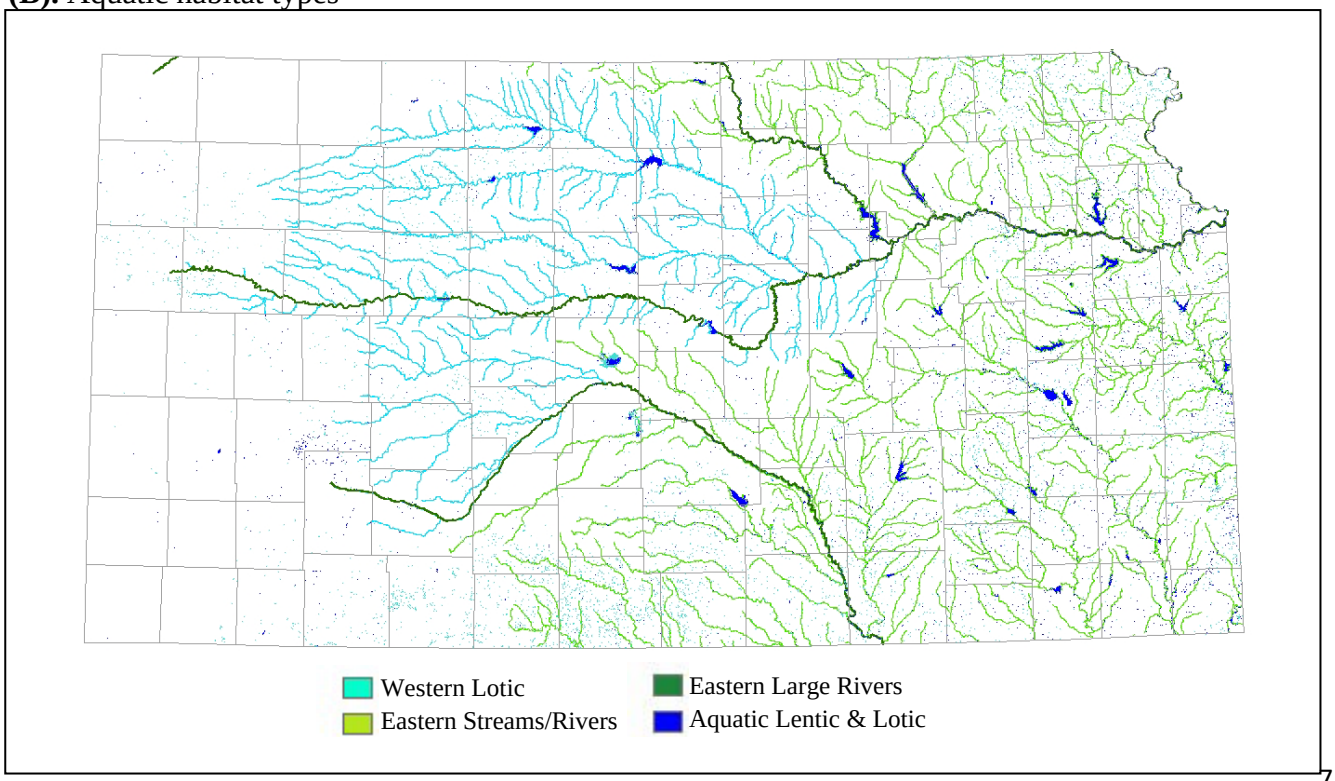
Terrestrial EFAs were designed using several data layers including large natural areas from the Crucial Habitat Assessment Tool (CHAT), landscape connectivity (also from the CHAT), portfolio sites

identified by The Nature Conservancy, landcover, potential high-quality forest, high-quality natural communities, ecoregions, physiographic provinces, and locations of SGCN.

Figure 2. Kansas Habitat Types
(A). Terrestrial habitat types.



(B). Aquatic habitat types



EFAs have been designed to be compatible with the Crucial Habitat Assessment Tool (CHAT) developed in cooperation with the Western Governors Association. CHAT is an online system of maps that displays crucial wildlife habitat based on commonly agreed upon definitions developed by the Western Governor's Wildlife Council across 16 western states. The CHAT provides a high-level, coarse-scale overview of crucial habitat for pre-planning on a wide variety of development projects across the West and is designed to reduce conflicts and surprises while ensuring wildlife values are better incorporated into land use planning. The SWAP and CHAT are similar tools designed to protect the state's biodiversity using data inputs such as locations of sensitive species and native habitats. By developing EFAs the SWAP goes a step further by identifying specific areas that offer the best opportunity to achieve conservation goals.

The following data layers were used as inputs in the development of terrestrial EFAs:

- CHAT large natural areas: This dataset was calculated from the NatureServe Landscape Integrity Model as a way to identify large areas that were relatively intact or have low levels of anthropogenic impacts. A minimum size was set at 1,000 hectares, but the threshold for "impacted" varied by ecodivisions to account for regional differences. Landscape condition is a measure of land cover impacted by human activities associated with ecological stressors. The Wildlife Council's Landscape Integrity Workgroup used a NatureServe landscape condition model to identify Large Natural Areas and Important Connectivity Zones.
- CHAT connectivity: The Landscape Integrity workgroup of the CHAT produced a West-wide dataset on Important Connectivity Zones which represents buffered landscape pathways connected to core habitats of Large Natural Areas. Landscape connectivity describes ease of movement for fish and wildlife based on species-specific habitat preferences and behavior. Well-connected habitats provide for higher quality ecological and biological processes.
- TNC portfolio sites: This layer was derived from Ecoregional Assessments conducted by The Nature Conservancy and its partners to identify areas of biodiversity significance and prioritize conservation action.
- 2005 land cover patterns – Level I: This dataset was developed by the Kansas Applied Remote Sensing Program at the Kansas Biological Survey using imagery from the Landsat 5 satellite. The percent of natural vegetation (grassland or forest) within a procedural hexagon was calculated from the 11 cover types mapped.
- Potential high-quality forest: This layer was developed by the Kansas Biological Survey by intersecting forest cover from the 2005 Land Cover Patterns layer with the Kansas Historic Forest layer derived from GLO plat maps created in the 1850s and 1860s. Currently forested areas that were forested prior to Euro-American settlement were considered potential high-quality forest. Much of the area included in EFAs has been determined to be of high quality from field survey.
- High-quality natural communities: This layer was developed through field surveys conducted primarily by the Kansas Natural Heritage Inventory. Comprehensive natural area surveys have been conducted in only seven counties in northeast Kansas so the layer is of limited usefulness outside this region. It was used to develop the Tallgrass Prairies EFA.
- Locations of SGCN: This layer includes observation data from the Kansas Natural Heritage Inventory, the Kansas herpetological and mammal atlases maintained by the Sternberg Museum

of Natural History, and KDWP databases. Records more than 40 years old were not used to eliminate the possibility of including in EFAs areas that no longer provide suitable habitat. Comprehensive surveys for most SGCN have not been conducted and data on the distribution of many SGCN is lacking and therefore insufficient for identifying priority areas.

- Spatial priorities developed by partners were used to develop EFAs where appropriate. Layers showing the priority areas for the following entities were evaluated:

The Nature Conservancy
Playa Lakes Joint Venture
Kansas Dept. of Wildlife and Parks
U.S. Fish and Wildlife Service
National Wild Turkey Federation
Ducks Unlimited
Kansas Dept. of Health and Environment
Kansas Forest Service

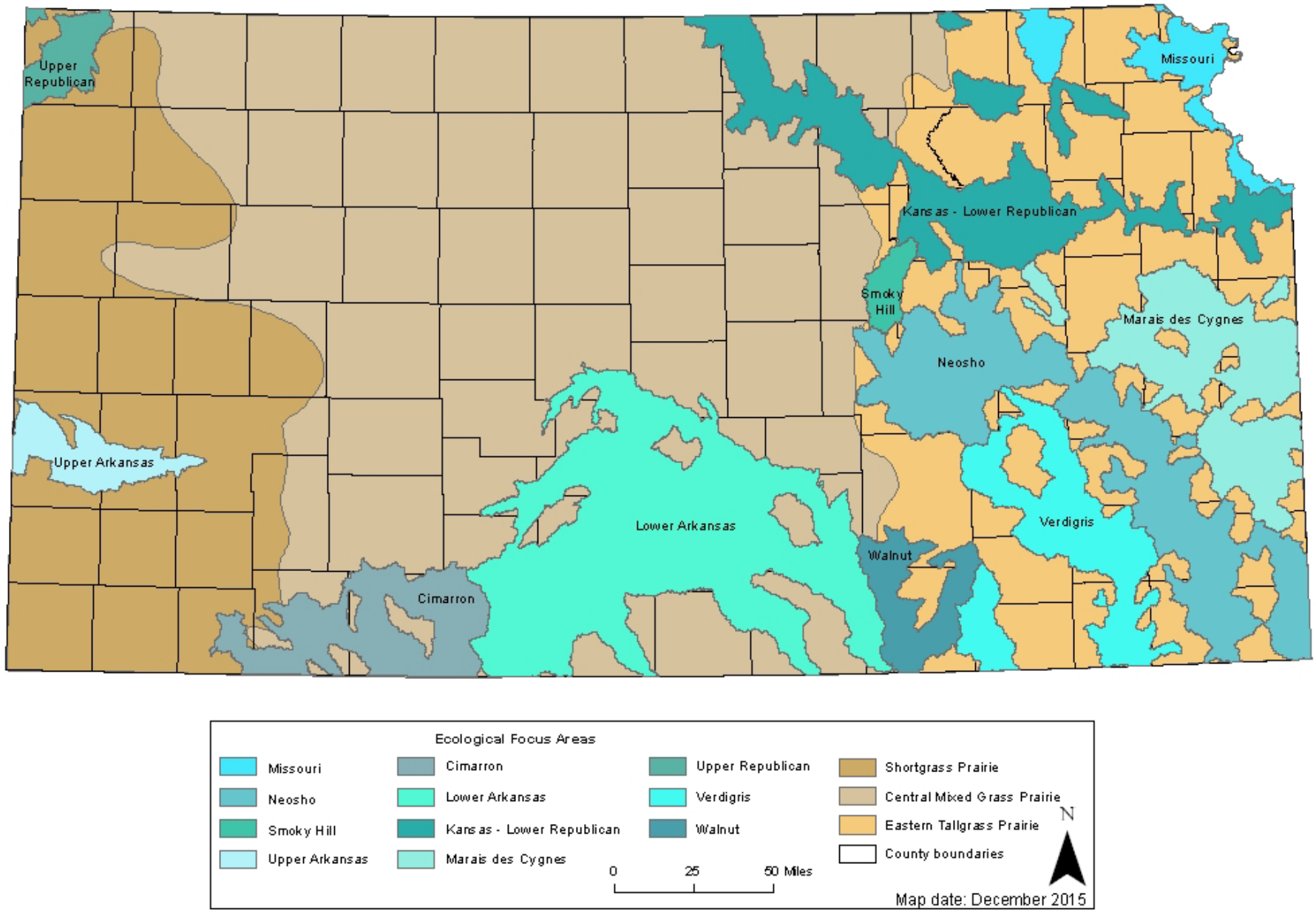
Identification of conservation issues and actions

Conservation issues and actions were identified from several existing planning documents developed by the KDWP Wildlife Diversity Program, the Kansas Central Grasslands All-bird Workshop, Partners in Flight, and Playa Lakes Joint Venture. These issues and actions were reviewed for current applicability and updated where needed. Issues were prioritized according to their impact on conservation and management of SGCN within key habitats within EFAs. The issues listed in each EFA are not exhaustive and are considered priority due to their impact on conservation and management of SGCN. The order in which the issues and actions are listed is not significant to their priority. Conservation actions were identified to address these issues. Conservation issues and actions were organized according to the framework of Salafsky lexicon's classification of general threats and conservation actions (Salafsky et al. 2008). Adopting the Salafsky's classification system will improve conservation work through consistency of terms and enable SWAPs to be summarized at the regional level.

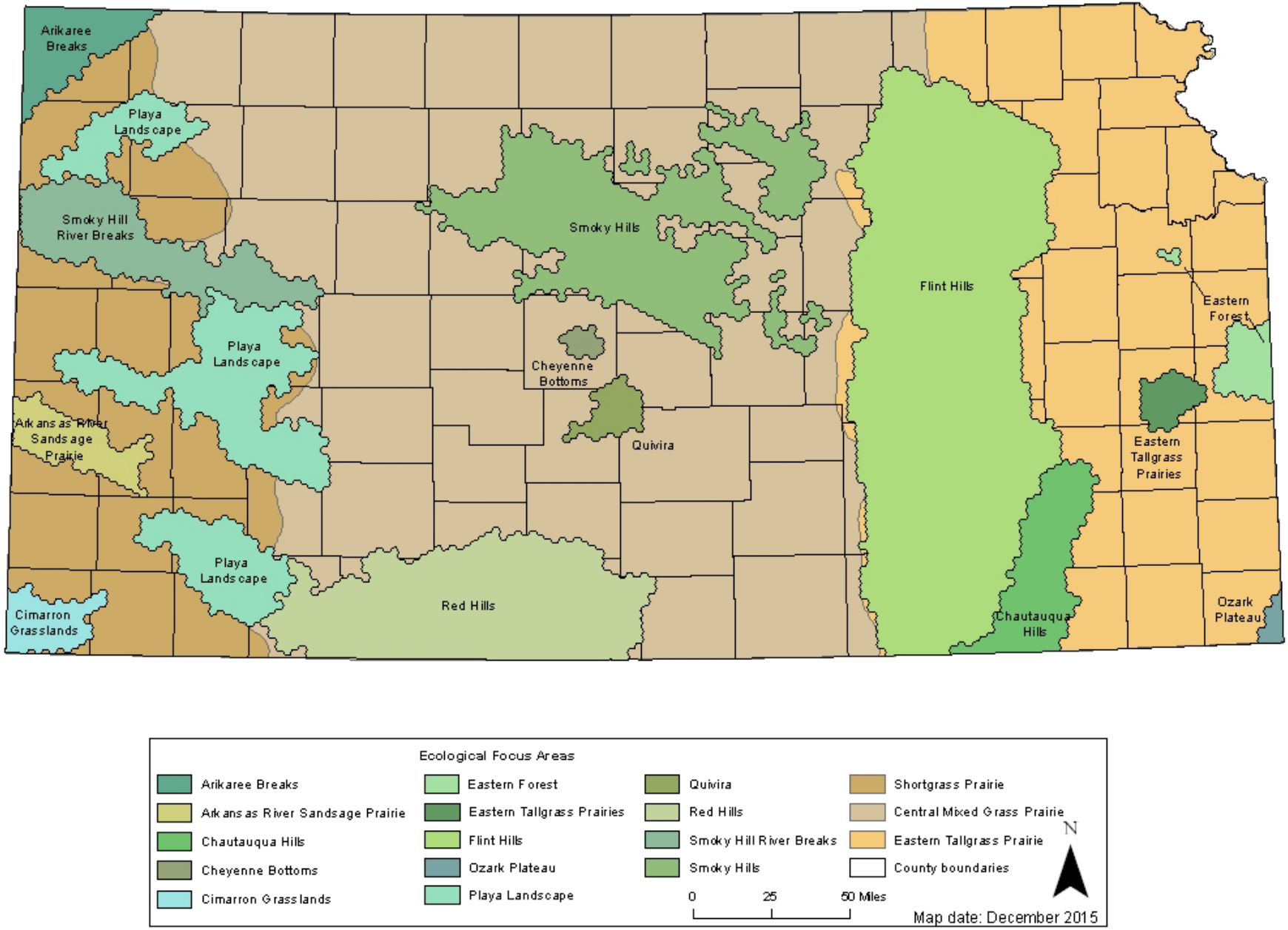
Public Involvement

Public input for the second edition revision of the SWAP was encouraged through multiple outlets. Public participation was invited through news releases, email lists of interested parties, email lists of experts, social media, exposure through Commission meetings, and presentations at society meetings. A draft of the plan was posted on KDWP's website in January 2016, with the public comment period of two months. Public comments were submitted via email or through the website. All comments received were reviewed by the SWAP Technical Committee and changes were made with a majority agreement. The types of public comments received relevant to the SWAP ranged from requesting inclusion on SWAP partners list, changes to the SGCN list, highlighting other agency/organizations' plans and conservation tools, and addressing the inclusion, removal or clarification of issues and actions. KDWP's website (http://ksoutdoors.com/Services/Kansas-SWAP) will continue to serve as the primary communication tool for providing information about the SWAP with the general public.

Figure 3. Ecological Focus Areas
(A). Aquatic Ecological Focus Areas



(B). Terrestrial Ecological Focus Area



How to Use this Plan: Implementation

The purpose of the SWAP is not to produce a plan – it is to implement actions and to improve fish and wildlife conservation in the future. Knowing it will take coordination from many entities for successful conservation impacts, KDWP will continue current efforts to facilitate partnership contacts through ongoing communication and coordination with partners and potential partners. It is expected that through frequent contact with potential partners and stakeholders, project proposals can be developed to address implementation of actions directed at the top ranked species, EFAs, or issues. Through on-going communication and coordination will all stakeholders, Kansas' SWAP will remain a vital, adaptive template for future fish and wildlife conservation efforts in the state.

Adaptive Management and Monitoring

Adaptive management recognizes uncertainty in how habitats may respond to management, and capitalizes upon changes and improvements in how we manage natural resources. Adaptive management involves four essential pieces: (1) developing plans, (2), implementing those plans, (3) monitoring the effects of management actions, and (4) adjusting future plans. Plan implementation and monitoring are conducted within an experimental framework to facilitate the learning process and allow for testing of new management methods and techniques. Monitoring and adaptive management will be facilitated through processes involving the KDWP and potential partners. Through ongoing communication supplemented by this process, ideas for projects can be exchanged and coordinated, information from existing surveys can be shared, and projects can be developed for implementing top strategies from this plan ("top" strategies being those addressing highest ranked habitats, issues, and species).

Monitoring approaches are identified within each key habitat within each conservation region. Monitoring is crucial to employing adaptive management approaches and ensuring strategies have the desired results. It is an ongoing part of management by the KDWP and many other agencies and organizations. Existing monitoring/data-gathering processes will be the basis for assessing the results of implementation of this plan. As individual projects are developed, evaluation/monitoring will be part of each project. In addition, specific projects, solely for monitoring, may be designed and implemented. In some cases, new approaches will have to be developed, and in other cases, information will be available from partner agencies and organizations. Monitoring of some species and habitats will provide relevant information for evaluating plan success. This includes monitoring SGCN at the statewide, conservation region, and habitat scales, in addition to monitoring success of individual projects. These monitoring projects will analyze both performance measures and achievement of actual changes in habitats or species status.

In keeping with the concepts behind the design of the Kansas Wildlife Action Plan approach and advice from the U.S. Fish and Wildlife Service and the International Association of Fish and Wildlife Agencies, at first Kansas' monitoring will employ existing surveys and inventories, including monitoring being done by conservation partners. As with the concept of using the best available information and not gathering new information on which to base this plan, the same concept applies to monitoring. The KDWP and their potential partners assisting in implementing this plan have ongoing, standardized surveys to monitor a host of parameters dealing with species and habitats in Kansas.

Information from these existing data gathering efforts will be meshed with information from additional monitoring efforts to provide the best, comprehensive picture of plan results. Monitoring will initially be focused on priority research and survey needs to obtain basic information. Monitoring will also be used to determine when strategies have adequately addressed various issues. When conservation success is not what was anticipated, monitoring will allow plans to be updated and altered so new actions can be developed and implemented – the "adaptive" part of adaptive management. In a number of cases, monitoring or research will need to be the first step to determine existing conditions where this basic knowledge does not yet exist.

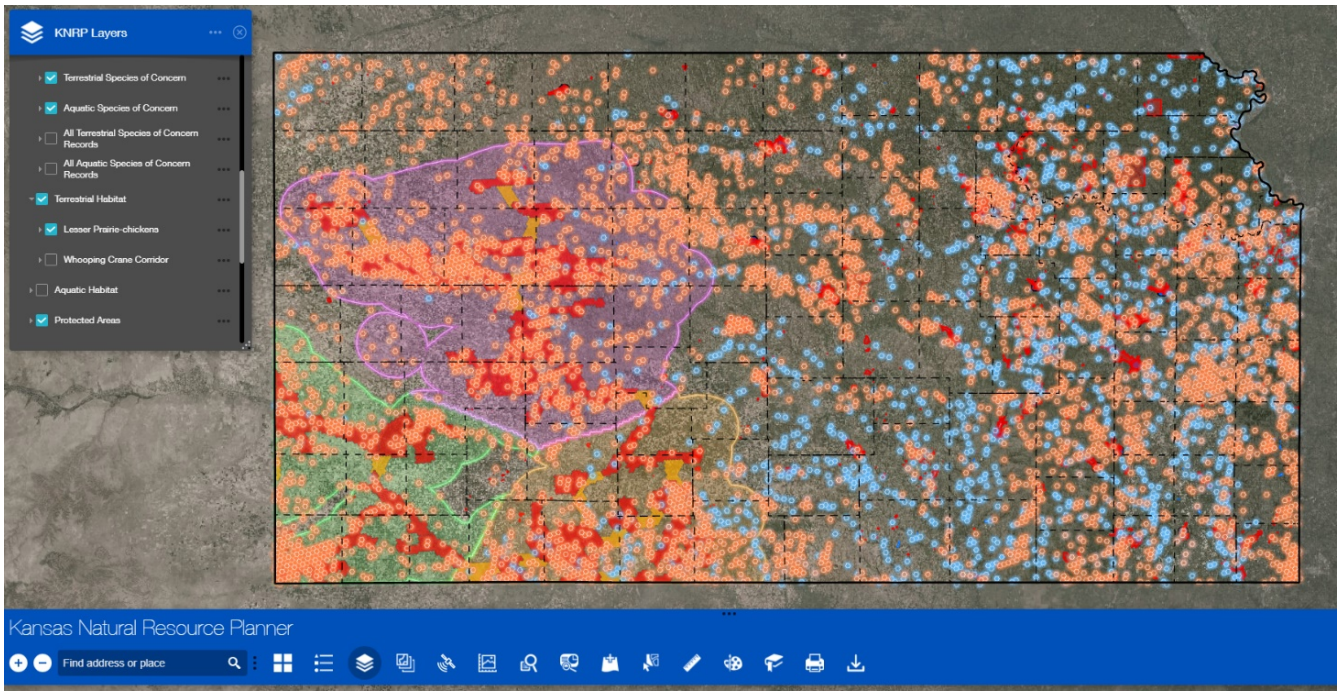
As implementation of Kansas' Wildlife Action Plan proceeds, monitoring will shift to include tracking tangible achievement of resource conservation. As this plan is implemented through operational planning and specific, detailed projects, it is anticipated that achieving positive conservation results may in many instances take several years. It will be necessary to maintain emphasis on monitoring to determine when, and to what extent, tangible results are achieved, and to decide when changes may need to be made in actions.

Success Story – Kansas Natural Resource Planner

The Kansas Natural Resource Planner (NRP) is an interactive mapping website designed to assist in the planning of development and conservation projects so that Kansas can benefit from development of its resources while protecting sensitive wildlife species and their habitats. The NRP provides an unbiased and non-regulatory resource that can be used during the early stages of development projects (e.g., wind facilities, oil and gas, or transmission lines), conservation planning, and environmental review. The NRP is an ongoing collaborative effort between the Kansas Applied Remote Sensing program (KARS) at the Kansas Biological Survey (KBS) and the Kansas Department of Wildlife and Parks, and is funded in part by the State Wildlife Grant program.

The NRP provides a central, accessible repository for Kansas natural resource data that enables users to view more than 20 categories of natural resource and infrastructure data. The site features over 40 data layers that include energy resources, terrestrial habitat, aquatic habitat, lakes and reservoirs, and wetland and riparian areas. The NRP also contains the Kansas data used in the Crucial Habitat Assessment Tool (CHAT) which was developed in cooperation with the Western Association of Fish and Wildlife Agencies. Dynamic data layers such as Species of Concern occurrences are updated periodically; new data layers are added at the request of users. All data layers are thoroughly documented and many are available for download via the KBS data portal.

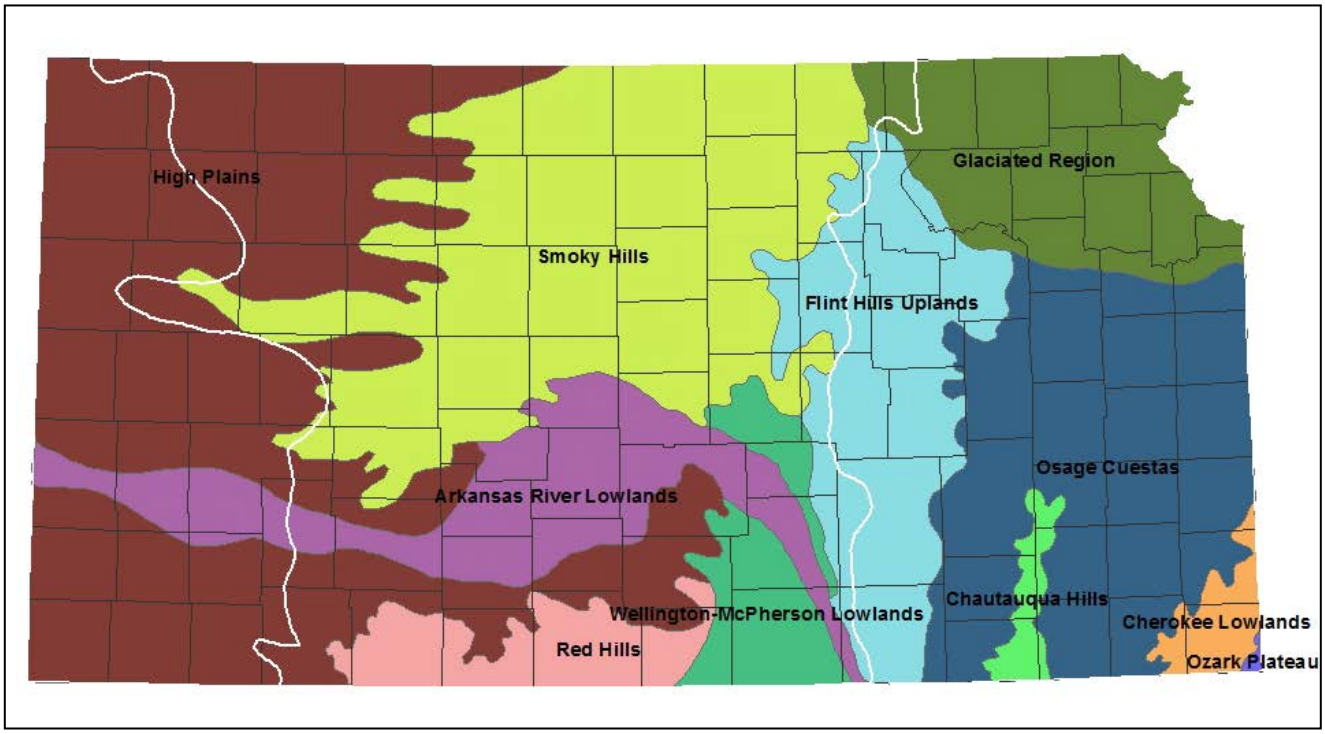
Since its roll-out in 2010 the NRP has been accessed by a wide variety of users including local energy companies, conservation practitioners, state and federal agencies, engineering and consulting firms, researchers, and private individuals. The Kansas Natural Resource Planner can be accessed at: http://kars.ku.edu/maps/naturalresourceplanner.



Chapter 3 - STATEWIDE PERSPECTIVE

Kansas is a state of variety in terms of landscape, weather, waters, and wildlife. The 82,276 square miles of natural Kansas offer displays of environmental change and associated diversity of plant and animal species. The land gradually rises from east to west; with elevation ranging from 684 ft. to 4,039 ft. (Collins 1985). In general, the topography of the state, moving from west to east, consists of flat, rolling, and hilly terrain. The exceptions to the generalities of Kansas' topography offer remarkable diversity of landforms, like the deep box canyons of the Arikaree Breaks in the northwest corner to the dripping ledges of Schermerhorn Cave in the southeast; from the towering chalk formations of the High Plains to the eroded cutouts of the Red Hills along the south central border (Collins 1985). Millions of years ago, the majority of Kansas was covered by a shallow ocean of salt water called the Permian Sea. The sea, along with its wildlife, created many of the natural resources Kansas provides today, including limestone, coal, oil, natural gas, and thick salt deposits. Geologically, the sedimentary layers of Kansas are relatively young, of Mississippian age and younger (Wilson and Bennett 1985) with the oldest strata exposed in eastern Kansas and most recent near the Colorado border.

Figure 4. Physiographic regions of Kansas (Kansas Geological Survey 1997)



Not only do the physical properties of the bedrock create different landforms but also the soil that develops from their upper layers. Broad areas of distinct physiography (Figure 4) are produced by the breakdown of differently composed bedrock belts (Savage 2004). This can lead to characteristic natural vegetation types developing on distinctive soil types (Wilson and Bennett 1985). Powerful forces of nature produced the landforms of the state. Forces such as fierce winds, alternations between

blazing heat and blizzard cold, gushes of floodwater, or melting glaciers, have eroded and broken down the differently composed bedrocks. One result that illustrates these forces is the sand and gravel in western Kansas that was deposited through erosion of the Rocky Mountains (Wilson 1984).

The weather in Kansas can often be described as dramatic and dynamic. The state has seen record high temperatures climb to 121° F, and the record cold drop to -40° F. Kansas temperatures can soar to over 100° F in both October and March, but also drop to freezing or below in every month of the year (Eagleman and Simmons 1985). Snowfall has been recorded in every month except July and August. The average amount of snowfall varies from 10 inches in the south-central part of the state to 24 inches in the northwest (Busby and Zimmerman 2001). Although Kansas displays a great variation of temperature regimes, the mean annual temperature is about 55° F (Eagleman and Simmons 1985). The state's varied weather displays are due in part to its diverse topography. Moisture from the Gulf of Mexico is blown to Kansas by strong surface winds. Eastern Kansas (the Tallgrass Prairie region) receives warm moist air from the Gulf more often since normal surface winds blow from a southerly direction (Savage 2004). The average annual amount of rainfall in the eastern part of the state is around 40 inches, while the western part of the state's average annual rainfall amount drops to 15 inches (Eagleman and Simmons 1985). Summer thunderstorms account for much of the annual rainfall, with 75% of precipitation occurring during the growing season (April through September) (Busby and Zimmerman 2001). The western third of Kansas (the Shortgrass Prairie region) consists of a semiarid climate, caused by the "rain shadow" of the Rocky Mountains. The mountains pull the moisture from the east moving air masses from the Pacific Ocean. The air that does move over the mountains and across the plains is much drier. The subtle rise in elevation leads to a long, subtle gradient of temperature and moisture regimes across the state (Eagleman and Simmons 1985).

Water, which aided in sculpting the landscape and is a major factor in the location and dispersal of plants and animals, is available in diverse forms throughout Kansas. Kansas is a land of few natural lakes such as river oxbows or playa lakes. Almost all the large lakes seen in Kansas today are manmade reservoirs and the result of flood-control projects (Madson 1985). Another type of water source in Kansas, shallow wetlands and playa lakes, are scattered across the state. They are found along major rivers and in natural depressions (Busby and Zimmerman 2001). The large wetlands, Cheyenne Bottoms and Quivira National Wildlife Refuge, of central Kansas are the best-known wetlands of the state. The northern half of the state lies in the Kansas River Basin. Those streams and rivers begin on the flatlands east of the Rocky Mountains, eventually draining into the Missouri River (Wilson 1984). The southern part of the state is in the Arkansas River Basin. The Arkansas River, running along the south-western corner of the state, is the only major river in the state that originates in the mountains. Most of the sandy-bottomed streams in the western portion of the state exist thanks to the underground reservoir called the Ogallala Aquifer (Madson 1985). Unlike the streams in the eastern part of the state, the western streams are not particularly fertile. There is less vegetative growth and cover, leaving the streams vulnerable to increased evaporation and erosion. The eastern streams typically have more growth and cover, due in part to the more constant supply of water and nutrients from fertile soil erosion.

The location and abundance of Kansas plants and animals are dictated by the combined factors of landscape, weather and water. Kansas, situated almost entirely within the Great Plains, is home to the prairie. The plants of the prairie have become well-adapted to extreme temperatures and rainfall, large grazing herbivores, and fire (Busby and Zimmerman 2001). The Kansas prairie is broadly divided into three groups based on dominant species and height of vegetation: the Shortgrass prairie, Mixed-grass prairie, and Tallgrass prairie. The Shortgrass prairie occurs in the western third of the state and the Tallgrass prairie in the eastern third of the state. The mixed-grass prairie comprising the central third of the state is a zone of transition from tallgrass prairie species in the east to shortgrass prairie species in the west. In addition to many species of grasses, prairies contain many broad-leaved plants and a minor shrub component. The western limit of the Eastern Deciduous Forest spreads into far eastern Kansas, mingling with portions of the Tallgrass prairie (Savage 2004). The trees of the deciduous forest are large, and their expansive crowns shade the earth from the sun. They blanket river valleys, adjacent drainages, and their associated hillsides. Moving westward, the trees begin to hug waterways, and continuous strands of trees eventually disappear in the western half of the state (Brooks 1985). Woodlands in western Kansas keep to the riparian zones but can spread into the uplands when they are protected from fire. Cottonwood, green ash, and elm are the dominant tree species in eastern Kansas, with occasional groves of oak, walnut, and hickory. Cottonwoods and willows are dominant in the west, where they can establish themselves quickly in the river bottoms that often experience flooding from torrential rains that scour the ground (Brooks 1985).

Many Kansas species, adapted to the extremes in temperature and precipitation, can live in abundance everywhere, but a fair number are restricted to eastern forest or arid High Plain (Collins 1985). Some restricted species may venture east or west, gradually declining in numbers as they leave the comfort of optimal habitat. Other habitat-specialist species may stay strictly within their distinct living conditions that keep them abundant and healthy. The majority of amphibian species, being restricted to water sources, occur in eastern Kansas, especially the south-eastern portion. Reptile species richness follows a similar pattern, with the most reptile species occurring in the south-east quarter of the state. For the most part, resident bird species can occur across the state, but the greatest number of bird species occurs on the eastern side of the state. Located in the heart of the Central Flyway, along the flight path for many migratory bird species, Kansas offers areas of shelter, food, and rest for the weary travelers. Many mammal species occur across the entire state, but the highest number of mammal species occurs in the western portion of the state. This pattern is demonstrated by the wide variety of *Rodentia* in the area. The greatest number of fish species occurs in the forested region on the east side of the state. The highest species richness of freshwater mussels occurs in the southeastern Kansas rivers where more stable water flows and gravel substrates underlying riffles and runs are the home of many long-lived species. A few short-lived species that can survive in ponded water occur in the western Kansas streams. Insects are the most abundant group of species across the state. However, our knowledge of them is greatly lacking when compared with what is known about the taxa.

Kansas Wildlife Resources

In Kansas, as elsewhere, terrestrial and aquatic wildlife has historically been generically categorized as "game" and "nongame" species. This is driven by the financial and philosophical contributions of hunting and sport fishing interests. Those designations aside, KDWP is tasked with regulating, monitoring, and managing populations of game and nongame wildlife. KDWP has no statutory obligation for plant protection although many activities address plant conservation through biological community associations and wildlife habitat management The KDWP is responsible for the management of about 798 species of vertebrates. This includes 468 bird species, 89 mammals, 144 fishes, 53 reptiles, and 30 amphibians. Additionally, approximately 24,000 species of invertebrates, including mussels, crustaceans, and insects are under jurisdiction of the Department. There are presently 31 threatened, 21 endangered, and an additional 79 species on the Species In Need of Conservation List. This list is reviewed every five years as per amendments to the Kansas Nongame and Endangered Species Act of 1975. The next listed-species review will commence in 2023. In the meantime, information is continually being gathered to assess the status of species or multiple-species groups.

Recently, the apparent decline in the multi-species group commonly referred to as "pollinators" has emerged as a major conservation concern. Animal pollinators are extremely important in meeting consumer demand and contributing to the profits generated from the harvest and sale of many agricultural crops. Roughly 75% of the 240,000 species of flowering plants world-wide rely on pollinators for flower reproduction. Available evidence indicates that certain pollinator species have been declining in the U.S. Declines in pollinator populations can be traced to a multitude of causes, such as intensive agricultural practices, use of certain pesticides, and habitat loss and degradation. Some species such as bumblebees have experienced declines as a result of the spread of pathogens and disease from commercially produced colonies to native populations. The best known example is Colony Collapse Disorder in honeybees. Flower-visiting insects account for 50 percent of all known insect extinctions. Reduced pollinator populations can result in decreased pollination of plant species that require pollinators for reproduction. As a result, the plants corresponding to each pollinator could face population declines or even increased threat of extinction. Climate change is also expected to provide additional challenges to pollinator populations, ranging from disruption of migratory paths of pollinators such as hummingbirds and bats, to decoupling of plant-pollinator interactions when plants and pollinators respond differently to climate cues. State Wildlife Grants are a viable source of funding to assist in providing the needed research and habitat developments to stem the decline of pollinators.

There are other great sources, found below, that contain more detailed information regarding the specific threats to pollinators and the conservation actions needed to address those issues.

- "North American Monarch Conservation Plan" 2008. Commission for Environmental Cooperation.
- Hatfield, R., S. Jepsen, E. Mader, S.H. Black, and M. Shepherd. 2012. Conserving Bumble Bees. Guidelines for Creating and Managing Habitat for American's Declining Pollinators. 32 pp. Portland, OR: The Xerces Society for Invertebrate Conservation.

Kansas Recreational Opportunities

Kansas provides many unique and exciting opportunities for recreational outdoor activities. There are 88 public lands managed for wildlife. Public waters include 54 state fishing lakes as well as 24 federal reservoirs that allow fishing opportunities. The three navigable rivers (Kansas, Arkansas, and Missouri rivers) provide a variety of recreation opportunities to the public and the Kansas River was recently designated a National Water Trail by the National Park Service. There are presently 25 state parks that provide opportunities such as hiking, biking and horseback riding, trails, canoeing and kayaking, rivers, geocaching, archery, swim beaches, and shooting ranges. The three navigable rivers (Kansas, Arkansas, and Missouri rivers) provide a variety of recreation opportunities to the public. The Kansas River and the Arkansas River (from Great Bend to the KS/OK border) are designated National Water Trails by the National Park Service. There are also a number of discovery centers and Outdoor Wildlife Learning Sites (OWLS) that provide hands-on environmental awareness experiences for children of all ages. More information on the recreational trends across the state can be found in the Statewide Comprehensive Outdoor Recreation Plan (SCORP).

Land Use History

Since pre-settlement times, Kansas has changed a great deal and people are the primary agent of change now and in the past. The diversity and abundance of animals and plants have declined. The land and waters have been altered, affecting how the remaining Kansas creatures live (Collins 1985). In the east, starting around the 1850s, settlement and accompanying agricultural development swept across the state. Fifty years later, 82.2% of the state was covered with farms (Busby and Zimmerman 2001). The major crops of the state were, and still are, wheat, corn, soybeans, and grain sorghum. Land that was too steep or rocky to plow was spared from conversion and left as grassland often used for livestock production. Today, there is relatively little prairie remaining in the shortgrass prairie regions of western Kansas (Savage 2004) (Cushman and Jones 1988). The most remaining tallgrass prairie in North America occurs in the Flint Hills of eastern Kansas (Duncan 1978).

Due to the relatively small amount of rainfall, especially in western Kansas, several crops require irrigation. Water is pulled from underground aquifers or, where surface water is abundant, from rivers, streams, and sometimes lakes, detrimentally lowering water levels and negatively affecting wildlife (Madson 1985).

Fire was, and continues to be, a natural part of the life cycle of the prairie, contributing to its growth and stability. These fires, which were once started naturally by lightning strikes or purposely by Native Americans, removed old growth from previous years and prevented or limited shrub and tree invasion of the grasslands. Because of fire's beneficial and rejuvenate effects, fires are still purposely set in prescribed areas, under specific conditions, to manipulate vegetation structure and composition (Savage 2004).

Success Story – Recovery Plans

Perhaps the most relevant program regarding the implementation of the State Wildlife Action Plan is Kansas' existing program to develop recovery plans for state-listed threatened and endangered species. These are distinct from USFWS recovery plans for federally listed species. Species on the state-sensitive species lists represent wildlife in probable jeopardy and likely future candidates for federal listing. Conservation efforts by the state can allay the need for federal action to list a species as threatened or endangered. Recovery plans which offer specifics at an operational planning level have already been developed for several species. We eventually plan to complete recovery plans for all species on the Kansas Threatened and Endangered lists.

Kansas recovery plans can potentially keep a species from being federally-listed by focusing efforts on preapproved recovery strategies. The plans are blueprints for future funding of survey, research, and habitat development. Below is a list of some completed recovery plans. All approved plans can be accessed online at https://ksoutdoors.com/services/threatened-and-endangered-wildlife

- Kansas Recovery Plan for Freshwater Mussels in the Upper Osage River system, Kansas: Mucket, *Actinonaias ligamentina*; Elktoe, *Alasmidonta marginata*; Rock Pocketbook, *Arcidens confragosus*; Purple Wartyback, *Cyclonaias tuberculata*
- Kansas Recovery Plan for Three Big River Fish Species: Sicklefin Chub *(Macrhybopsis meeki)*, Sturgeon Chub *(Macrhybopsis gelida),* and Western Silvery Minnow *(Hybognathus argyritis)*
- Recovery Plan for the Arkansas Darter, *Etheostoma cragini* Gilbert, in Kansas
- Kansas Recovery Plan for the Slender Walker Snail, *Pomatiopsis lapidaria (*Say) in Kansas
- Recovery Plan for the Scott Riffle Beetle, *Optioservus phaeus,* in Kansas
- Kansas Recovery Plan for the Snowy Plover (*Charadrius alexandrinus*)
- Recovery Plan for the Topeka Shiner (*Notropis topeka*) in Kansas

Currently, several recovery plans are in the draft and review stages. Some species require more survey/research to be completed before a well-devised recovery plan can be developed.

Recovery plans are an example of how the planning process brings people together. Before a recovery plan is signed by the Secretary of KDWP, it is reviewed and critiqued by both a Scientific Task Committee and a Local Committee. The Scientific Task Committee reviews the plan for scientific rigor and merit. The Local Committee, comprised of representatives from agriculture, industry, and conservation, considers how to best adapt the recovery plan to the social and economic conditions where the species recovery efforts will occur. All Kansas recovery plans are reviewed every five years to add new survey/research information, update recovery strategies and document recent efforts made toward the goal of delisting.


Photo © Victoria Cikanek

Kansas was once home to large herds of bison, elk and pronghorn. They were intensively hunted for their hides and meat to very low numbers (Meade 2008). Today there are no natural populations of bison left in the state. A few small herds of bison occur throughout the state, primarily in conservation areas or on private lands where they are managed as livestock. There are some free-range elk in north-east and south-west Kansas though populations are lower than they were historically. Similarly, pronghorn herds still persist but not to the magnitude that they once did. These extant populations are largely the result of reintroduction efforts which occurred after the natural populations had been extirpated from the state. With the once prevalent prey sources dwindled, larger predators such as mountain lions, grizzly bears, black bears, and grey wolves, began to diminish in numbers. Ranchers interested in protecting their livestock, helped in eliminating the large predators from the state (Choate 1987).

Overall, Statewide Issues

Following are the primary statewide issues regarding the conservation of native plants and wildlife in Kansas. It is recognized that only when issues are well-identified, then strategies to address those issues will be more focused and effective in addressing those issues. From the many perspectives we listened to concerning the future of Kansas' fish and wildlife, certain themes emerged over and over. These issues are closely related to each other and can be complex in the way they interact. The goal here is to highlight the most crucial conservation and research needs while stressing the importance of on-going conservation planning at the smaller habitat specific landscape scales. The actions to address the conservation issues are listed in each EFA section.

Although the details are shown in the chapters that address specific geographic areas and habitats, the general themes are identified here for providing an overall, statewide perspective. Here are the primary issues related to the threats that affect many SGCN and/or are issues widely distributed across the state. This list is not exhaustive and is meant to illustrate the ways in which various threats interact with species and/or their habitats.

The diversity of flora and fauna in Kansas is declining due to a variety of stresses, including habitat loss, habitat degradation, habitat fragmentation, climate change, diseases, and competition and predation from invasive species. Past conservation actions have had noteworthy successes but have not provided sufficient achievement in addressing the overall current decline in species. There is a need for a comprehensive, systematic and proactive approach that involves multiple agencies and an interested public, for conserving Kansas' biological diversity. This plan is the blueprint to implement that proactive approach by addressing these issues.

Statewide Conservation Issues

1. **Residential and commercial development – human settlements or other nonagricultural land uses with a substantial footprint**

   The most notable impact of residential and commercial development is the loss of functional native habitats due to human infrastructure developments. Residential and commercial development and accompanying roads, utility corridors, and other infrastructure cause direct loss, alteration, and fragmentation of native habitats. Fragmentation can reduce the size of intact habitat below the threshold required by a species or negatively impact species ability to move between suitable habitats if adequate travel corridors are not present. Species dynamics, such as predator/prey relationships and competition among species for resources, can also be altered by habitat changes resulting from residential and commercial development. An example is the proliferation of exotic or introduced non-natives that out-compete native plant species and change the food and cover resources available for wildlife. Hydrology is often negatively affected by impermeable surfaces. For instance, pavement prevents infiltration of storm water, decreasing the groundwater amount available for plants' root zones. The lack of infiltration increases the quantity of runoff into surface creeks and streams, which can carry fertilizers and pesticides. The local hydrology is also impacted by actions that seek to provide increased water availability for larger human populations, such as damming and diversion of natural waterways. Stream degradation and downstream scour has caused many road crossing structures, particularly culverts, to become perched over time. These structures then act as barriers that fragment stream habitat and prevent aquatic organism passage.

2. **Agriculture-threats from farming and ranching as a result of agricultural expansion and intensification**

   Cropland

   Conversion of prairie, wetlands, and woodland to cropland replaces native habitat with grain crops or non-native forage crops. Activities such as plowing, tilling, mowing, and the use of pesticides can have direct or indirect impacts on native species or their habitats. Agricultural fields can still provide food and cover for some wildlife species, however, the activities associated with agricultural production can be fatal to some species inhabiting the fields**.** Many wetlands have been drained or are being farmed through, greatly reducing their functions and habitat value. Farming near stream channels can reduce riparian habitats, resulting in erosion, sedimentation, and can increase total suspended solids in flowing waters. Drainage systems accelerate flow and reduce the natural filtration process that recharges groundwater and reduce peak flood flows. Another important concern is the groundwater depletion and loss of base flows in western Kansas streams due to irrigation to sustain crop agriculture. Some of the same concerns for residential and commercial development relative to water quality and quantity also apply to cropland.

   Livestock Farming & Ranching

   Native grasslands have historically been maintained by grazing and browsing animals leaving a heterogeneous landscape. Some ranching practices can create homogeneous structure and reduce native forb species making less suitable conditions for many grassland wildlife species. Overgrazing can also degrade riparian habitats, reducing natural filtration capacity of the soil

and increasing nutrient loads and increasing peak flood flows into streams. Runoff from concentrated livestock feeding operations often contains bacteria, nutrients and other contaminants known to impair water uses (including use by aquatic life) by causing excessive algae growth, spikes in unionized ammonia and lower dissolved oxygen. Another way livestock ranching may reduce habitat suitability for wildlife is the conversion of native rangeland by seeding non-native pasture grasses, thereby altering the structure and composition of native prairie habitats.

3. **Energy Production – threats from production of non-biological resources (oil and gas drilling and renewable energy)**

Oil and Gas Drilling

Oil and gas development involves a complex series of exploration and production activities, and includes associated infrastructure such as pipelines, well pads, and roads. Some terrestrial wildlife is impacted by habitat conversion, alteration, and fragmentation that can result in reduced reproductive success or behavioral avoidance of those impacted areas. Similarly, aquatic wildlife can be affected as well by infrastructure construction and water use. A significant amount of water is used in oil/gas drilling, followed by disposal of contaminated water post-drilling.

Renewable Energy

Wind energy production continues to grow throughout the state. Renewable sources of energy are important for a variety of reasons, but they also come with the potential for adverse impacts to wildlife. For instance, the development of wind farms increases habitat fragmentation with associated roads and transmission lines. Migratory bird collisions and bat mortality are also concerns with wind farms that need further research. Habitat loss caused by conversion to energy development use are causing wildlife to vacate an area because of aversion to structures has been documented after wind farm development. Newer types of industrial-scale energy production moving into the state likely present many of the same issues. Biofuel production can exacerbate the issues caused by crop production by increasing land use intensification and conversion. Solar energy development, which is poised to be the next renewable energy boom in the state, poses many of the same concerns inherent in wind energy development.

4. **Natural system modifications-threats from actions that convert or degrade habitat in service of "managing" natural or semi-natural systems, often to improve human welfare**

Fire and Fire Suppression

The Kansas landscape has evolved with periodic wildfires. Fire can maintain a heterogeneous landscape, and therefore a variety of habitat types, by controlling the density of trees and shrubs, removing thatch and dead plant litter from the ground surface, opening up space for the regeneration of forbs, and much more. The suppression of natural fire regimes causes trees to become denser and understory fuels to accumulate. On the other hand, annual fires on vast tracts of prairie can limit ground cover needed for ground nesting birds. Some alternative approaches such as rotational grazing or patch-burn grazing are economically feasible and provide a more heterogeneous habitat that benefits many wildlife populations.

Dams and Water Management/Use

The impacts of dams, and the use and management of water on wildlife and their habitats are complex. Dams not only replace habitat, but their operation affects the timing, volume, and temperature of flows. These changes may also indirectly affect closely related habitat characteristics (oxygen levels, sediments, type of riparian vegetation, etc.). Crucial habitat for many wildlife species such as riparian and wetland plants, require specific conditions for growth and reproduction. The amount of surface water and groundwater relates to the survival of these species. Likewise, the amount of water, the water temperature, chemical composition and amount of sedimentation affect survivability of fish. Dams and impoundments also fragment stream habitat by preventing or reducing aquatic organism movement. The ways in which water is managed and used can either support or degrade the specific habitats for aquatic and riparian species. Long-term the water releases from dams can increase the rate of streambank erosion by keeping high flows within the banks of a stream for long periods. Dam operation can reduce out-of-bank flows onto the floodplain to protect agricultural crops although by doing so, it also short-circuits groundwater recharge, sediment deposition that enriches floodplain soils, the ability of floodplains to reduce peak flow events, and the capacity of floodplain soils to filter and reduce nutrient loading.

Many Kansas streams have been channelized in attempts to rapidly move storm water or to increase farmable acreage. Channelization reduces stream length and stream habitat available for aquatic organisms. The lack of sinuosity in channelized systems also reduces the ability of a stream to effectively dissipate energy, resulting in higher velocities and increased erosion. Excessive erosion can cause streams to become incised, which reduces floodplain connectivity and the quality and quantity of riparian habitat. Subsequent attempts to stabilize eroding banks with riprap or concrete further exacerbate stream incision and riparian habitat loss. Channelization and resulting high stream velocities combined with reduced floodplain connectivity often lead to more dangerous and destructive flood events. Furthermore, commercial sand and gravel dredging operations can lead to stream bed degradation, channel incision, and bank instability.

5. **Invasive and other problematic species and genes-threats from non-native and native plants, animals, pathogens/microbes, or genetic materials that have or are predicted to have harmful effects on biodiversity following their introduction, spread and/or increase in abundance**

Invasive & Non-Native Species

Non-native species are plants or animals that have been introduced into ecosystems due to human activity. Often these non-native species are termed as "invasive" because they are able to out-compete native species for needed resources, or prey on native species. A few native species can also be considered invasive. Invasives spread and can overtake and dominate native ecosystems because of a lack of biological or environmental controls. This can change native species distribution and abundance. Also, the use of pesticides to control invasive, non-native species can impact native wildlife.

Pathogens

There are some pathogens impacting Kansas wildlife species that will require monitoring and research. Avian cholera is a contagious bacterial infection that commonly affects geese, coots, gulls and crows. White-nose syndrome is a fungal disease impacting bats throughout the nation and has been confirmed in a few counties in . The Chytrid fungus is a pathogen impacting some amphibian species. Chronic Wasting Disease is a neurological disease of deer and elk. Though the about examples may be the most notable to readers, they certainly do not constitute an exhaustive list of potentially devastating wildlife pathogens.

6. Pollution – threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources

Pollution sources vary from housing and urban areas to industrial and agricultural activities. Harmful pollutants such as inadequately treated discharge from municipal waste treatment plants, and contaminants such as fertilizers and pesticides via runoff often end up in water sources where they change water chemistry and thereby impact aquatic vegetation, invertebrate communities, amphibians, and fish.

7. Climate Change

The distribution and abundance of species is strongly influenced by climate. Temperature extremes, along with the variation and frequency of precipitation, regulates factors such as growing season lengths and the water cycle, determining where species occur and how well they thrive. Climate changes are likely to influence species and ecosystems by altering fundamental interactions with other species and the physical environment, potentially creating a cascade of impacts throughout ecosystems (Staudinger, et al. 2012). Climate models predict changes in annual precipitation that vary geographically and temporally. The eastern half of the state could see increases in precipitation of up to 11 inches (28 cm) per year in the 2090-2099 timeframe. The west will likely see a drying climate in the short and long term, but there is a high level of disagreement between models. The contrast between expected east and west precipitation changes due to climate change could have substantial implications for future water use and allocation patterns in the state of Kansas.

There is much uncertainty when it comes to climate change and how it will impact the state. Given the information available and the research being done, we can only estimate potential impacts climate change may have on habitats and species.

Species are already being significantly impacted by climate change. Effects such as shifts in species distributions, changes in phenology of species, and de-coupling of co-evolved interactions have been documented. At a regional scale, there is uncertainty in the variations of climate change impacts, but there are predicted impacts that wildlife and their habitats are expected to experience. Changes in temperature and precipitation will lead to changes in the water cycle impacting both aquatic and terrestrial species. An increase of extreme events such as floods, droughts, heat waves, and severe storms are expected, which can alter species habitats by increasing wildfires, pests, diseases, and invasive species. Increasing temperatures may cause range shifts or contractions of flora and fauna. Species that have limited mobility or are unable to migrate may become extirpated or even extinct. Increasing temperatures may also change seasons and their associated physiological processes, shifting phenology of species. The temporal alignment of food availability and reproduction may be shifted. Many aquatic species will suffer due to reduced precipitation and increased temperatures in streams, rivers, and lakes. Altered flooding regimes will affect spawning and rearing habitat.

Individual species and habitats will have very different responses to climate change. Many species and habitats will be negatively affected by climate change and will require a special set of actions to ensure their survival. Some species may benefit from a changing climate and could expand their range or increase in abundance, requiring a separate set of actions. In addition, the movement of species will create new communities of species for which there will be no previous examples and will require new management regimes. Wildlife management plans will need to reflect these changes and will likely need to be updated on a more frequent basis. Climate change is a large and growing threat to wildlife and natural systems, but it will also exacerbate many existing threats. Efforts to address climate change should not diminish the immediate need to combat threats that are independent of climate change, such as habitat loss, invasive species spread, pollution, and wildlife diseases. Our goal should be to sustain ecosystems and viable wildlife populations regardless of the threat.

As part of the SWAP revision a climate change vulnerability assessment was conducted on several SGCN. The methods and results of that work are summarized in Appendix 6.

8. **Law and Policy – actions to develop, change, influence, and help implement formal legislation, regulations, and voluntary standards**

Compliance and Enforcement

Poaching and illegal wildlife trade can directly threaten the survival of many species. Kansas natural resource officers not only provide a law enforcement presence in state parks, but also enforce Kansas Department of Wildlife and Parks rules and regulations and support the enforcement of the Endangered Species Act. Supporting and strengthening law enforcement to monitor and enforce compliance with laws, policies and regulations, and standards and codes at all levels will benefit the protection of at-risk species.

There are also conservation issues considered by this plan that are not direct threats to biodiversity. These issues occur statewide and impede effective conservation planning and implementation.

9. **Lack of Knowledge and Data**

For effective wildlife management and conservation efforts there is a requirement for sufficient understanding of species life history and habitat requirements, distributions, relationships among and between species, effects of management and conservation efforts. Incomplete knowledge inhibits our ability to identify and interpret potential threats and decide on appropriate actions.

10. **Organizational Capacity and Management**

Differing goals, bureaucratic obstacles, personnel turnover, and lack of resources can all impact the efficiency and effectiveness of conservation actions. Agencies, researchers, non-governmental and governmental organizations must collaborate, share information and resources, and support each other's efforts to effectively manage and conserve wildlife and their habitats. The implementation of this plan is a forward step toward this collaboration.

11. **Outreach and Education**

Connecting people to nature is an important element of successful conservation strategy implementation. Community engagement and wildlife conservation education is important for conservation agencies to share the importance of the work they do to protect and manage healthy fish and wildlife populations. Acquiring the knowledge, skills, and motives to conserve the state's natural resources empowers people to work together to take strategic actions for the benefit of current and future generations. Fostering broad participation in conservation will be critical to maintain Kansas' fish, wildlife, and habitats.

Statewide Conservation Partners

- Audubon of Kansas
- American Fisheries Society
- Baker University
- Bureau of Reclamation
- Central Plains Society of Mammologist
- County Conservation Districts
- County Extension Service
- Ducks Unlimited
- Emporia State University
- Fort Hays State University
- Great Plains Fish Habitat Partnership
- Kansas Applied Remote Sensing Program
- Kansas Alliance for Wetlands and Streams
- Kansas Association of Conservation Districts
- Kansas Association for Conservation and Environmental Education
- Kansas Biological Survey
- Kansas Cooperative Fish and Wildlife Research Unit
- Kansas Dept. of Ag, Div. of Conservation
- Kansas Dept. of Ag, Div. of Water Resources
- Kansas Dept. of Education
- Kansas Dept. of Health and Environment
- Kansas Dept. of Transportation
- Kansas Farm Bureau
- Kansas Forest Service
- Kansas Grazers Association
- Kansas Grazing Lands Coalition
- Kansas Geological Survey
- Kansas Native Plant Society
- Kansas Ornithological Society
- Kansas Herpetological Society
- Kansas State University
- Kansas State University Research and Extension
- Kansas National Education Association
- Kansas Section of Society of Range Management
- Kansas Livestock Association
- Kansas Prescribed Burn Association
- Kansas Prescribed Fire Council
- Kansas Rural Center
- Kansas Water Authority (Regional Advisory Committees)
- Kansas Wildlife Federation
- McPherson College
- National Center for Disease Control
- National Park Service
- National Wild Turkey Federation
- No-till On the Plains
- Pheasants Forever/Quail Forever
- Pittsburg State University
- Private Landowners
- State Authorized Land Trusts
- Sternberg Museum of Natural History
- Tabor College
- The League of Municipalities
- The Nature Conservancy
- The Wildlife Society
- The University of Kansas
- US Army Corps of Engineers
- US Dept. of Interior
- USDA Farm Services Agency
- USDA Natural Resources Conservation Service
- US Environmental Protection Agency
- US Fish and Wildlife Service, Ecological Services Field Office
- US Fish and Wildlife Service, Partners for Fish and Wildlife Program
- US Fish and Wildlife Service, Refuge System
- US Geological Service
- US Military Installations
- Westar Energy Green Team
- Watershed Restoration and Protection Strategy (local groups)

Success Story – Kansas Residents' Attitudes Regarding Threatened and Endangered Wildlife 2021 Report

A scientifically rigorous survey regarding Kansans' attitudes toward rare wildlife species was conducted by Responsive Management, Inc. for Kansas Department of Wildlife and Parks (KDWP) to determine residents' knowledge of and opinions on threatened and endangered wildlife. Respondents were asked about their support for or opposition to various actions to protect threatened and endangered wildlife. The study used a telephone survey of Kansas residents ≥ 18 years of age and has a statistical error of ± 4%. The success story here may be that the Kansas Nongame and Endangered Species Conservation Act of 1975 continues to have widespread support of Kansas residents even though development interests have questioned its regulatory oversight when taxpayer funded or permitted projects are reviewed for critical habitat losses.

KNOWLEDGE OF THREATENED AND ENDANGERED WILDLIFE AND RELATED ISSUES

- 32% of Kansas residents say they know at least a moderate amount about threatened and endangered wildlife in KS. 67% say they know a little or nothing at all
- 55% of Kansas residents indicated that they were aware that there are, in addition to federal laws, state laws to protect types of wildlife that are threatened and endangered
- 68% were aware that there are state laws protecting the *habitats* of threatened and endangered wildlife

PERCEIVED THREATS TO WILDLIFE

- Regarding economic activities, 60% strongly or moderately agree that oil field development threatens some wildlife populations, 53% strongly or moderately agree converting land into agricultural crop production threatens wildlife

SUPPORT OF OR OPPOSITION TO VARIOUS DEPARTMENT ACTIONS TO ADDRESS THREATENED AND ENDANGERED WILDLIFE

- 74% of Kansas residents support having an official state list of threatened and endangered wildlife
- 72% strongly support the state imposing stiff fines on those who harm endangered wildlife or their habitats
- 91% agree that the Department should continue to identify and protect habitat critical to the existence of threatened and endangered wildlife
- Support for protecting peripheral species was indicated as 73% of the respondents agreed with the statement: "Wildlife that is threatened or endangered in Kansas yet abundant in other states should be protected in Kansas"

LAND OWNERSHIP, USES OF LAND, AND OPINIONS ON WILDLIFE ON THAT LAND

- 40% of surveyed residents who own land said that they have no particular feeling about threatened and endangered wildlife on their land
- 67% said they would be willing to follow a conservation plan to maintain habitat for threatened and endangered wildlife on their land, if they received monetary compensation
- 66% of landowners would support the reintroduction of a threatened and endangered wildlife species to its historical range if that range was near or adjacent to the landowner's property

Responsive Management, Inc. 2021. Kansas residents' opinions on threatened and endangered wildlife and actions to protect wildlife. Final Report to Kansas Dept. Wildlife and Parks. 495pp. www.responsivemanagement.com

Chapter 4 - SHORTGRASS PRAIRIE CONSERVATION REGION

Description

The Shortgrass Prairie Conservation Region is located in the western third of Kansas. It is primarily in the High Plains and a portion of the Arkansas River Lowlands physiographic regions (Figure 4) (Kansas Geological Survey 1997).

The High Plains is composed of sediment eroded from the Rocky Mountains (Wilson 1984). The flat almost featureless plain is broken by rugged breaks and valleys at sites such as the Arikaree Breaks near St. Francis and along Ladder Creek in Scott County. The dominant grasses of the region are typically of short stature and have large extensive root systems which enables the plants to better tolerate long periods of unfavorable conditions (Physiographic 1997). Trees are scarce and desert type plants, such as cactus and yucca, are common. Water in an underground layer of sand and gravel, called the Ogallala Aquifer, is the main source of ground water in western Kansas (Wilson and Bennett 1985).

The Arkansas River Lowlands follow the Arkansas River corridor. The riverbed is filled with sediments washed down from the Rocky Mountains by the river (Wilson 1984). The only river in Kansas which originates in the mountains, the Arkansas River channel is wide and shallow, with much of the water flowing underground through the porous sand in this system (Wilson and Bennett 1985). The relatively flat terrain is disrupted by sand hills along the south side of the river formed in the Quaternary period, making them the geologically youngest soils in Kansas (Wilson 2010)

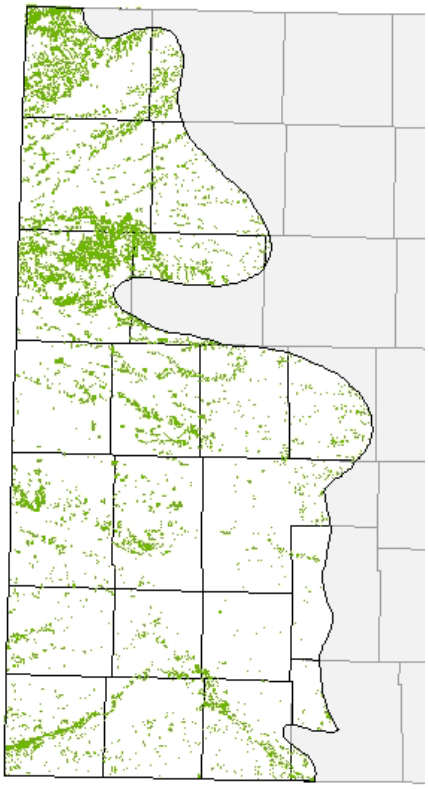
Because it sits in the rain shadow of the Rocky Mountains, this is the driest region of the state with rainfall averaging 10 to 20 inches annually (Cushman and Jones 1988). Summer (June-August) is the major rainy season throughout the region, and rainfall is almost entirely the result of convective thunderstorms. Winter precipitation is a small proportion of the total annual amount, less than 2.5 in (Laurenroth and Milchunas 1992). The native plants in this area are adapted to stresses such as drought, grazing and fire. This region is defined by the dominant short grass species that occur in a higher abundance than in the other conservation regions. The semiarid conditions of the region are not severe enough to discourage cultivated agriculture. With its nearly level landscape, relatively fertile soil, and often aided by groundwater irrigation, this is among the state's most intensively farmed regions (Brooks 1985). Crops such as wheat, corn, soybeans, and grain sorghum are grown on large farms. Much of the grain produced is used to feed cattle for the production of beef (Laurenroth and Milchunas 1992). Another economically important industry in the area is petroleum production. In the south there is the large Hugoton gas field with oil resources scattered over the whole region (Busby and Zimmerman 2001). Population is sparse in this part of the state, often with only two or three small towns per county.

Major rivers are the Cimarron and Arkansas in the south, the Smoky Hill in the central part of the region, the headwaters of the Solomon and Saline in the north, as well as portion of the Republican which cuts through the northwest corner of the state.

Priority habitats in the Shortgrass Prairie Conservation Region

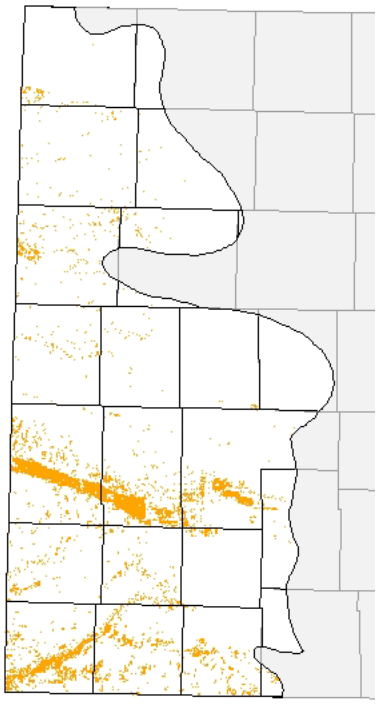
Habitats considered important for the conservation of biodiversity of the region include Shortgrass Prairie, Sandsage Shrubland, Herbaceous Wetlands and Playas, Deciduous Floodplain, Aquatic (lotic and lentic), and Riparian Shrubland (Figure 4). The last three can be considered together as the riparian corridor complex for this section. Shortgrass Prairie and Sandsage Shrubland habitats are the primary habitats within this conservation region. Other habitats that occur within the region, but are not considered priority, are Mixed Prairie, CRP/Native, CRP/Introduced Grass, Cropland Urban Areas, and Seeps and Springs.

Shortgrass Prairie



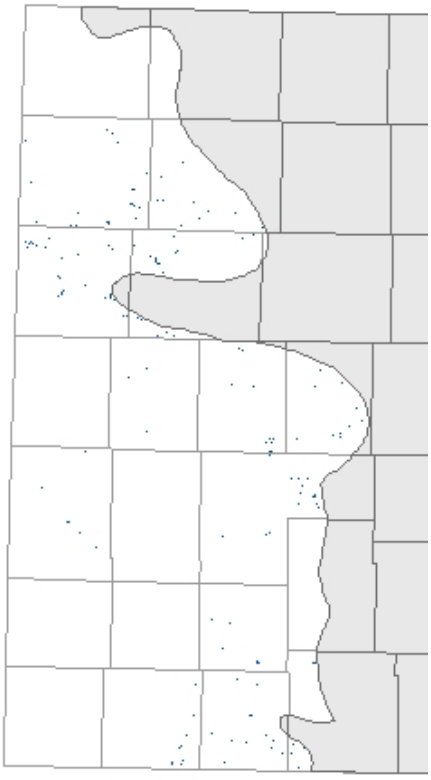
The relative condition of the Shortgrass Prairie habitat is currently good with a stable trend. The quality of the Shortgrass Prairie Habitat is unknown. Shortgrass Prairie Habitats are identified by the dominant short grass species like Buffalo Grass (*Buchloe dactyloides*), and Blue Grama (*Bouteloua gracilis*). These species are dominant on well drained soils or rocky slopes and are highly resistant to drought. Associations of Blue Grama/Hairy Grama (*Bouteloua hirsuta*) occur on loamy or sandy soils, and Blue Grama/Buffalo Grass/Western Wheatgrass (*Pascopyrum smithii*) on clay soils (Brooks 1985). While grasses are often dominant in this regions, vegetative composition also includes a robust forb component such as Heath Aster, Engelmann Daisy, Slimflower Scurfpea, and the ever-present Yarrow, along with legumes like Milkvetches and Locoweeds, can be found throughout Shortgrass Prairie Habitat (Brooks 1985). Much of the original shortgrass prairie habitat has been converted to crop production. Many crop fields have been enrolled in the Conservation Reserve Program (CRP) because of the potential for soil loss due to erosion (Cushman and Jones 1988), which aids the effort to return some of the land back to shortgrass prairie.

Sandsage Shrubland



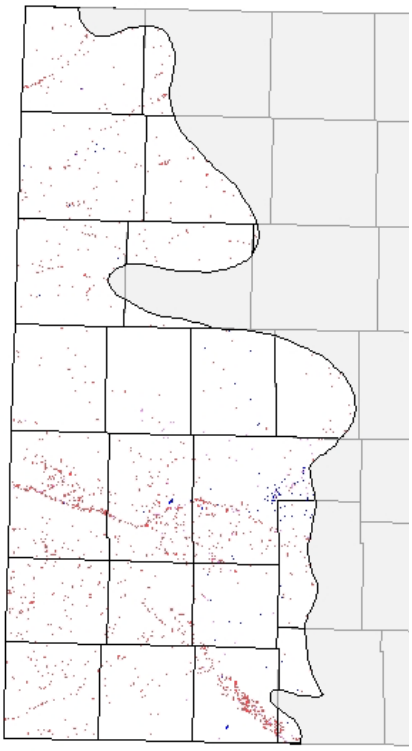
The Sandsage Shrubland habitat is declining both in quality and quantity. This habitat is located primarily in the southwestern portion of Kansas, along the valleys of the Cimarron and Arkansas rivers. Sandsage (*Artemisia filifolia*) and grasses such as Sand Bluestem (*Andropogon hallii*) and Sandreed Grass (*Calamovilfa longifolia*) are dominant in the Sandsage Shrubland Habitat. Sandsage functions as an important soil stabilizer by breaking surface winds. Were it not for this plant, much of the western sand prairie would be shifting dunes. Sandsage also provides forage, shade and shelter for smaller kinds of wildlife when all other plants succumb to the intense heat of a High Plains summer (Brooks 1985).

Herbaceous Wetland



The Herbaceous Wetland habitat in the Shortgrass Prairie Conservation Region includes grass and forb playa lakes, low or wet prairie, freshwater marsh, and bulrush marsh. Playa lakes are the predominant herbaceous wetlands of the region. Playa lakes are small, circular basins and most are shallow, clay-lined, ephemeral wetlands that hold water during rainy periods. Because rainfall is the only source of water, playa lakes go through a wet-dry cycle each year. The condition of the playa lakes has been significantly impacted by human activity. Plowing, drainage, livestock, watering, and irrigation have severely altered them by decreasing the amount of water input into the system or completely eliminating the wetland altogether. They have also been polluted by sedimentation and runoff of fertilizers and pesticides. Grasses and forbs including Scarlet Globemallow (*Sphaerlcea* coccinea), Blue Mudplantain (*Heteranthera limosa*), Prairie Zinnia (*Zinnia* grandiflora), Muhly Grass (*Muhlehergia torreyi*), Knotweed (*Polygonum* spp), Watergrass (*Echinochloa* spp), and Western Wheatgrass grow in more mesic sites such as the margins of playas. Prairie Cordgrass (*Spartina pectinata*) thrives in the low or wet prairie. Many bulrush (*Scirpus* spp.) and cattail (*Typha* spp.) species are found in freshwater marshes. Bulrush marshes are home to Common Three-Square Sedge (*Scirpus pungens*). The current quality of Herbaceous Wetland Habitat is unknown and the trend in quantity is declining.

Riparian Corridor Complex



The Riparian Corridor Complex is composed of Deciduous Floodplain habitat, lotic surface water habitat, lentic surface water habitat, and Riparian Shrubland habitat. The riparian corridor historically consisted of grassland on the ephemeral or intermittent streams with trees only occurring along big rivers. The relative quality and quantity of the components of this habitat complex are declining. Riparian corridors provide an important edge effect and allows for the connection of travel corridors between fragmented habitats. The Deciduous Floodplains are temporarily flooded habitats. Dominant tree species are Pecan (*Carya* illinoinensis), Bur Oak (*Quercus macrocarpa*), Green Ash (*Fraxinus pennsylvanica*), American Elm (*Ulmus americana*), Eastern Cottonwood (*Populus deltoids*), Sugar Maple (*Acer saccharum*), River Birch (*Betula nigra*), and Hackberry (*Celtis occidentalis*). Aside from the major rivers, surface water (lotic and lentic) in this region is mostly ephemeral in nature due to their dependence on precipitation or snowmelt and the Short-grass Prairie Conservation Region receives the least amount of precipitation in the state. Surface water also suffers from decline due to the lowering of the water table and surface and ground water withdrawal for irrigation. Riparian Shrublands occurring along rivers, streams and surface waters, and are characterized by the dominant vegetation types such as willows (*Salix* spp.), Indigo bush (*Amorpha* spp.), and the non-native Salt Cedar (*Tamarix* spp.). Deciduous Floodplains and Riparian Shrubland in this region are dependent upon flows that are for the most part intermittent. Because flows are intermittent, aquatic habitats are somewhat ephemeral.

Ecological Focus Areas in the Shortgrass Prairie Conservation Region

Terrestrial

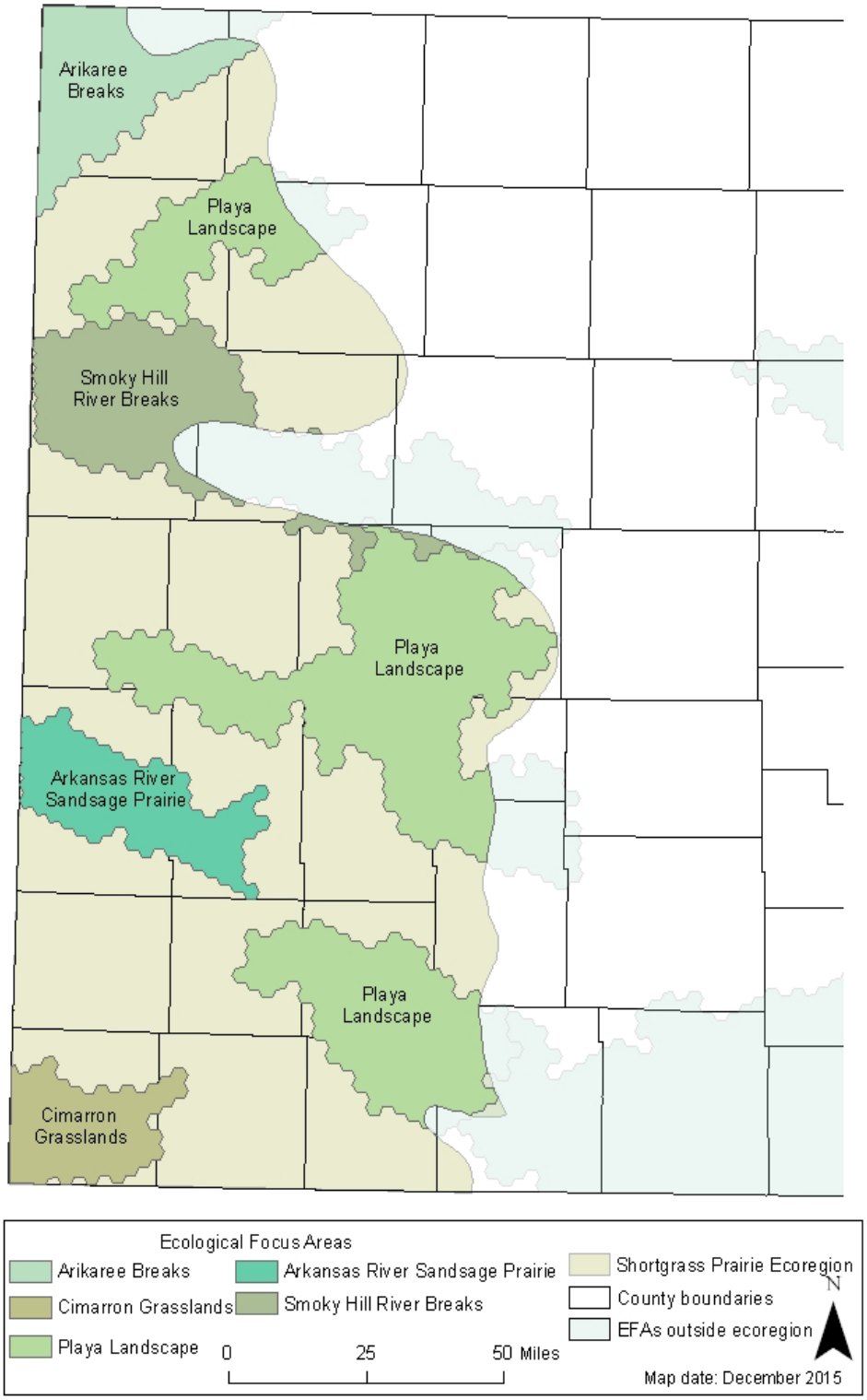
1. Arikaree Breaks
2. Playa Landscape
3. Smoky Hill River Breaks
4. Arkansas River Sandsage Prairie
5. Cimarron Grasslands

Aquatic

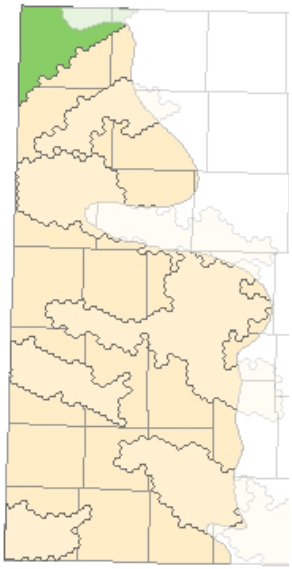
1. Upper Republican
2. Upper Arkansas

Terrestrial EFAs

Figure 5. Terrestrial Ecological Focus Areas of the Shortgrass Prairie Conservation Region. These EFAs represent landscapes where conservation actions can be applied for maximum benefit to Kansas wildlife. Each EFA includes a suite of SGCN and priority habitats.



1. Arikaree Breaks



The Arikaree Breaks Ecological Focus Area is located in the northwestern half of Cheyenne County. This area borders Colorado on the west and Nebraska on the north. The Arikaree Breaks are named for its rough terrain, with deep ravines and gullies that were formed by the erosion of loess soils causing head and side wall cutting creating tributaries of the Arikaree River and South Fork of Republican River. In addition to the rugged terrain of the Arikaree Breaks this area includes a small cluster of playa lakes and the upland areas to the north of the South Fork Republican River. Several of these playas have been prioritized for restoration in the PLJV Playa Decision Support Tool (http://pljv.org/for-habitat-partners/maps-and-data/playa-decision-support-system/) and are located within cropland areas. This area is ecologically important as the habitats change throughout the focus area and are host to numerous state listed and SGCN species.

EFA Development

This EFA captures a concentration of Large Natural Areas in Cheyenne County. The final boundary is based on the Level 4 EPA ecoregion (Moderate Relief Rangeland).

***** Conservation issues and actions are not listed in any significant order

Conservation Issues

Agriculture

*Inappropriate grazing practices on native grasslands decreases habitat heterogeneity and can change vegetative community composition

*Conversion of grasslands to other uses and/or haying of native grasslands causes fragmentation, destroys native flora and decreases habitat availability

Natural system modifications

*Bank destabilization caused by man and some resulting bank stabilization methods are negatively affecting riparian corridors

*Improperly applied use of prescribed fire (*i.e.* prominence of annual burning is detrimental for some grassland nesting birds while infrequent burning causes prairie to transition to shrubland or forest)

Invasive and other problematic species and genes

*Invasive exotic woody and herbaceous plants compete with native flora and modify habitat structure and function for fauna

Pollution

*Widespread broadcast application of pesticides often causes off-target species mortality, contributes to development of pesticide resistance, and reduces diversity of flora and fauna while increasing soil salinity

*Overuse/misapplication of pesticides and fertilizer also contribute to water quality degradation from runoff

Conservation Actions

Land/water protection

*Use conservation easements to prevent further fragmentation

*Promote field border programs and county road easements which are landowner and wildlife friendly
*Provide incentives to landowners to maintain, improve, enhance key grassland sites, and reduce intensified agricultural practices
*Acquire key parcels of land including corridors from willing sellers and/or donors

Land/water management

*Increase the heterogeneity of native habitats, as well as general landscapes by using greenways, corridors, buffer strips, refuges and the Conservation Reserve
*Implement ecologically sensitive grazing and haying practices for shortgrass prairie on private and public lands; as well as promoting the responsible, well-planned use of prescribed fire as a management/restoration tool
*Continue to develop and implement incentive programs for landowners and managers to promote heterogeneity and diversity for wildlife while maintaining viable farming/ranching operation (*i.e.* cover crops, defer/limit herbicide applications, CRP grazing reserve)
*Develop cost-neutral conservation practices for producers to provide for maintenance of ecologically and economically viable farming/ranching operations (*i.e.* patch burn grazing)
*Develop and implement methods to offset economic practices (*i.e.* wind farms, farm management systems encouraging overproduction, conversion of marginal lands into crop production, urbanization) that have negative environmental impacts
*Reduce grazing impacts by designing and encouraging implementation of wildlife friendly grazing systems, drought management plans, and conservation payment systems
*Encourage the use of CRP as a grazing reserve to allow recovery of native range

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Continued disease monitoring (Chytrid Fungus, Ranavirus, Snake Fungal Disease, etc)
*Research cover crops benefits for wildlife
*Develop a broad scale education approach and outreach program detailing the impacts of fragmentation, woody invasion and encroachment, energy development and other land use changes on flora and fauna

External capacity building

*Work with other state agencies to avoid, minimize, reduce and mitigate impacts to habitat resulting from their programs
*Develop/expand partnerships to assist in addressing conservation issues

Species of Greatest Conservation Need

Tier 1 SGCN		
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Monarch	*Danaus plexippus*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Tier 2 SGCN		
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Barn Owl	*Tyto alba*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Bullock's Oriole	*Icterus bullockii*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Cassin's Sparrow	*Peucaea cassinii*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Common Poorwill	*Phalaenoptilus nuttallii*

Tier 2 SGCN		
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Ferruginous Hawk	*Buteo regalis*
Birds	Golden Eagle	*Aquila chrysaetos*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Prairie-Chicken	*Tympanuchus cupido*
Birds	Lark Bunting	*Calamospiza melanocorys*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	McCown's Longspur	*Rhynchopanes mccownii*
Birds	Northern Bobwhite	*Colinus virginianus*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Spotted Towhee	*Pipilo maculatus*
Birds	Swainson's Hawk	*Buteo swainsoni*
Birds	Western Kingbird	*Tyrannus verticalis*
Crustaceans	Ringed Crayfish	*Faxonius neglectus*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A scarab beetle	*Geomyphilus kiowensis*
Insect	A scarab beetle	*Onthophagus knausi*
Insect	A scarab beetle	*Orizabus pyriformis*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A scarab beetle	*Trox paulseni*
Insect	A sweat bee	*Dieunomia apacha*
Insect	A wool-carder bee	*Anthidium maculosum*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Hunt’s Bumble Bee	*Bombus huntii*
Insect	Old World Swallowtail	*Papilio machaon*
Insect	Ottoe Skipper	*Hesperia ottoe*
Insect	Pocket Gopher Flower Beetle	*Eupharia disciollis*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Two-spotted Skipper	*Euphyes bimacula illinois*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Western Small-footed Myotis	*Myotis ciliolabrum*
Reptiles	Glossy Snake	*Arizona elegans*
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*

2. Playa Landscape

The Playa Landscape Ecological Focus Area is dotted with shallow, temporary wetlands, each of which lies in the lowest point of a closed watershed. Lined with clay soil, their basins collect and hold water from rainfall and runoff events. These temporary lakes are an important water source for prairie wildlife and serve as stopover locations for migrating waterfowl and shorebirds. Grasslands and shrublands are the primary native habitat found within the playa clusters, though current land use in the area is dominated by crop cultivation. Playas are threatened by agricultural and other land conversion activities that result in sedimentation and loss of function.

EFA Development

This EFA was created by overlaying occurrences of Tier 1 and Tier 2 SGCN on the PLJV playa clusters layer to identify priority landscapes.

Conservation Issues

Agriculture

*Grassland conversion and improper grazing regimes result in habitat loss and fragmentation, and increases sediment discharge to basins and increases nutrient runoff which alters playa hydrology (timing, duration, and depth of flooding) and water quality

*Practices such as wetland drainage and cropland cultivation can degrade water quality from runoff and increase sedimentation

Energy Production

*Development and expansion of wind energy, solar arrays, and oil/gas fields infrastructure and activities also lead to fragmentation and habitat loss

*Construction of infrastructure and associated roads negatively alter surface water runoff into playas

Natural system modifications

*The use of terraces built above playas to treat highly erodible land compliance requirements is lowering groundwater levels and degrading playa hydrology

Conservation Actions

Land/water protection

*Provide incentives to landowners to maintain, improve, enhance key grassland sites, and reduce intensified agricultural practices

*Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

*Provide landowners incentives for restoring and maintaining Playas

*Acquire water rights as advisable and possible and/or incentivize landowner retirement of water rights and conversion to less intensive land use

Land/water management

*Increase the heterogeneity of native habitats, as well as general landscapes by using greenways, corridors, buffer strips, refuges and the Conservation Reserve, Grassland Reserve and Sodbuster programs

*Develop incentive programs and cost-effective practices for landowners and managers to protect and restore playa landscapes and to promote heterogeneity and diversity

*Develop cost-neutral conservation practices for producers to provide for maintenance of ecologically and economically viable farming/ranching operations (*i.e.* patch burn grazing)

*Develop and implement methods to offset economic practices (*i.e.* wind farms, farm programs that encourage overproduction, conversion of unsuitable lands into production, urbanization) that have negative environmental impacts

*Encourage water right and water quality regulations in appropriate watersheds to reduce aquifer depletion, increase overland flow to basins, and improve water quality

*Develop and implement watershed management plans that approach playa landscape conservation from a holistic perspective.

*Develop a standardized water quality-testing program for playa lakes.

*Promote the use of permanent grass buffers around playa lakes

*Develop projects which inform management and policies to achieve conservation and inform landscape design

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Continued disease monitoring (Chytrid Fungus, Ranavirus, Snake Fungal Disease, etc)

*Investigate ways to determine water use (i.e., implement metering and have fees based upon amount used)

*Educate energy companies on reducing impacts to playas

External capacity building

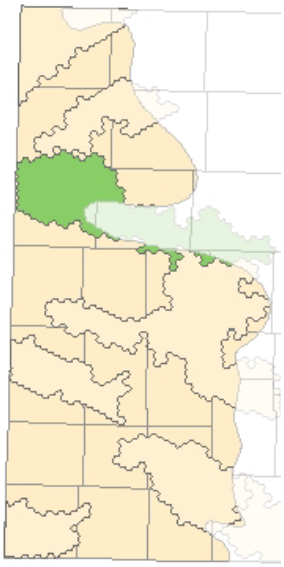
*Develop/expand partnerships to assist in addressing conservation issues.

Species of Greatest Conservation Need

Tier 1 SGCN		
Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicintus*
Birds	Piping Plover	*Charadrius melodus*
Birds	Snowy Plover	*Charadrius alexandrinus*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Monarch	*Danaus plexippus*
Mammals	Eastern Spotted Skunk	*Spilogale putorius*
Tier 2 SGCN		
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Avocet	*Recurvirostra americana*
Birds	American Golden-Plover	*Pluvialis dominica*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	American White Pelican	*Pelecanus erythrorhynchos*
Birds	Baird's Sandpiper	*Calidris bairdii*
Birds	Barn Owl	*Tyto alba*
Birds	Black-bellied Plover	*Pluvialis squatarola*
Birds	Black-necked Stilt	*Himantopus mexicanus*
Birds	Buff-breasted Sandpiper	*Calidris subruficollis*
Birds	Bullock's Oriole	*Icterus bullockii*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Canvasback	*Aythya valisineria*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Common Nighthawk	*Chordeiles minor*

Tier 2 SGCN		
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Ferruginous Hawk	*Buteo regalis*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Yellowlegs	*Tringa melanoleuca*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Least Sandpiper	*Calidris minutilla*
Birds	Lesser Yellowlegs	*Tringa flavipes*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Long-billed Curlew	*Numenius americanus*
Birds	Long-billed Dowitcher	*Limnodromus scolopaceus*
Birds	Marbled Godwit	*Limosa fedoa*
Birds	McCown's Longspur	*Rhynchopanes mccownii*
Birds	Mississippi Kite	*Ictinia mississippiensis*
Birds	Northern Pintail	*Anas acuta*
Birds	Pectoral Sandpiper	*Calidris melanotos*
Birds	Semipalmated Sandpiper	*Calidris pusilla*
Birds	Short-eared Owl	*Asio flammeus*
Birds	Stilt Sandpiper	*Calidris himantopus*
Birds	Swainson's Hawk	*Buteo swainsoni*
Birds	Upland Sandpiper	*Bartramia longicauda*
Birds	Western Kingbird	*Tyrannus verticalis*
Birds	White-rumped Sandpiper	*Calidris fuscicollis*
Birds	Wilson's Phalarope	*Phalaropus tricolor*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A callirhoe bee	*Melissodes intortus*
Insect	A dieunomia bee	*Dieunomia triangulifera*
Insect	A nomia bee	*Nomia universitatis*
Insect	A scarab beetle	*Geomyphilus kiowensis*
Insect	A scarab beetle	*Onthophagus knausi*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A scarab beetle	*Trox paulseni*
Insect	A sweat bee	*Dieunomia apacha*
Insect	A wool-carder bee	*Anthidium maculosum*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Nevada Bumble Bee	*Bombus nevadensis*
Insect	Old World Swallowtail	*Papilio machaon*
Insect	Orange-bellied Sweat Bee	*Agopostemon melliventris*
Insect	Pocket Gopher Flower Beetle	*Eupharia disciollis*
Insect	Red-belted Bumble Bee	*Bombus rufocintus*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Swift Fox	*Vulpes velox*
Mammals	Yellow-faced Pocket Gopher	*Cratogeomys castanops*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Glossy Snake	*Arizona elegans*
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*
Reptiles	Long-nosed Snake	*Rhinocheilus lecontei*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*

3. Smoky Hill River Breaks



The Smoky Hill River Breaks Ecological Focus Area is within the High Plains and Smoky Hills ecoregions and is dominated by the shortgrass prairie ecosystem. Dramatic chalk badlands and bluffs overlook large expanses of rangeland and rocky ravines along the Smoky Hill River. The Smoky Hill River floodplain and its surrounding upland habitats provide valuable refugia to the biodiversity of the EFA. Rangeland grazing is a common practice within the EFA. Issues include fragmentation of prairies and mismanaged grazing practices, which have modified the existing prairies. Protected areas include the Logan Wildlife Area, the Smoky Valley Ranch, and Scott State Park. Numerous SGCN occur within this EFA, including the endemic Scott Riffle Beetle and isolated populations of the Green Toad. Prairie dog colonies provide habitats for many SGCN including the Burrowing Owl, Swift Fox, and Black-footed Ferret.

EFA Development

This EFA captures a concentration of Large Natural Areas in the Chalk Bluffs area. It is similar to the TNC portfolio site "Chalk Bluffs" from the Central Shortgrass Prairie Ecoregional Plan but excludes the northeastern extent of that site which is dominated by agricultural land.

<u>Conservation Issues</u>

Agriculture

*Inappropriate grazing practices on native grasslands decreases habitat heterogeneity and can change vegetative community composition

*Conversion of grasslands to other uses cause fragmentation, destroys native flora and decreases habitat availability

*Practices such as wetlands drainage and cropland cultivation can degrade water quality from runoff and increase sedimentation

Energy Production

*Development and expansion of wind energy, solar arrays, and oil/gas fields infrastructure and activities in native grasslands – impacting grasslands and migratory birds, bats, and other wildlife

Natural system modifications

*The use of surface water from rivers and streams for irrigation is lowering the ground water level

Invasive and other problematic species and genes

*Sylvatic plague has the potential to impact black-tailed prairie dog populations

*Invasive woody and herbaceous plants compete with native flora and modify habitat structure and function for fauna

Pollution

*Widespread broadcast application of pesticides often causes off-target species mortality, contributes to development of pesticide resistance, and reduces diversity of flora and fauna while increasing soil salinity

*Overuse/misapplication of pesticides and fertilizer also contribute to water quality degradation from runoff

Biological resource use

*Black-tailed Prairie Dog population is low and under continual threat due to eradication programs

Conservation Actions

Land/water protection

*Provide incentives to landowners to maintain, improve, enhance key grassland sites, and reduce intensified agricultural practices

*Provide incentives to prevent or reduce the likelihood of the sale of key grassland sites for industrial, housing, or other development

*Promote field border programs and county road easements which are landowner and wildlife friendly

*Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

Land/water management

*Increase the heterogeneity of native habitats, as well as general landscapes by using greenways, corridors, buffer strips, refuges and the Conservation Reserve

*Implement ecologically-sensitive grazing and haying practices, including rest periods, for shortgrass prairie on private and public lands as well as promoting the responsible, well-planned use of prescribed fire as a management/restoration tool

*Develop and implement incentive programs for landowners and managers to promote heterogeneity and diversity for wildlife while maintaining viable farming/ranching operation (*i.e.* cover crops, defer/limit herbicide applications, CRP grazing reserve)

*Develop and implement methods to offset economic practices (*i.e.* wind farms, farm management systems encouraging overproduction, conversion of marginal lands into crop production, urbanization) that have negative environmental impacts

*Encourage use of CRP as a grazing reserve to allow recovery of native range

*Promote ecologically sounds techniques for flood control, erosion control, non-point source pollution control, and bank stabilization

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Research cover crop benefits for wildlife

*Develop a broad scale education approach and outreach program on the impacts of fragmentation, woody invasion and encroachment, energy development and other land use changes on flora and fauna

*Develop best management practices to control and manage invasive species

*Continued disease monitoring (Chytrid Fungus, Ranavirus, Snake Fungal Disease, Sylvatic Plague, etc.)

External capacity building

*Work with other state agencies, to avoid, minimize, reduce and mitigate impacts to habitat resulting from their programs

*Partner with industrial, energy, and telecommunication companies as well as private landowners to reduce impacts on native grasslands and lesser prairie chickens by encouraging burial or rerouting of power lines and other structures around key lekking, nesting, and brood rearing habitats

Species management

*****Develop and implement an effective information and educational program focused on the role and value of Black-tailed Prairie Dogs in native grasslands and the importance of ending removal policies for prairie dogs from public and private lands

*Continue to conduct population and distributional surveys of the Black-tailed Prairie Dog

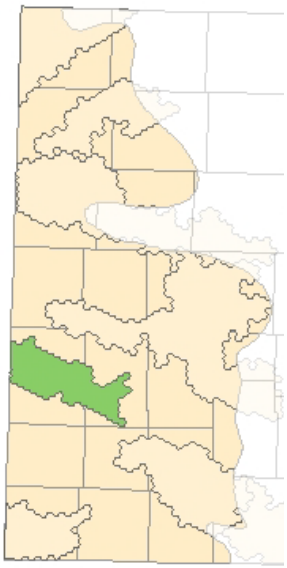
*****Develop and implement a Black-tailed Prairie Dog Management Plan

Species of Greatest Conservation Need

Tier 1 SGCN		
Amphibians	Green Toad	*Anaxyrus debilis*
Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	A leafcutter bee	*Megachile deflexa*
Insect	Monarch	*Danaus plexippus*
Insect	Scott Riffle Beetle	*Optioservus phaeus*
Mammals	Black-footed Ferret	*Mustela nigripes*
Mammals	Eastern Spotted Skunk	*Spilogale putorius*
Tier 2 SGCN		
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Barn Owl	*Tyto alba*
Birds	Bullock's Oriole	*Icterus bullockii*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Cassin's Sparrow	*Peucaea cassinii*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Common Poorwill	*Phalaenoptilus nuttallii*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Ferruginous Hawk	*Buteo regalis*
Birds	Golden Eagle	*Aquila chrysaetos*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Prairie-Chicken	*Tympanuchus cupido*
Birds	Lark Bunting	*Calamospiza melanocorys*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Long-billed Curlew	*Numenius americanus*
Birds	McCown's Longspur	*Rhynchopanes mccownii*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Short-eared Owl	*Asio flammeus*
Birds	Swainson's Hawk	*Buteo swainsoni*
Birds	Western Kingbird	*Tyrannus verticalis*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A scarab beetle	*Geomyphilus kiowensis*
Insect	A scarab beetle	*Onthophagus knausi*
Insect	A scarab beetle	*Orizabus pyriformis*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A scarab beetle	*Trox paulseni*
Insect	A sweat bee	*Agopostemon coloradensis*
Insect	A sweat bee	*Dieunomia apacha*
Insect	A wool-carder bee	*Anthidium maculosum*
Insect	Bicoloured Sweat Bee	*Agopostemon virescens*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Evening Primrose Leafcutter Bee	*Megachile anograe*
Insect	Great Plains Giant Tiger Beetle	*Amblycheila cylindriformis*
Insect	Morrison’s Bumble Bee	*Bombus morrisoni*
Insect	Ottoe Skipper	*Hesperia ottoe*
Insect	Pocket Gopher Flower Beetle	*Eupharia disciollis*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Southern Chimney Bee	*Diadasia australis*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*

Tier 2 SGCN		
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Spotted Ground Squirrel	*Xerospermophilus spilosoma*
Mammals	Swift Fox	*Vulpes velox*
Mammals	Western Small-footed Myotis	*Myotis ciliolabrum*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Glossy Snake	*Arizona elegans*
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*
Reptiles	Long-nosed Snake	*Rhinocheilus lecontei*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*

4. Arkansas River Sandsage Prairie



The Arkansas River Sandsage Prairie Ecological Focus Area is located in the southwestern portion of Kansas, adjacent to the Arkansas River drainage from the Colorado/Kansas state line to the Finney/Kearny county line. The area is characterized by fine sandy soils and rolling sand dunes. Sandsage brush and deep-rooted, sand tolerant native grasses (Sand Bluestem, Sand Lovegrass, Giant Sandreed Grass, etc.) make this ecosystem unique. The once common sandsage shrubland habitat in Kansas is declining in both quality and quantity due to the fragmentation and conversion of grasslands to agricultural crop production through the use of center pivot irrigation, lack of proper grazing management, uniformed herbicide applications to eliminate sandsage, invasive species, and energy development. Moreover, the issue is compounded by the observed difficulties of successfully restoring formerly cropped sites to native species. This area is ecologically sensitive as well as ecologically important, because it contains some of the last remaining intact remnants of sandsage prairie in the state.

EFA Development

This EFA was delineated using Large Natural Areas, CHAT Connectivity, Species of Concern and Land Cover as base data. Within this area 2.5 km hexagons with >= 50% Natural Vegetation were selected. Note this EFA extends further north than the extent of the TNC portfolio site, including a concentration of CRP land (from 2005).

Conservation Issues

Agriculture

*Inappropriate grazing practices on native grasslands decreases habitat heterogeneity and can change vegetative community composition

*Conversion of grasslands to other uses causes fragmentation, destroys native flora, and decreases habitat availability

Invasive and other problematic species and genes

*Invasive plants compete with native flora and modify habitat structure and function for fauna

Biological resource use

*Black-tailed Prairie Dog population is low and under continual threat due to eradication programs

Conservation Actions

Land/water protection

*Provide incentives to landowners to maintain, improve, enhance key grassland sites, and reduce intensified agricultural practices.

*Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

Land/water management

*Increase the heterogeneity of native habitats, as well as general landscapes by using greenways, corridors, buffer strips, refuges and the Conservation Reserve

*Implement ecologically-sensitive grazing and haying practices, including rest periods, for shortgrass prairie on private and public lands as well as promoting the responsible, well-planned use of prescribed fire as a management/restoration tool

*Develop and implement incentive programs for landowners and managers to promote heterogeneity and diversity for wildlife while maintaining viable farming/ranching operation (*i.e.* cover crops, defer herbicide applications)

*Develop new programs or modify existing incentive programs encouraging implementation of wildlife friendly grazing systems, drought management plans, and conservation payment systems for private lands

*Develop cost-neutral conservation practices for producers to provide for maintenance of ecologically and economically viable farming/ranching operations (*i.e.* patch burn grazing)

*Develop and implement methods to offset economic practices (*i.e.* wind farms, farm management systems encouraging overproduction, conversion of marginal lands into crop production, urbanization) that have negative environmental impacts

*Use CRP as a Grassbank to allow recovery of native range.

*Develop a sandsage shrubland restoration plan that identifies mitigation opportunities and funding sources.

*Promote improved water quality

*Develop an integrated exotic and invasive species control program.

*Implement programs to minimize disturbance of public and private lands, including roads and trails.

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Research cover crop benefits for wildlife

*Conduct research to better understand the threats of exotic and invasive species

*Continued disease monitoring (Chytrid Fungus, Ranavirus, Snake Fungal Disease, Sylvatic Plague, etc.)

*Research methods to control and manage sagebrush, instead of its elimination

*Conduct research on ways to improve effectiveness and efficiency of irrigation practices

*Determine dewatering impacts on aquatic wildlife and wetlands

External capacity building

*Develop better coordination of government programs to increase efficiency of actions

Species management

*Develop and implement an effective information and educational program focused on the role and value of Black-tailed Prairie Dogs in native grasslands and the importance of ending removal policies for prairie dogs from public and private lands

***Develop and implement a Black-tailed Prairie Dog Management Plan

*Continue to conduct population and distributional surveys of the Black-tailed Prairie Dog

Species of Greatest Conservation Need

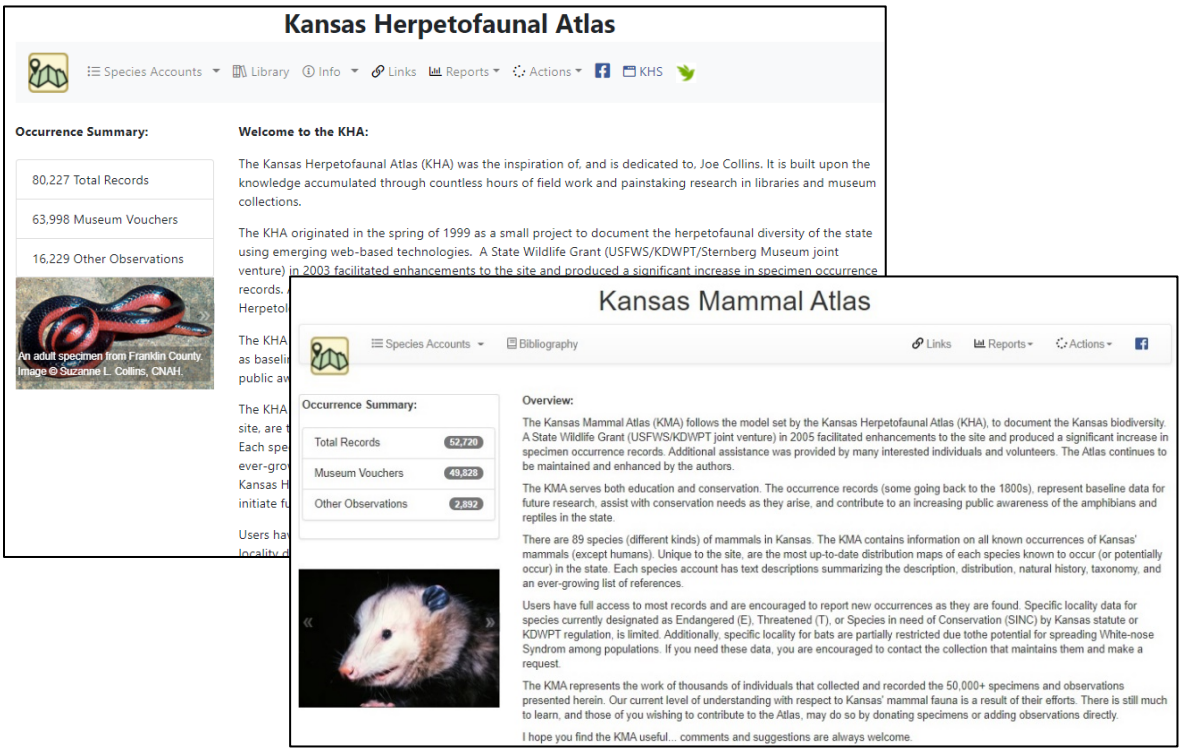
Tier 1 SGCN		
Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Monarch	*Danaus plexippus*
Insect	Sage Sphinx	*Lintneria eremitoides*
Tier 2 SGCN		
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	Barn Owl	*Tyto alba*
Birds	Bullock's Oriole	*Icterus bullockii*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Cassin's Sparrow	*Peucaea cassinii*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Common Poorwill	*Phalaenoptilus nuttallii*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Lark Bunting	*Calamospiza melanocorys*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	McCown's Longspur	*Rhynchopanes mccownii*
Birds	Scaled Quail	*Callipepla squamata*
Birds	Short-eared Owl	*Asio flammeus*
Birds	Swainson's Hawk	*Buteo swainsoni*
Birds	Western Grebe	*Aechmophorus occidentalis*
Birds	Western Kingbird	*Tyrannus verticalis*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A dieunomia bee	*Dieunomia triangulifera*
Insect	A longhorned beetle	*Tetraopes pilosus*
Insect	A scarab beetle	*Geomyphilus kiowensis*
Insect	A scarab beetle	*Onthophagus knausi*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A scarab beetle	*Trox paulseni*
Insect	A sweat bee	*Agopostemon coloradensis*
Insect	A sweat bee	*Dieunomia apacha*
Insect	A wool-carder bee	*Anthidium maculosum*
Insect	Abberrant Cellophane Bee	*Colletes aberrans*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Orange-bellied Sweat Bee	*Agopostemon melliventris*
Insect	Pocket Gopher Flower Beetle	*Eupharia disciollis*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Southern Chimney Bee	*Diadasia australis*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Spotted Ground Squirrel	*Xerospermophilus spilosoma*
Mammals	Swift Fox	*Vulpes velox*
Mammals	Yellow-faced Pocket Gopher	*Cratogeomys castanops*
Plants	Sandhill Goosefoot	*Chenopodium cycloides*
Plants	Sandsage Prairie-clover	*Dalea cylindriceps*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Glossy Snake	*Arizona elegans*

Tier 2 SGCN		
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*
Reptiles	Long-nosed Snake	*Rhinocheilus lecontei*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*

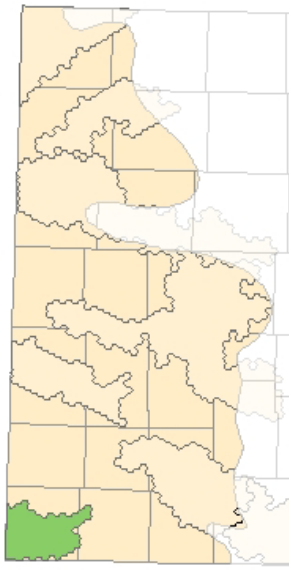
Success Story – Kansas Mammal and Herpetofaunal Atlases

A constant priority for Kansas conservation and management is obtaining vital information on wildlife species and habitats. Data on species/habitat relationships, population demography, and community dynamics increases our ability to identify and interpret potential threats and decide on appropriate actions. The Kansas Mammal Atlas and the Kansas Herp Atlas were developed to address the lack of species data. Both atlases are products of State Wildlife Grants to the Sternburg Museum of Natural History, Fort Hays State University. The Mammal Atlas project began in 2006, while the Herp Atlas started as a small personal project in 1999 but was enhanced by the support of the State Wildlife Grant. For each species the Atlases contain a description of taxonomy, recognition features, distribution, ecology, reproduction, and behavior. Through the long history of professional collecting and the work of thousands of individuals contributing information, our body of knowledge about Kansas mammals and herps continues to grow. This not only benefits education and conservation purposes but contributes to an increasing public awareness of the species in the state.

https://webapps.fhsu.edu/ksmammal/
https://webapps.fhsu.edu/ksherp/default.aspx



5. Cimarron Grasslands



The Cimarron Grasslands Ecological Focus Area is located in extreme southwest Kansas and is dominated by shortgrass prairie, but also includes sandsage prairie and riparian communities along the Cimarron River. The focus area includes the Cimarron National Grasslands, the largest publicly owned parcel of land in Kansas and the only parcel managed by the United States Forest Service. This focus area represents a large portion of shortgrass prairie that is surrounded by cropland. Lack of proper grazing management for biological diversity, improper prescribed fire frequency/management, fragmentation of prairie habitat and energy development are a few of the issues impacting this ecological focus area.

EFA Development

The core of this EFA is the TNC portfolio site "Cimarron Grasslands" from the Central Shortgrass Prairie Ecoregional Plan. Hexagons containing outlying parcels of the Cimarron National Grasslands were then added as well as all hexagons intersecting TNC priority areas with a minimum of 50% Natural Vegetation.

Conservation Issues

Agriculture

*Inappropriate grazing practices on native grasslands decreases habitat heterogeneity and can change vegetative community composition

*Conversion of grasslands to other uses causes fragmentation, destroys native flora, and decreases habitat availability

Energy Production

*Development and expansion of wind energy, solar arrays, and oil/gas fields infrastructure and activities in native grasslands – impacting grasslands and migratory birds, bats, and other wildlife

Invasive and other problematic species and genes

*Exotic and invasive species (*i.e.* Tamarix sp.)

Biological resource use

*Black-tailed Prairie Dog population is low and under continual threat due to eradication programs

Conservation Actions

Land/water protection

*Provide incentives to landowners to maintain, improve, enhance key grassland sites, and reduce intensified agricultural practices.

*Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

*Promote field border programs and county road easements which are landowner and wildlife friendly.

Land/water management

*Increase the heterogeneity of native habitats, as well as general landscapes by using greenways, corridors, buffer strips, refuges and the Conservation Reserve

*Implement ecologically-sensitive grazing and haying practices, including rest periods, for shortgrass prairie on private and public lands as well as promoting the responsible, well-planned use of prescribed fire as a management/restoration tool

*Provide incentives to landowners to maintain, improve, enhance key grassland sites, and reduce intensified agricultural practices

*Develop and implement incentive programs for landowners and managers to promote heterogeneity and diversity for wildlife while maintaining viable farming/ranching operation (*i.e.* cover crops, defer spraying)

*Develop and implement methods to offset economic practices (*i.e.* wind farms, farm management systems encouraging overproduction, conversion of marginal lands into crop production, urbanization) that have negative environmental impacts

*Use CRP as a Grassbank to allow recovery of native range

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Research cover crop benefits for wildlife

*Continued disease monitoring (Chytrid Fungus, Ranavirus, Snake Fungal Disease, etc.)

*Develop a broad scale education approach and outreach program on the impacts of fragmentation, woody invasion and encroachment, energy development and other land use changes on flora and fauna

External capacity building

*Work with other state agencies to avoid, minimize, reduce and mitigate impacts to habitat resulting from their programs.

Species management

*Develop and implement an effective information and educational program focused on the role and value of Black-tailed Prairie Dogs in native grasslands and the importance of ending removal policies for prairie dogs from public and private lands

*****Develop and implement a Black-tailed Prairie Dog Management Plan.

*Continue to conduct population and distributional surveys of the Black-tailed Prairie Dog

*****Continue Lesser Prairie Chicken surveys. Bury or route power lines around nesting, brood rearing and lek habitats. Acquire, as advisable and possible, conservation easements on critical habitat with protocols for non-impact.

Species of Greatest Conservation Need

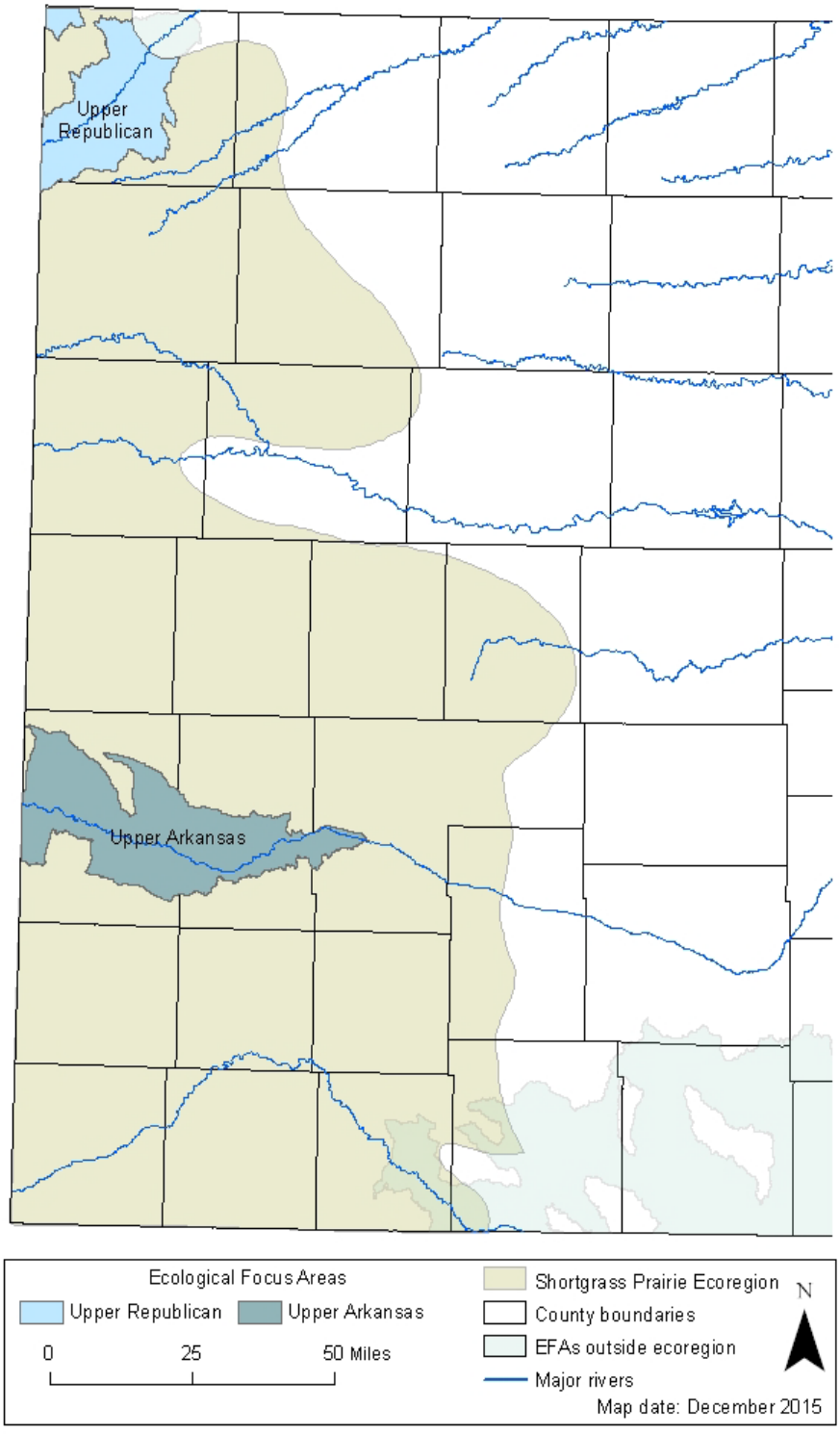
Tier 1 SGCN		
Amphibians	Green Toad	*Anaxyrus debilis*
Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	Arogos Skipper	*Atrytone arogos*
Insect	Monarch	*Danaus plexippus*
Insect	Sage Sphinx	*Lintneria eremitoides*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Reptiles	New Mexico Threadsnake	*Rena dissectus*

Tier 2 SGCN		
Amphibians	Red-spotted Toad	*Anaxyrus punctatus*
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Avocet	*Recurvirostra americana*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	Baird's Sparrow	*Centronyx bairdii*
Birds	Barn Owl	*Tyto alba*
Birds	Bullock's Oriole	*Icterus bullockii*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Cassin's Sparrow	*Peucaea cassinii*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Chihuahuan Raven	*Corvus cryptoleucus*
Birds	Common Nighthawk	*Chordeiles minor*

Tier 2 SGCN		
Birds	Common Poorwill	*Phalaenoptilus nuttallii*
Birds	Curve-billed Thrasher	*Toxostoma curvirostre*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Ferruginous Hawk	*Buteo regalis*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Ladder-backed Woodpecker	*Dryobates scalaris*
Birds	Lark Bunting	*Calamospiza melanocorys*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Long-billed Curlew	*Numenius americanus*
Birds	McCown's Longspur	*Rhynchopanes mccownii*
Birds	Mississippi Kite	*Ictinia mississippiensis*
Birds	Mountain Plover	*Charadrius montanus*
Birds	Northern Bobwhite	*Colinus virginianus*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Scaled Quail	*Callipepla squamata*
Birds	Scissor-tailed Flycatcher	*Tyrannus forficatus*
Birds	Short-eared Owl	*Asio flammeus*
Birds	Western Kingbird	*Tyrannus verticalis*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A longhorned beetle	*Tetraopes pilosus*
Insect	A nomia bee	*Nomia universitatis*
Insect	A scarab beetle	*Cryptoscatomaseter paulseni*
Insect	A scarab beetle	*Geomyphilus kiowensis*
Insect	A scarab beetle	*Geomyphilus viceversus*
Insect	A scarab beetle	*Onthophagus knausi*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A scarab beetle	*Trox paulseni*
Insect	A sweat bee	*Dieunomia apacha*
Insect	A wool-carder bee	*Anthidium maculosum*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Burrow Small Dung Beetle	*Geomyphilus thomomysi*
Insect	Ottoe Skipper	*Hesperia ottoe*
Insect	Pocket Gopher Flower Beetle	*Eupharia disciollis*
Insect	Punctured Small Dung Beetle	*Cryptoscatomaseter punctissimus*
Insect	Southern Chimney Bee	*Diadasia australis*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Spotted Ground Squirrel	*Xerospermophilus spilosoma*
Mammals	Swift Fox	*Vulpes velox*
Plants	Sandhill Goosefoot	*Chenopodium cycloides*
Plants	Sandsage Prairie-clover	*Dalea cylindriceps*
Reptiles	Eastern Hog-nosed Snake	*Heterdon platirhinos*
Reptiles	Glossy Snake	*Arizona elegans*
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*
Reptiles	Long-nosed Snake	*Rhinocheilus lecontei*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*

Aquatic EFAs

Figure 6. Aquatic Ecological Focus Areas of the Shortgrass Prairie Conservation Region. These EFAs represent landscapes where conservation actions can be applied for maximum benefit to Kansas wildlife. Each EFA includes a suite of SGCN and priority habitats.



1. Upper Republican

The Upper Republican Ecological Focus Area is composed of the South Fork Republican River. The river flows from its origins in eastern Colorado, through the northwest corner of Kansas, and into Nebraska where it joins with the Republican River. This EFA occurs in the Western High Plains ecoregion and is characterized by flat to rolling plains that are smoother, more level, and generally have thicker loess-mantled uplands than other Western High Plains regions. Dryland farming with areas of irrigated cropland agriculture are extensive throughout the region. The South Fork Republican River is considered habitat for state listed species such as the Flathead Chub, Brassy Minnow, and Plains Minnow.

Conservation Issues

Agriculture & Aquaculture

*Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation and nutrient issues

*Intense grazing regimes can degrade riparian habitats

*Livestock access to streams can increase nutrient input

Natural system modifications

*Use of ground water and surface water from rivers and streams for irrigation is lowering the water level, and as a result many miles of stream are drying

*Structures that alter the water from its natural drainage are impacting natural hydrology of streams

*Bank destabilization (due to riparian management, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat

*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Introduced non-native species negatively impact native aquatic species and habitat

*Introduced predatory species can impact populations of native aquatic species, fisheries management in stocking game fish, can be detrimental to native species

*Invasive plants impact riparian areas and reduce streamflows

Pollution

*Runoff of pesticides and fertilizers

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors

*Acquire riparian corridor acreages through willing sellers/donors

*Acquire water rights as advisable and possible

*Encourage conservation easements on high quality habitats

Land/water management

*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species

*Promote improved water quality standards

*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes

*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats

*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control, and bank stabilization

*Encourage engineering techniques that promote high habitat diversity

*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management

*Maximize habitat diversity for wildlife species

*Expand cooperative programs that supply technical and direct assistance for non-native species removal

*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species

*Promote mechanical removal of non-native, invasive plant species by utilizing local habitat partnerships

*Promote restoration of stream channels through natural stream design

*Promote restoration projects that increase floodplain connectivity in incised streams

*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage

*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit landowners as well as stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts

*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Inform landowners and managers of and promote best management practices

*Educate landowners and managers on the value of rare species

*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics.

*Continue disease monitoring (Chytrid Fungus, Ranavirus, etc.)

*Investigate contaminant effects on reptilian and amphibian populations

*Research and develop engineering techniques for effective river and stream management

*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding

*Study the impact of introduced species on native species

*Educate the public regarding the importance of preventing the spread of invasive species

*Inventory perched culverts and other structures that are preventing aquatic organism passage

External capacity building

*Promote and encourage formation of coalitions/associations such as the Comanche Pool Prairie Resource Foundation

*Promote sound water quality standards and their enforcement through education and continue coordination with the Kansas Department of Health and Environment

*Work with neighboring states to gain compliance of interstate compacts in regard to water rights

*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage.

*Promote the use of conservation culverts that retain natural stream bed features

*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

Livelihood, economic and other incentives

*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Fish	Plains Minnow	*Hybognathus placitus*
Tier 2 SGCN		
Fish	Brassy Minnow	*Hybognathus hankinsoni*
Fish	Northern Plains Killifish	*Fundulus kansae*
Fish	Orangethroat Darter	*Etheostoma spectabile*
Fish	Quillback	*Carpiodes cyprinus*
Fish	Stonecat	*Noturus flavus*
Fish	White Sucker	*Catostomus commersonii*
Mussels	Pondhorn	*Uniomerus tetralasmus*

2. Upper Arkansas

The Upper Arkansas Ecological Focus Area is the Kansas entry point of the Arkansas River, which originates in Colorado. As part of the Western High Plains, this EFA is characterized by sandy plains and dune areas that are part of the Rolling Sand Plains, as well as the Moderate Relief Rangeland with greater slopes than the surrounding flat and rolling plains. The area surrounding this EFA is called the Flat to Rolling Cropland ecoregion. The focus area contains a mosaic of land use, primarily as rangeland with areas of irrigated agriculture. The Upper Arkansas is habitat for state threatened species such as the Arkansas River Shiner, Flathead Chub and Plains Minnow.

Conservation Issues

Agriculture

*Groundwater mining of the Ogallala Aquifer has caused parts of the upper Arkansas River to become dry, which reduces and fragments available habitat for aquatic organisms
*Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation, and nutrient issues
*Intense grazing regimes can degrade riparian habitats
*Livestock access to streams can increase nutrient input

Natural system modifications

* Use of ground water and surface water from rivers and streams for irrigation is lowering the water level, and as a result many miles of stream are drying

*Structures that alter the water from its natural drainage are impacting natural hydrology of streams

*Bank destabilization (due to riparian management, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat

*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Introduced species negatively impact native aquatic species and habitat.

*Introduced predatory species can impact populations of native aquatic species.

*Invasive plants impact riparian areas and reduce streamflows

Pollution

*Widespread broadcast application of pesticides often causes off-target species mortality, contributes to development of pesticide resistance, and reduces diversity of flora and fauna while increasing soil salinity

*Overuse/misapplication of pesticides and fertilizer also contribute to water quality degradation from runoff

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage.

*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors

*Acquire riparian corridor acreages through willing sellers/donors

*Acquire water rights as advisable and possible

*Encourage conservation easements on high quality habitats

Land/water management

*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species

*Promote improved water quality standards

*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes

*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats

*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control and bank stabilization

*Encourage engineering techniques that promote high habitat diversity

*Encourage the use of fences where necessary to manage the riparian corridor, and otherwise conduct proper grazing management

*Maximize habitat diversity for wildlife species

*Expand cooperative programs that supply technical and direct assistance for non-native species removal

*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species

*Promote mechanical removal of non-native, invasive plant species by utilizing local habitat partnerships
*Promote restoration of stream channels through natural stream design
*Promote restoration projects that increase floodplain connectivity in incised streams
*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage
*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit landowners as well as stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts
*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Inform landowners and managers of and promote best management practices
*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics.
*Continue disease monitoring (Chytrid Fungus, Ranavirus, etc.)
*Investigate contaminant effects on reptilian and amphibian populations
*Research and develop engineering techniques for effective river and stream management
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Study the impact of introduced species on native species
*Educate the public regarding the importance of preventing the spread of invasive species
*Inventory perched culverts and other structures that are preventing aquatic organism passage

External capacity building

*Promote and encourage formation of coalitions/associations such as the Comanche Pool Prairie Resource Foundation
*Promote sound water quality standards and their enforcement through education and continue coordination with the Kansas Department of Health and Environment
*Work with the county zoning boards to implement good urban planning procedures
*Work with neighboring states to gain compliance of interstate compacts in regard to water rights
*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage.
*Promote the use of conservation culverts that retain natural stream bed features
*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

Livelihood, economic and other incentives

*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife
*Promote the use of more efficient irrigation methods and drought tolerant crops to conserve water in the Ogallala Aquifer

Species of Greatest Conservation Need

Tier 1 SGCN		
Fish	Flathead Chub	*Platygobio gracilis*
Fish	Arkansas River Shiner	*Notropis girardi*
Fish	Peppered Chub	*Macrhybopsis tetranema*

Tier 2 SGCN		
Fish	Golden Redhorse	*Moxostoma erythrurum*
Fish	Northern Plains Killifish	*Fundulus kansae*
Fish	White Sucker	*Catostomus commersonii*
Turtles	Smooth Softshell	*Apalone mutica*

Shortgrass Prairie Conservation Region Conservation Partners (not listed on Statewide List)

- Bird Conservancy of the Rockies
- Great Plains Landscape Conservation Cooperative
- Kansas Prescribed Burn Association (local associations)
- Playa Lakes Joint Venture
- Republican River Compact
- Water For Wildlife – One-Shot Antelope Foundation

Chapter 5 -
CENTRAL MIXED GRASS PRAIRIE CONSERVATION REGION

Description

The Central Mixed Grass Prairie Conservation Region is located in the central part of Kansas. It is the transition area between the Shortgrass Prairie Conservation Region to the west and the Eastern Tallgrass Prairie Conservation Region to the east. It includes all or part of the High Plains, Smoky Hills, Arkansas River Lowlands, Wellington-McPherson Lowlands, Red Hills, Glaciated Region and Flint Hills physiographic regions (Figure 4).

The High Plains region is composed of sediment eroded from the Rocky Mountains. The flat, almost featureless plain is broken up by rugged breaks and valleys. The dominant grasses of this region are short stature and have large extensive root systems that can tolerate the dry climate. Trees are scarce and herbaceous species indicative of more arid environments are common.

The Smoky Hills, a large area of north central Kansas, is a transitional area between the drier High Plains to the west and the more mesic regions to the east. The Cretaceous bedrock of this region consists of sandstones, limestones, and shales deposited when the area was covered by stream channels and shallow seas (Wilson 1984). The thick deposits of Niobrara chalk, well known for their fossils, occur along the upper Smoky Hill River. The landscape varies from steep hills to gentle rolling hills and open plains (Savage 2004). Trees are more frequent in lowland or riparian areas.

The Arkansas Lowlands follows the Arkansas River and associated lowlands. The river bed is filled with sediments washed down from the Rocky Mountains by the river (Busby and Zimmerman 2001). The only river in Kansas that originates in the Mountains, the Arkansas River channel is wide and shallow, with much of the water moving through this system flowing underground through the porous sand (Madson 1985). The relatively flat terrain is disrupted by sand hills along the south side of the river. Wetlands were once prominent features in this region but, with the increase in irrigated crop land, the water table was lowered resulting in extensive loss of wetlands. Some large wetlands still persist and are found in Quivira National Wildlife Refuge and Cheyenne Bottoms.

The Wellington-McPherson Lowlands occur on either side of the lower portion of the Arkansas Lowlands. The gently rolling to level plains of this region was produced by the erosion of thick deposits of shale (Busby and Zimmerman 2001). The Wellington-McPherson Lowlands sit on top of one of the largest salt deposits in the world, known as the Hutchinson salt bed (Wilson and Bennett 1985). Another important underground feature is the Equus beds aquifer, providing water for Wichita, McPherson, Newton and the surrounding communities (Madson 1985). Sand dunes occur in many places throughout the region. For the most part, the dunes are covered with vegetation, preventing the sand from shifting (Physiographic 1997).

The Red Hills region is located at the southern edge of the Kansas Mixed Grass Prairie. The topography consists of rugged grassy hills, with buttes topped by flat mini-grasslands. The soils are bright red resulting from oxidized sandstone and shale (Wilson 1985). In Barber and eastern Comanche counties, caves have formed where thick gypsum deposits were eroded out. The gypsum deposit along with salt is responsible for the sinkholes common in the Red Hills (Busby and

Zimmerman 1985). Woodlands occur along major tributaries, with eastern red cedars invading the uplands.

The Glaciated Region occupies the north-east corner of the state. Only a very small portion of this region occurs in the Mixed Grass Prairie Conservation Region. Shaped by the repeated southern advance and then northern retreat of glaciers during the Quaternary period. Wind-blown deposit of loess, often associated with glaciation, occurs throughout the region and is thickest along the Nebraska border (Physiographic 1997). The region is intensively farmed today because of its fertile soil. Woodlands are confined to the bluffs along the Missouri River and other major stream courses protected from fire (Busby and Zimmerman 2001). The Flint Hills lie at the western edge of the Tallgrass prairie. Only a small portion of the Flint Hills occurs in the Mixed Grass Prairie Conservation Region. It is composed of flint-bearing limestone which is resistant to erosion (Busby and Zimmerman 2001). The topography consists of flat-topped hills which drop off steeply into valleys with rocky, clear-flowing streams. The soil is fertile but shallow and gravelly, discouraging the conversion of prairie to cropland. Forests occur along major tributaries and areas protected from fire; otherwise woody vegetation is scarce (Duncan 1978).

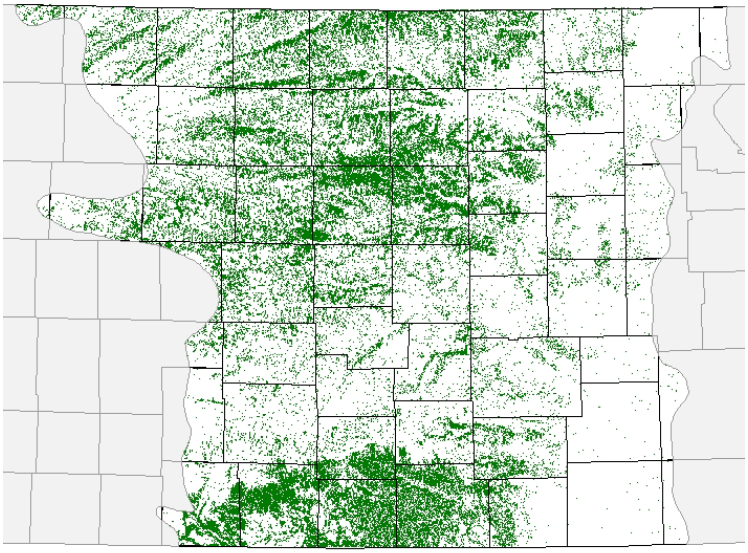
The functional boundaries of the Mixed Grass Prairie are at times inexact and can shift east or west depending on trends in precipitation and temperature (Coupland 1992). The amount of annual rainfall in the region is between 20-30 inches (Brooks 1985). Strong winds are common, particularly in the spring, which can increase evaporation. The climate is dry-sub humid to semi-arid, with individual years ranging from humid to arid. As the name suggests, this region contains a mixture of short-grass and tall-grass plants. Depending on soils, topographic position, grazing, fire, and weather, the composition of the mixed grass prairie can favor the tall-grass species of the east or the short-grass species of the west (Collins 1985). In times of little rainfall, plants more associated with the arid climate of western Kansas increase in abundance, while plants more accustomed to the moisture of eastern Kansas increase in abundance during wetter periods. It is in this region the plants reach their western or eastern limit (Brooks 1985). Woodlands and shrublands are restricted to lowlands adjacent to river systems and areas protected from fire.

The economy of the Mixed Grass region in Kansas is primarily agricultural. Land use is generally split between crop production and rangeland grazing. Often, gravelly or sandy soils are avoided for cropland production because of plowing difficulty and their inability to hold water. Extensive areas of cropland are planted to wheat, grain sorghum, and other crops. Areas with unsuitable soil for crop production and steep slopes, remain as native prairie mostly used for livestock grazing. Though adapted to grazing, a major concern for the health of the remaining grasslands is the intensity of grazing pressure allowed by landowners (Savage 2004). Although some large blocks of the natural mixed grass prairie still exist in rangelands, much of the area has been converted to farmland or significantly changed by grazing practices (Coupland 1992). The Mixed Grass region is more populated than the Shortgrass region. The smaller towns are relatively sparsely situated. The larger cities occur in the central, south-central portion of the region. Major rivers are the Republican and Solomon in the north, the central Saline and Smoky Hill, and Arkansas in the south.

Priority habitats in the Central Mixed Grass Prairie Conservation Region

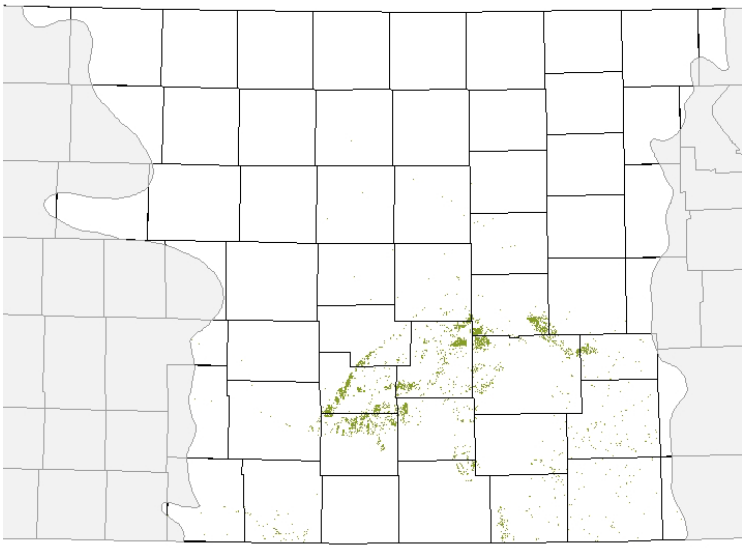
Priority habitats in the region include: Mixed Prairie, Sand Prairie, Herbaceous Wetland, Aquatic (lotic), Seeps and Springs, and Eastern Large Rivers. Other habitats that occur within the region, but are not considered priority, are Sandsage Shrubland, CRP/Native, Bur Oak, Deciduous Floodplain, Cropland, Evergreen (cedar), Riparian Shrubland, Caves, Aquatic (lentic), and Cool Season Conservation Plantings.

Mixed Prairie



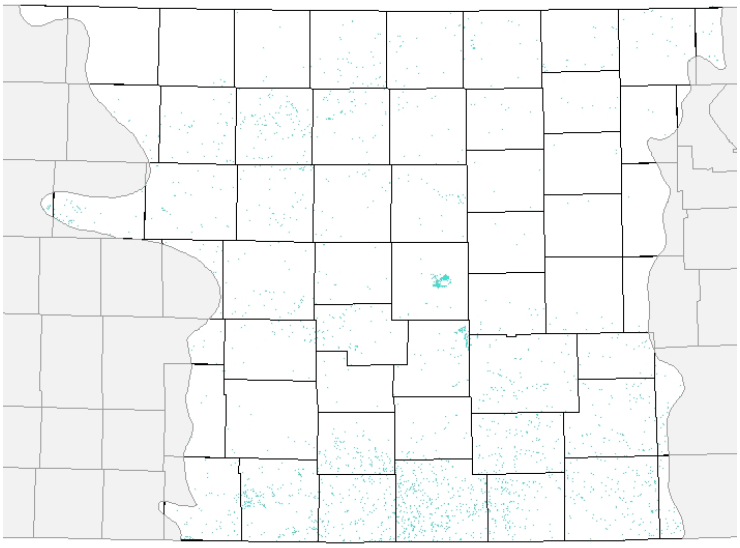
The Mixed Prairie habitat is located primarily in the Smoky Hills, Red Hills, and High Plains regions of Kansas. This habitat is composed of both short-grass and tall-grass species. Shortgrass species such as Buffalo grass (*Buchloe dactyloides*) and Blue Grama (*Bouteloua gracilis*), are found on the shallow soils of the uplands. Tallgrass species such as Big Bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), and Switchgrass (*Panicum virgatum*), are abundant in moist areas. Midsized grasses such as Little Bluestem (*Schizachyrium scoparium*), Tall Dropseed (*Sporobolus asper*), and Side-oats Grama (*Bouteloua curtipendula*), occur elsewhere. Dominant woody species include Hackberry, Sand Plum, and Smooth Sumac (*Rhus glabra*) (Thompson et al. 2011).

Sand Prairie



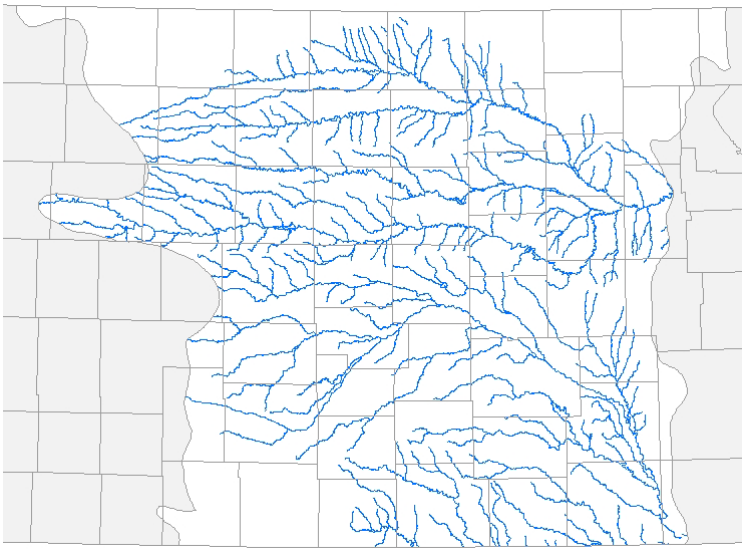
The Sand Prairie habitat is found in well-drained sand soils in the Arkansas River Lowlands, the Red Hills, the Smoky Hills, and the Wellington-McPherson Lowlands. Sand Bluestem (*Andropogon hallii),* is the dominant plant species. Other common species are Prairie Sand Reed (*Calamovilfa longifolia*), Plains Sunflower (*Helianthus petiolaris*), Beebalm (*Monarda punctata*), Fourpoint Evening Primrose (*Oenothera rhombipetala*), Switchgrass (*Panicum virgatum*), Sand Hill Plum (*Prunus angustifolia*), and Little Bluestem (*Schizachyrium scoparium*). Eastern Red Cedar (*Juniperus virginiana*) is scattered over the slopes, and small patches of woody growth including Hackberry, Elm, and Smooth Sumac occur in ravine bottoms (Thompson 2011).

Herbaceous Wetland



The Herbaceous Wetland habitat in the Central Mixed Grass Prairie Conservation Region includes salt marsh/prairie, spikerush playa lake, playa lake, low or wet prairie, freshwater marsh, cattail marsh, and weedy marsh. The best known wetlands in the state occur in the Central Mixed Grass Prairie Conservation Region. Cheyenne Bottoms Wildlife Area is a naturally occurring freshwater wetland maintained by water control structures. A close neighbor to Cheyenne Bottoms, Quivira National Wildlife Refuge is a naturally occurring saltwater marsh. Both wetlands complement each other in providing habitat for many migrating waterfowl and shorebirds. In freshwater marshes, prairie cordgrass (*Spartina pectinata*), sedges, and cattails (*Typha* spp.) dominate, and vegetation may be tall and dense. In salt marshes, inland salt grass (*Distichlis spicata*) and seepweed (*Suaeda depressa*) dominate, but other grasses, sedges, spike-rush (*Eleocharis* spp.), and various forbs may be important; vegetation is usually of low to medium height (Thompson 2011).

Aquatic – Western Lotic

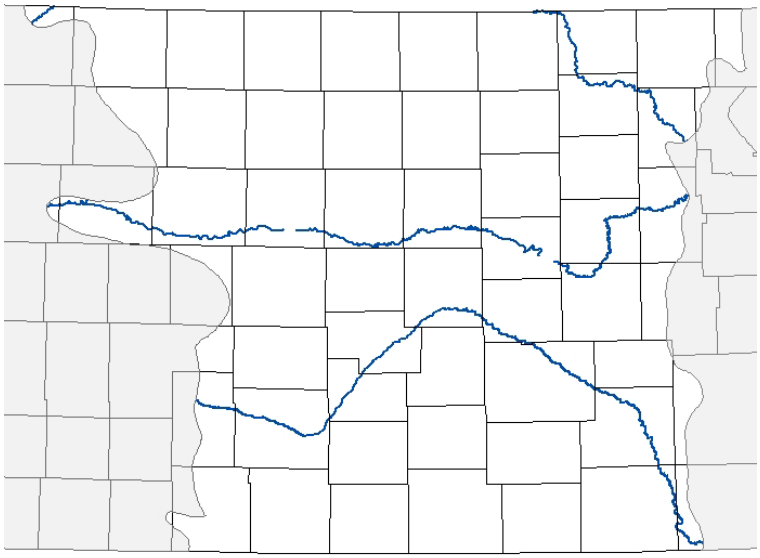


The Aquatic – Western Lotic (flowing water) habitat includes rivers, streams, and their tributaries in the Arkansas, Smoky Hill, Saline and Solomon River Basins of the Central Mixed Grass Conservation Region. These rivers and their flowing tributaries have sandy, shallow beds, with few deep chutes, sloughs, and oxbows. Many lakes in this region, such as Wilson Lake, Kanopolis Lake and Cedar Bluff Reservoir, were created by the construction of impoundments for flood control. Human activities have had the greatest effect on aquatic habitat, such as water consumption and agriculture, depleting the water levels and polluting the remaining water (Cross 1995).

Seeps and Springs

Both seeps and springs are places where ground water moves naturally to the earth's surface either into a body of water or onto land. Springs differ from seeps in that the ground water flows from the earth at a rate sufficient to form a current. With seeps, the ground water oozes out of the soil or rock without distinct flow. Beginning as precipitation that falls to the surface, spring water moves down into the subsurface by gravity until it reaches a less permeable layer of rock, such as shale. Many rock layers in Kansas slope subtly to the west. The ground water moves down the slope through permeable rock until it reaches a location where the rock has been exposed to the atmosphere by erosion. This type of spring is called a contact spring, the most common type of spring in Kansas. There are a few springs in Kansas, known as artesian springs, where water is forced to the surface by pressure rather than by gravity. Artesian springs were more common in the state before heavy pumping lowered the water table and lessened the pressure that might have created artesian conditions (Buchanan et al. 1998).

Aquatic – Eastern Large Rivers



The Aquatic – Eastern Large Rivers habitat is the portion of the Arkansas and the Kansas Rivers that flow through the Central Mixed Grass Conservation Region. These rivers have sandy bottoms with few deep chutes, sloughs, and oxbows. The wide, shallow banks are subject to seasonal flooding. Human activities have had the greatest effect on aquatic habitats such as water consumption and agriculture, depleting the water levels and polluting the remaining water (Cross 1995).

Ecological Focus Areas in the Central Mixed Grass Prairie Conservation Region

Terrestrial

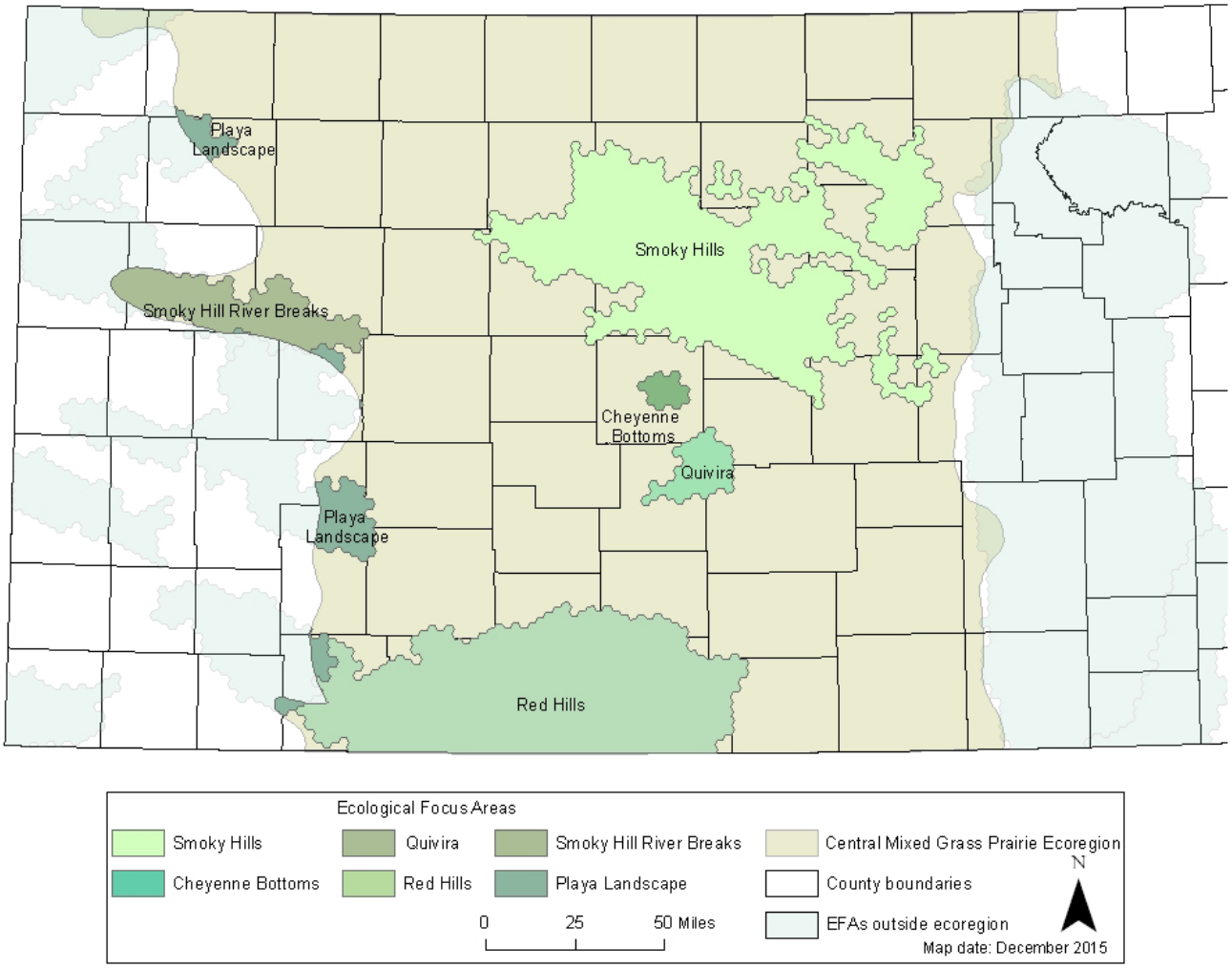
1. Playa Landscape
2. Smoky Hill River Breaks
3. Smoky Hills
4. Cheyenne Bottoms
5. Quivira
6. Red Hills

Aquatic

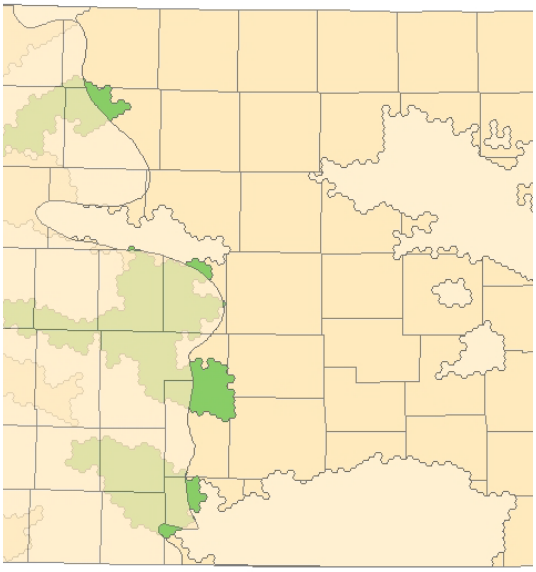
1. Kansas - Lower Republican
2. Lower Arkansas
3. Cimarron

Terrestrial EFAs

Figure 7. Terrestrial Ecological Focus Areas of the Central Mixed Grass Prairie Conservation Region. These EFAs represent landscapes where conservation actions can be applied for maximum benefit to Kansas wildlife. Each EFA includes a suite of SGCN and priority habitats



1. Playa Landscape



The Playa Landscape Ecological Focus Area is dotted with shallow, temporary wetlands, each of which lies in the lowest point of a closed watershed. Lined with clay soil, their basins collect and hold water from rainfall and runoff events. These temporary lakes are an important water source for prairie wildlife and serve as stopover locations for migrating waterfowl and shorebirds. Grasslands and shrublands are the primary native habitat found within the playa clusters. This region is dominated by agricultural land uses such as crop cultivation and livestock grazing. Playas are threatened by agricultural and other land conversion activities that result in sedimentation and loss of function.

EFA Development

This EFA was created by overlaying occurrences of Tier 1 and Tier 2 SGCN on the PLJV playa clusters layer to identify priority landscapes.

Conservation Issues

Agriculture

*Grassland conversion and improper grazing regimes result in habitat loss and fragmentation, and increases sediment discharge to basins and increases nutrient runoff which alters playa hydrology (timing, duration, and depth of flooding) and water quality

*Practices such as draining wetlands and cropland cultivation can degrade water quality from runoff and increase sedimentation

Energy Production

*Development and expansion of wind energy, solar arrays, and oil/gas fields infrastructure and activities also lead to fragmentation and habitat loss

*Construction of infrastructure and associated roads negatively alters surface water runoff into playas

Natural system modifications

*The use of surface water for irrigation and terraces built above playas to treat highly erodible land compliance requirements is lowering groundwater levels and degrading playa hydrology

*Practices such as pitting of playas alter their natural wetland function and collected water is used for irrigation

Conservation Actions

Land/water protection

* Provide incentives to landowners to maintain, improve, enhance key grassland sites, and reduce intensified agricultural practices.

*Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

* Provide landowners incentives for maintaining and restoring Playas

*Acquire water rights as advisable and possible and/or incentivize landowner retirement of water rights and conversion to less intensive land use

Land/water management

*Increase the heterogeneity of native habitats, as well as general landscapes by using greenways, corridors, buffer strips, refuges and the Conservation Reserve Program
*Develop incentive programs and cost-effective practices for landowners and managers to protect and restore playa landscapes and to promote heterogeneity and diversity.
*Develop cost-neutral conservation practices for producers to provide for maintenance of ecologically and economically viable farming/ranching operations (*i.e.* patch burn grazing).
*Develop and implement methods to offset economic practices (*i.e.* wind farms, farm management systems encouraging overproduction, conversion of unsuitable lands into production, urbanization) that have negative environmental impacts.
*Encourage water right and water quality regulations in appropriate watersheds to reduce aquifer depletion, increase overland flow to basins, and improve water quality
*Develop and implement watershed management plans that approach playa landscape conservation from a holistic perspective.
*Promote improved water quality standards for ground water aquifers.
*Promote the use of permanent grass buffers around playa lakes.
*Develop projects which inform management and policies to achieve conservation and inform landscape design

Education and awareness

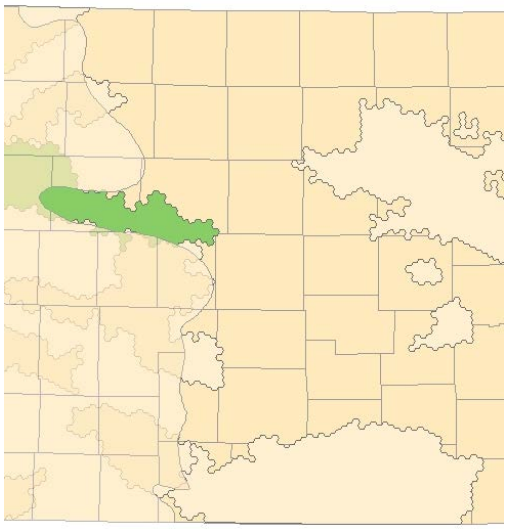
*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Develop or continue disease monitoring (Chytrid Fungus, Ranavirus, Avian Influenza and other potential diseases, etc.)
*Investigate ways to determine water use (i.e., implement metering and have fees based upon amount used).
*Educate energy companies on reducing impacts to playas

Species of Greatest Conservation Need

Tier 1 SGCN		
Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicintus*
Birds	Piping Plover	*Charadrius melodus*
Birds	Snowy Plover	*Charadrius alexandrinus*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Monarch	*Danaus plexippus*
Mammals	Eastern Spotted Skunk	*Spilogale putorius*
Tier 2 SGCN		
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Avocet	*Recurvirostra americana*
Birds	American Golden-Plover	*Pluvialis dominica*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	American White Pelican	*Pelecanus erythrorhynchos*
Birds	Baird's Sandpiper	*Calidris bairdii*
Birds	Barn Owl	*Tyto alba*
Birds	Black-bellied Plover	*Pluvialis squatarola*
Birds	Black-necked Stilt	*Himantopus mexicanus*
Birds	Buff-breasted Sandpiper	*Calidris subruficollis*
Birds	Bullock's Oriole	*Icterus bullockii*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Canvasback	*Aythya valisineria*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Ferruginous Hawk	*Buteo regalis*

Tier 2 SGCN		
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Yellowlegs	*Tringa melanoleuca*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Least Sandpiper	*Calidris minutilla*
Birds	Lesser Yellowlegs	*Tringa flavipes*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Long-billed Curlew	*Numenius americanus*
Birds	Long-billed Dowitcher	*Limnodromus scolopaceus*
Birds	Marbled Godwit	*Limosa fedoa*
Birds	McCown's Longspur	*Rhynchopanes mccownii*
Birds	Mississippi Kite	*Ictinia mississippiensis*
Birds	Northern Pintail	*Anas acuta*
Birds	Pectoral Sandpiper	*Calidris melanotos*
Birds	Semipalmated Sandpiper	*Calidris pusilla*
Birds	Short-eared Owl	*Asio flammeus*
Birds	Stilt Sandpiper	*Calidris himantopus*
Birds	Swainson's Hawk	*Buteo swainsoni*
Birds	Upland Sandpiper	*Bartramia longicauda*
Birds	Western Kingbird	*Tyrannus verticalis*
Birds	White-rumped Sandpiper	*Calidris fuscicollis*
Birds	Wilson's Phalarope	*Phalaropus tricolor*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A dieunomia bee	*Dieunomia triangulifera*
Insect	A nomia bee	*Nomia universitatis*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A sweat bee	*Dieunomia apacha*
Insect	A callirhoe bee	*Melissodes intortus*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Swift Fox	*Vulpes velox*
Mammals	Yellow-faced Pocket Gopher	*Cratogeomys castanops*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Glossy Snake	*Arizona elegans*
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*
Reptiles	Long-nosed Snake	*Rhinocheilus lecontei*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*

2. Smoky Hill River Breaks



The Smoky Hill River Breaks Ecological Focus Area is within the High Plains and Smoky Hills physiographic regions and is primarily composed of shortgrass prairie vegetation. Dramatic chalk badlands and bluffs overlook large expanses of rangeland and rocky ravines along the Smoky Hill River. The Smoky Hill River floodplain and its surrounding upland habitats provide valuable refugia to the biodiversity of the EFA. Actively grazed rangelands and haying are common practices within the EFA. Issues include fragmentation of prairies and mismanaged grazing practices, which have modified the existing prairies. Protected areas include the Logan Wildlife Area, the Smoky Valley Ranch, and Scott State Park. Numerous SGCN occur within this EFA, including the endemic Scott Riffle Beetle and isolated populations of the Green Toad. Prairie dog colonies provide habitats for many SGCN including the Burrowing Owl, Swift Fox, and Black-footed Ferret.

EFA Development

This EFA captures a concentration of Large Natural Areas in the Chalk Bluffs area. It is similar to the TNC portfolio site "Chalk Bluffs" from the Central Shortgrass Prairie Ecoregional Plan but excludes the northeastern extent of that site which is dominated by agricultural land.

Conservation Issues

Agriculture

*Grassland conversion and improper grazing regimes result in habitat loss and fragmentation, and increases sediment discharge to basins and increases nutrient runoff which alters playa hydrology (timing, duration, and depth of flooding) and water quality

*Conversion of grasslands to other uses causes fragmentation, destroys native flora and decreases habitat availability

*Practices such as wetland drainage and cropland cultivation degrades water quality from runoff, and sedimentation

Energy Production

*Development and expansion of wind energy, solar arrays, and oil/gas fields infrastructure and activities in native grasslands – impacting grassland and migratory birds, bats, and other wildlife

Natural system modifications

*The use of surface water from rivers and streams for irrigation is lowering the water level

*The suppression of fire has a negative impact on habitat heterogeneity

Invasive and other problematic species and genes

*Sylvatic plague has the potential to impact black-tailed prairie dog populations

*Invasive woody and herbaceous plants compete with native flora and modify habitat structure and function for fauna

Pollution

*Widespread broadcast application of pesticides often causes off-target species mortality, contributes to development of pesticide resistance, and reduces diversity of flora and fauna while increasing soil salinity

*Overuse/misapplication of pesticides and fertilizer also contribute to water quality degradation from runoff

Biological resource use

*Black-tailed Prairie Dog population is low and under continual threat due to eradication programs

Conservation Actions

Land/water protection

* Provide incentives to landowners to maintain, improve, enhance key grassland sites, and reduce intensified agricultural practices

*Provide incentives to prevent or reduce the likelihood of the sale of key grassland sites for industrial, housing, or other development

*Promote field border programs and county road easements which are landowner and wildlife friendly.

*Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

Land/water management

*Increase the heterogeneity of native habitats, as well as general landscapes by using greenways, corridors, buffer strips, refuges and the Conservation Reserve Program

*Implement ecologically-sensitive grazing and haying practices, including rest periods, for shortgrass prairie on private and public lands as well as promoting the responsible, well-planned use of prescribed fire as a management/restoration tool

*Develop and implement incentive programs for landowners and managers to promote heterogeneity and diversity for wildlife while maintaining viable farming/ranching operation (*i.e.* cover crops, defer/limit herbicide applications, prescribed fire, prescribed grazing)

*Develop and implement methods to offset economic practices (*i.e.* wind farms, farm management systems encouraging overproduction, conversion of marginal lands into crop production, urbanization) that have negative environmental impacts

*Use CRP as a grass bank to allow recovery of native range.

*Promote ecologically sounds techniques for flood control, erosion control, non-point source pollution control, and bank stabilization

Education and awareness

*Conduct wildlife surveys for data-lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Research cover crop benefits for wildlife

*Develop a broad scale education approach and outreach program on the impacts of fragmentation, woody invasion and encroachment, energy development and other land use changes on flora and fauna

*Develop best management practices to control and manage invasive species

*Continued disease monitoring (Chytrid Fungus, Ranavirus, Snake Fungal Disease, Sylvatic Plague, etc.)

External capacity building

*Work with other state agencies, to avoid, minimize, reduce and mitigate impacts to habitat resulting from their programs.

*Partner with industrial, energy, and telecommunication companies as well as private landowners to reduce impacts on native grasslands and lesser prairie chicken by encouraging burial or rerouting of power lines and other structures around key lekking, nesting, and brood rearing habitats.

Species management

*****Develop and implement an effective information and educational program focused on the role and value of Black-tailed Prairie Dogs in native grasslands and the importance of ending removal policies for prairie dogs from public and private lands

*Continue to conduct population and distributional surveys of the Black-tailed Prairie Dog.

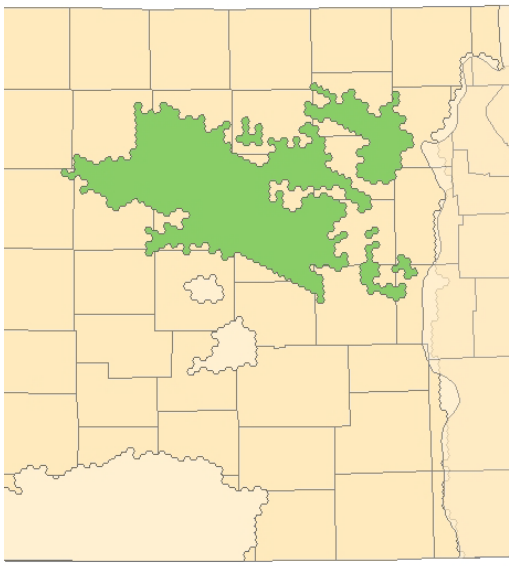
*Develop and implement a Black-tailed Prairie Dog Management Plan

Species of Greatest Conservation Need

Tier 1 SGCN		
Amphibians	Green Toad	*Anaxyrus debilis*
Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*
Gastropods	A terrestrial snail	*Succinea pseudavara*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	A Cave Obligate Isopod	*Caecidotea tridentata*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Arogos Skipper	*Atrytone arogos*
Insect	Monarch	*Danaus plexippus*
Insect	Robust Sunflower Leafcutter Bee	*Megachile fortis*
Insect	Scott Riffle Beetle	*Optioservus phaeus*
Mammals	Black-footed Ferret	*Mustela nigripes*
Mammals	Eastern Spotted Skunk	*Spilogale putorius*
Tier 2 SGCN		
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Barn Owl	*Tyto alba*
Birds	Bullock's Oriole	*Icterus bullockii*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Cassin's Sparrow	*Peucaea cassinii*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Common Poorwill	*Phalaenoptilus nuttallii*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Ferruginous Hawk	*Buteo regalis*
Birds	Golden Eagle	*Aquila chrysaetos*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Prairie-Chicken	*Tympanuchus cupido*
Birds	Lark Bunting	*Calamospiza melanocorys*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Long-billed Curlew	*Numenius americanus*
Birds	McCown's Longspur	*Rhynchopanes mccownii*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Short-eared Owl	*Asio flammeus*
Birds	Swainson's Hawk	*Buteo swainsoni*
Birds	Western Kingbird	*Tyrannus verticalis*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A dieunomia bee	*Dieunomia triangulifera*
Insect	A digger bee	*Anthophora montana*
Insect	A leafcutter bee	*Megachile integra*
Insect	A leafcutter bee	*Megachile mucorosa*
Insect	A scarab beetle	*Geomyphilus insolitus*
Insect	A scarab beetle	*Orizabus pyriformis*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Strategus mormon*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A sweat bee	*Agopostemon coloradensis*
Insect	A sweat bee	*Dieunomia apacha*
Insect	Abberrant Cellophane Bee	*Colletes aberrans*
Insect	Bald-spot Sweat Bee	*Lasioglossum paraforbesii*
Insect	Bicoloured Sweat Bee	*Agopostemon virescens*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Dotted Skipper	*Herperia attralus*
Insect	Ghost Tiger Beetle	*Ellipsoptera lepida*
Insect	Morrison’s Bumble Bee	*Bombus morrisoni*
Insect	Ottoe Skipper	*Hesperia ottoe*

Tier 2 SGCN		
Insect	Particular Small Dung Beetle	*Scabrostomus peculiosis*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Soapberry Hairstreak	*Phaeostrymon alcestis*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Susan's Plasterer Bee	*Colletes susannae*
Insect	The Unexpected Milkweed Moth	*Cycnia inopinatus*
Insect	White-cloaked Tiger Beetle	*Eunota togata latilabris*
Insect	Whiteish Sweat Bee	*Agopostemon sericeus*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Spotted Ground Squirrel	*Xerospermophilus spilosoma*
Mammals	Swift Fox	*Vulpes velox*
Mammals	Western Small-footed Myotis	*Myotis ciliolabrum*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Glossy Snake	*Arizona elegans*
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*
Reptiles	Long-nosed Snake	*Rhinocheilus lecontei*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*

3. Smoky Hills



The Smoky Hills Ecological Focus Area is within the Smoky Hills physiographic region, a mixed grass prairie in north - central Kansas. The area is characterized as gently rolling hills with numerous limestone rocky outcrops and uplifts of Dakota sandstone. The primary plant communities are composed of mixed grass species transitioning into tallgrass prairie ecosystems towards the east. The Smoky Hill River, Saline River, and a portion of the Republican River are encompassed within the EFA. Protected areas include: Wilson Lake Wildlife Area, Kanopolis Lake and associated wildlife areas, and Maxwell Wildlife Refuge. The region is predominantly agriculture with cattle grazing and haying the common practices within the native landscapes; mismanagement and fragmentation are common threats within the EFA.

EFA Development

This EFA was delineated using CHAT Large Natural Areas, CHAT Connectivity, SGCN locations and Land Cover as base data. Hexagons were selected with >= 50% Natural Vegetation within the Smoky Hills physiographic province in an area generally bounded by the TNC portfolio sites occurring within the Smoky Hills. The EFA connects several disjunct TNC portfolio sites into a continuous landscape.

Conservation Issues

Agriculture

*Grassland conversion and improper grazing regimes result in habitat loss and fragmentation, and increases sediment discharge to basins and increases nutrient runoff which alters playa hydrology (timing, duration, and depth of flooding) and water quality

*Conversion of grasslands to other uses causes fragmentation, destroys native flora, and decreases habitat availability

*Practices such as wetland drainage and cropland cultivation degrades water quality from runoff, and sedimentation

Energy Production

*Development and expansion of wind energy, solar arrays, and oil/gas fields infrastructure and activities in native grasslands—impacting grassland and migratory birds, bats, and other wildlife

Natural system modifications

*Suppression of fire alters composition of native grasslands

*Improperly applied use of prescribed fire (including periodicity and seasonality of fire

*The use of surface water from rivers and streams for irrigation is lowering the water level

Invasive and other problematic species and genes

*Invasive woody and herbaceous plants compete with native flora and modify habitat structure and function for fauna

Pollution

*Pollution from point and non-point sources includes runoff of pesticides, fertilizers, and other chemicals

Conservation Actions

Land/water protection

*****Offer incentives to landowners not to sell land for private development

*****Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

*****Offer incentives for constructing fences around seeps and springs to restrict livestock access

Land/water management

*****Implement ecologically sensitive grazing and haying practices, including rest periods, for mixed grass prairie on private and public lands as well as promoting the responsible, well-planned use of prescribed fire as a management/restoration too

*****Provide incentives for mechanical control of woody invasive species

*****Implement procedures to discourage planting of invasive species, while encouraging the establishment of appropriate native species

*Implement Wildlife expert review of wind energy siting effects on prairie chickens, bats, etc., and make recommendations

*Promote ecologically sound techniques for flood control, erosion control, non-point source pollution control, and bank stabilization

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Continue disease monitoring (e.g. Chytrid Fungus, Ranavirus, White Nose Syndrome)

*****Research the effects of coal bed-methane extraction on wildlife and water quality

*****Conduct pre- and post-construction studies on energy generation facilities to determine the impact on wildlife and habitat. Research temperature and vegetation impacts caused by wind generators

*Develop sites to demonstrate best management practices on public and private lands

*Place special emphasis on programs to study and conserve grassland-nesting birds

*Research and investigate best management practices to control invasive species (e.g. Eastern Red Cedar and Old World Bluestems)

External capacity building

*****Work with county zoning boards to implement well thought out planning procedures.

*****Cooperate with the state and federal Department of Agriculture in developing management strategies for coping with potential problems from exotic livestock and wildlife introductions. Develop contingency plans for managing exotic wildlife

Species management

*****Develop and implement an effective information and educational program focused on the role and value of Black-tailed Prairie Dogs in native grasslands and the importance of ending removal policies for prairie dogs from public and private lands

*Continue to support population and distributional surveys of the Black-tailed Prairie Dog

*Develop and implement a Black-tailed Prairie Dog Management Plan.

*Initiate and continue distributional surveys of Greater and Lesser Prairie Chickens, and other declining grassland bird species

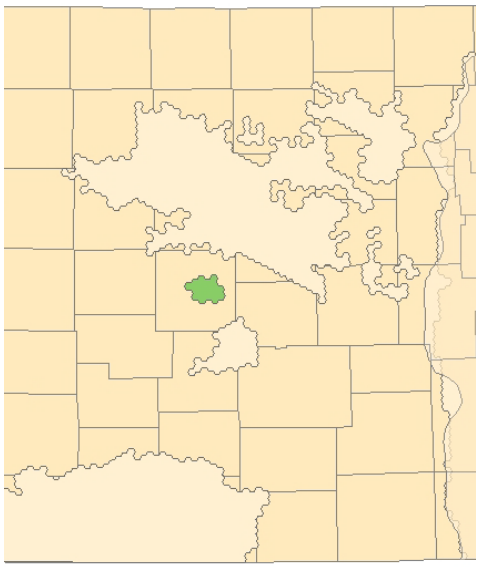
*For mammals, describe habitat associations and measure trends in habitat distribution and quality in coordination with conservation societies. Assess the range and distribution of particular restricted range species, such as the Southern Bog Lemming

Species of Greatest Conservation Need

Tier 1 SGCN		
Birds	Piping Plover	*Charadrius melodus*
Gastropods	A terrestrial snail	*Succinea pseudavara*
Gastropods	Ruidoso Snaggletooth	*Gastrocopta ruidosensis*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	A leafcutter bee	*Megachile integra*
Insect	A Cave Obligate Isopod	*Caecidotea tridentata*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Arogos Skipper	*Atrytone arogos*
Insect	Monarch	*Danaus plexippus*
Insect	Robust Sunflower Leafcutter Bee	*Megachile fortis*
Mammals	Eastern Spotted Skunk	*Spilogale putorius*
Mammals	Northern Long-eared Bat	*Myotis septentrionalis*
Tier 2 SGCN		
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	American White Pelican	*Pelecanus erythrorhynchos*
Birds	Baird's Sparrow	*Centronyx bairdii*
Birds	Bald Eagle	*Haliaeetus leucocephalus*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Barn Owl	*Tyto alba*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Black-billed Cuckoo	*Coccyzus erythropthalmus*
Birds	Buff-breasted Sandpiper	*Calidris subruficollis*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Common Poorwill	*Phalaenoptilus nuttallii*
Birds	Dickcissel	*Spiza americana*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Prairie-Chicken	*Tympanuchus cupido*
Birds	Harris's Sparrow	*Zonotrichia querula*
Birds	Henslow's Sparrow	*Centronyx henslowii*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Northern Bobwhite	*Colinus virginianus*

Tier 2 SGCN		
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Rusty Blackbird	*Euphagus carolinus*
Birds	Short-eared Owl	*Asio flammeus*
Birds	Sprague's Pipit	*Anthus spragueii*
Birds	Swainson's Hawk	*Buteo swainsoni*
Birds	Upland Sandpiper	*Bartramia longicauda*
Birds	Western Kingbird	*Tyrannus verticalis*
Birds	Wilson's Phalarope	*Phalaropus tricolor*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A dieunomia bee	*Dieunomia triangulifera*
Insect	A leafcutter bee	*Megachile mucorosa*
Insect	A scarab beetle	*Geomyphilus insolitus*
Insect	A scarab beetle	*Orizabus pyriformis*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Strategus mormon*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A sweat bee	*Agopostemon coloradensis*
Insect	A sweat bee	*Dieunomia apacha*
Insect	Abberrant Cellophane Bee	*Colletes aberrans*
Insect	Bald-spot Sweat Bee	*Lasioglossum paraforbesii*
Insect	Bicoloured Sweat Bee	*Agopostemon virescens*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Byssus Skipper	*Problema byssus*
Insect	Dotted Skipper	*Herperia attralus*
Insect	Ghost Tiger Beetle	*Ellipsoptera lepida*
Insect	Maritime Sunflower Borer Moth	*Papaipema maritima*
Insect	Morrison’s Bumble Bee	*Bombus morrisoni*
Insect	Mottled Duskywing	*Erynnis martialis*
Insect	Occidental Digger Bee	*Anthophora occidentalis*
Insect	Ottoe Skipper	*Hesperia ottoe*
Insect	Pahaska Skipper	*Hesperia pahaska*
Insect	Particular Small Dung Beetle	*Scabrostonus peculiosis*
Insect	Soapberry Hairstreak	*Phaeostrymon alcestis*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Susan’s Plasterer Bee	*Colletes susannae*
Insect	Variable Cuckoo Bumble Bee	*Bombus variabilis*
Insect	The Unexpected Milkweed Moth	*Cycnia inopinatus*
Insect	White-cloaked Tiger Beetle	*Eunota togata latilabris*
Insect	Whiteish Sweat Bee	*Agopostemon sericeus*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Southern Bog Lemming	*Synaptomys cooperi*
Mammals	Tricolored Bat	*Perimyotis subflavus*
Mammals	Franklin’s Gound Squirrel	*Poliocitellus franklinii*
Plants	Hancin’s Dewberry	*Rubus hancinianus*
Plants	Kansas Arrowhead	*Sagittaria ambigua*
Plants	Missouri Mud-plantain	*Heteranthera missouriensis*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Ground-snake	*Sonora semiannulata*
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*
Turtles	Smooth Softshell	*Apalone mutica*

4. Cheyenne Bottoms



The Cheyenne Bottoms Ecological Focus Area is located in Barton County, Kansas within the Arkansas River lowlands ecoregion. It occurs in a large natural basin that consists of native mixed grass prairies and wetlands having typical hydrophilic vegetation and large pools of water supplied by Walnut Creek inlet canal as well as the intermittent Blood Creek and Deception Creek drainages. Protected areas include the Cheyenne Bottoms Wildlife Area (CBWA) and The Nature Conservancy's Cheyenne Bottoms Preserve. Historically Cheyenne Bottoms consisted of one vast pool fed by two drainages, Blood and Deception creeks, and many small, isolated marshes. A canal was built to manage water flow from the Arkansas River and Walnut Creek into CBWA (Zimmerman 1990). KDWP implements chemical application to treat herbaceous invasive species, prescribed grazing management plans and prescribed burning as management tools on the Bottoms. Within the Central Flyway, CBWA is a major migratory bird rest and resource area for waterfowl, shorebirds, and other water birds and is managed accordingly. Numerous SGCN occur within this EFA as well as federally designated critical habitat for the Whooping Crane.

EFA Development

This EFA is based on the TNC portfolio site from the Central Mixed-Grass Prairie ecoregional plan with a slight adjustment to include the entirety of the protected areas.

Conservation Issues

Agriculture

*Some herbaceous wetlands have been or might be drained and converted to cropland

Natural system modifications

*The use of surface and ground water for irrigation is lowering the water inflow

Invasive and other problematic species and genes

*Invasive woody and herbaceous species (e.g. Phragmites, cattail, etc.)

Pollution

*Pollution from point and non-point sources includes runoff of pesticides, fertilizers, and other chemicals

Conservation Actions

Land/water management

*****Implement procedures to discourage planting of invasive species, while encouraging the establishment of appropriate native species

*Plant vegetation strips or buffers around wetlands to reduce sedimentation and filter pollutants.

External capacity building

*****Cooperate with the National Audubon Society relative to the IBA (Important Birding Areas) program.

Education and awareness

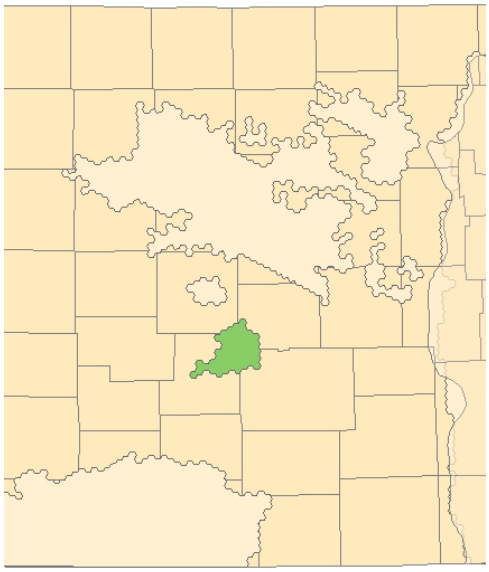
*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Continue disease monitoring (Avian influenza, Chytrid Fungus, Ranavirus, etc.)

Species of Greatest Conservation Need

Tier 1 SGCN		
Birds	Least Tern	*Sternula antillarum*
Birds	Piping Plover	*Charadrius melodus*
Birds	Snowy Plover	*Charadrius alexandrinus*
Birds	Whooping Crane	*Grus americana*
Gastropods	A terrestrial snail	*Succinea pseudavara*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	A leafcutter bee	*Megachile integra*
Insect	A Cave Obligate Isopod	*Caecidotea tridentata*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Arogos Skipper	*Atrytone arogos*
Insect	Monarch	*Danaus plexippus*
Insect	Robust Sunflower Leafcutter Bee	*Megachile fortis*
Insect	Variable Cuckoo Bumble Bee	*Bombus variabilis*
Mammals	Eastern Spotted Skunk	*Spilogale putorius*
Tier 2 SGCN		
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Avocet	*Recurvirostra americana*
Birds	American Bittern	*Botaurus lentiginosus*
Birds	American Golden-Plover	*Pluvialis dominica*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	American White Pelican	*Pelecanus erythrorhynchos*
Birds	Baird's Sandpiper	*Calidris bairdii*
Birds	Bald Eagle	*Haliaeetus leucocephalus*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Barn Owl	*Tyto alba*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Black Rail	*Laterallus jamaicensis*
Birds	Black Tern	*Chlidonias niger*
Birds	Black-bellied Plover	*Pluvialis squatarola*
Birds	Black-necked Stilt	*Himantopus mexicanus*
Birds	Bobolink	*Dolichonyx oryzivorus*
Birds	Buff-breasted Sandpiper	*Calidris subruficollis*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Dickcissel	*Spiza americana*
Birds	Eared Grebe	*Podiceps nigricollis*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Eastern Meadowlark	*Sturnella magna*
Birds	Forster's Tern	*Sterna forsteri*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Yellowlegs	*Tringa melanoleuca*
Birds	Harris's Sparrow	*Zonotrichia querula*
Birds	Hudsonian Godwit	*Limosa haemastica*
Birds	Least Bittern	*Ixobrychus exilis*
Birds	Least Sandpiper	*Calidris minutilla*
Birds	Lesser Yellowlegs	*Tringa flavipes*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Long-billed Curlew	*Numenius americanus*
Birds	Long-billed Dowitcher	*Limnodromus scolopaceus*
Birds	Marbled Godwit	*Limosa fedoa*
Birds	Northern Pintail	*Anas acuta*
Birds	Pectoral Sandpiper	*Calidris melanotos*

Tier 2 SGCN		
Birds	Peregrine Falcon	*Falco peregrinus*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Red Knot	*Calidris canutus rufa*
Birds	Rusty Blackbird	*Euphagus carolinus*
Birds	Scissor-tailed Flycatcher	*Tyrannus forficatus*
Birds	Semipalmated Sandpiper	*Calidris pusilla*
Birds	Sprague's Pipit	*Anthus spragueii*
Birds	Stilt Sandpiper	*Calidris himantopus*
Birds	Upland Sandpiper	*Bartramia longicauda*
Birds	Western Grebe	*Aechmophorus occidentalis*
Birds	Western Kingbird	*Tyrannus verticalis*
Birds	White-rumped Sandpiper	*Calidris fuscicollis*
Birds	Wilson's Phalarope	*Phalaropus tricolor*
Crustaceans	Fairy Shrimp	*Branchinecta mediospinosa*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A dieunomia bee	*Dieunomia triangulifera*
Insect	A leafcutter bee	*Megachile mucorosa*
Insect	A scarab beetle	*Geomyphilus insolitus*
Insect	A scarab beetle	*Orizabus pyriformis*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Strategus mormon*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A sweat bee	*Agopostemon coloradensis*
Insect	A sweat bee	*Dieunomia apacha*
Insect	Abberrant Cellophane Bee	*Colletes aberrans*
Insect	Bald-spot Sweat Bee	*Lasioglossum paraforbesii*
Insect	Bicoloured Sweat Bee	*Agopostemon virescens*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Byssus Skipper	*Problema byssus*
Insect	Dotted Skipper	*Herperia attralus*
Insect	Ghost Tiger Beetle	*Ellipsoptera lepida*
Insect	Morrison’s Bumble Bee	*Bombus morrisoni*
Insect	Occidental Digger Bee	*Anthophora occidentalis*
Insect	Ottoe Skipper	*Hesperia ottoe*
Insect	Particular Small Dung Beetle	*Scabrostonus peculiosis*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Soapberry Hairstreak	*Phaeostrymon alcestis*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Susan’s Plasterer Bee	*Colletes susannae*
Insect	The Unexpected Milkweed Moth	*Cycnia inopinatus*
Insect	White-cloaked Tiger Beetle	*Eunota togata latilabris*
Insect	Whiteish Sweat Bee	*Agopostemon sericeus*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Southern Bog Lemming	*Synaptomys cooperi*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Glossy Snake	*Arizona elegans*
Reptiles	Long-nosed Snake	*Rhinocheilus lecontei*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*

5. Quivira



The Quivira Ecological Focus Area is located in Stafford, Reno, Barton, and Rice counties within the Arkansas River Lowlands ecoregion. Rare habitats include inland salt marshes and wetlands. The wetlands range from high salinity to fresh water throughout the EFA and are dominated by typical hydrophilic vegetation and/or salt-tolerant plants with large pools of water supplied by Rattlesnake Creek. Mixed Grass Prairie vegetation dominates the uplands around the wetlands where soils are not too alkaline. The Quivira National Wildlife Refuge (QNWR) is the only protected area within the Quivira EFA. The United States Fish and Wildlife Service implements prescribed grazing management, prescribed burning, invasive species control, and brush removal as management tools to overcome the primary issues of fragmentation, conversion, woody invasion and miss-managed rangelands. Like it's close neighbor, Cheyenne Bottoms, QNWR is a major migratory bird rest and resource area for waterfowl, shorebirds, and blackbirds and is managed accordingly. Interior Least Terns are known to successfully nest at Quivira, and numerous other SGCN occur within this EFA, which also includes federally designated critical habitat for the Whooping Crane

EFA Development

This EFA is based on the TNC portfolio site from the Central Mixed-Grass Prairie ecoregional plan.

Conservation Issues

Agriculture

*Some herbaceous wetlands are being converted, drained and plowed

Natural system modifications

*The use of surface water for irrigation is lowering the water level

Invasive and other problematic species and genes

*Invasive woody and herbaceous species (Phragmites, cattail, etc.)

Pollution

*Pollution from point and non-point sources includes runoff of pesticides, fertilizers, and other chemicals

Conservation Actions

Land/water management

*Implement procedures to discourage planting of invasive species and to encourage planting appropriate species.

*Plant vegetation strips or buffers around wetlands to reduce siltation and filter pollutants.

External capacity building

*Cooperate with the National Audubon Society relative to the IBA (Important Birding Areas) program.

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

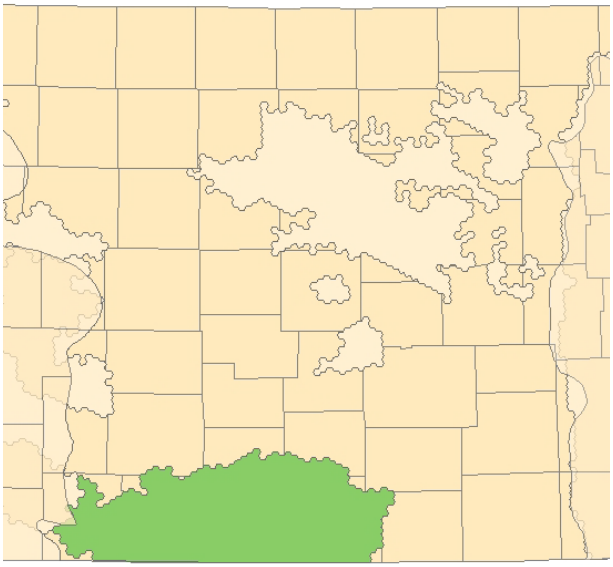
*Develop and continue disease monitoring (Avian influenza, Chytrid Fungus, Ranavirus, etc.)

Species of Greatest Conservation Need

Tier 1 SGCN		
Birds	Least Tern	*Sternula antillarum*
Birds	Piping Plover	*Charadrius melodus*
Birds	Snowy Plover	*Charadrius alexandrinus*
Gastropods	A terrestrial snail	*Succinea pseudavara*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	A leafcutter bee	*Megachile integra*
Insect	A Cave Obligate Isopod	*Caecidotea tridentata*
Insect	Arogos Skipper	*Atrytone arogos*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Monarch	*Danaus plexippus*
Insect	Robust Sunflower Leafcutter Bee	*Megachile fortis*
Insect	Variable Cuckoo Bumble Bee	*Bombus variabilis*
Tier 2 SGCN		
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Avocet	*Recurvirostra americana*
Birds	American Bittern	*Botaurus lentiginosus*
Birds	American Golden-Plover	*Pluvialis dominica*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	American White Pelican	*Pelecanus erythrorhynchos*
Birds	Baird's Sandpiper	*Calidris bairdii*
Birds	Bald Eagle	*Haliaeetus leucocephalus*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Barn Owl	*Tyto alba*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Black Rail	*Laterallus jamaicensis*
Birds	Black Tern	*Chlidonias niger*
Birds	Black-bellied Plover	*Pluvialis squatarola*
Birds	Black-necked Stilt	*Himantopus mexicanus*
Birds	Bobolink	*Dolichonyx oryzivorus*
Birds	Buff-breasted Sandpiper	*Calidris subruficollis*
Birds	Canvasback	*Aythya valisineria*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Dickcissel	*Spiza americana*
Birds	Eared Grebe	*Podiceps nigricollis*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Eastern Meadowlark	*Sturnella magna*
Birds	Forster's Tern	*Sterna forsteri*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Yellowlegs	*Tringa melanoleuca*
Birds	Harris's Sparrow	*Zonotrichia querula*
Birds	Hudsonian Godwit	*Limosa haemastica*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Least Bittern	*Ixobrychus exilis*
Birds	Least Sandpiper	*Calidris minutilla*
Birds	Lesser Yellowlegs	*Tringa flavipes*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Long-billed Curlew	*Numenius americanus*
Birds	Long-billed Dowitcher	*Limnodromus scolopaceus*
Birds	Marbled Godwit	*Limosa fedoa*
Birds	Mississippi Kite	*Ictinia mississippiensis*

Tier 2 SGCN		
Birds	Northern Bobwhite	*Colinus virginianus*
Birds	Northern Pintail	*Anas acuta*
Birds	Pectoral Sandpiper	*Calidris melanotos*
Birds	Peregrine Falcon	*Falco peregrinus*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Red Knot	*Calidris canutus rufa*
Birds	Rusty Blackbird	*Euphagus carolinus*
Birds	Semipalmated Sandpiper	*Calidris pusilla*
Birds	Stilt Sandpiper	*Calidris himantopus*
Birds	Upland Sandpiper	*Bartramia longicauda*
Birds	Western Grebe	*Aechmophorus occidentalis*
Birds	Western Kingbird	*Tyrannus verticalis*
Birds	White-rumped Sandpiper	*Calidris fuscicollis*
Birds	Wilson's Phalarope	*Phalaropus tricolor*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A dieunomia bee	*Dieunomia triangulifera*
Insect	A leafcutter bee	*Megachile mucorosa*
Insect	A scarab beetle	*Geomyphilus insolitus*
Insect	A scarab beetle	*Orizabus pyriformis*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Strategus mormon*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A sweat bee	*Agopostemon coloradensis*
Insect	A sweat bee	*Dieunomia apacha*
Insect	Abberrant Cellophane Bee	*Colletes aberrans*
Insect	Bald-spot Sweat Bee	*Lasioglossum paraforbesii*
Insect	Bicoloured Sweat Bee	*Agopostemon virescens*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Byssus Skipper	*Problema byssus*
Insect	Dotted Skipper	*Herperia attralus*
Insect	Ghost Tiger Beetle	*Ellipsoptera lepida*
Insect	Morrison’s Bumble Bee	*Bombus morrisoni*
Insect	Occidental Digger Bee	*Anthophora occidentalis*
Insect	Ottoe Skipper	*Hesperia ottoe*
Insect	Particular Small Dung Beetle	*Scabrostonus peculiosis*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Soapberry Hairstreak	*Phaeostrymon alcestis*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Susan’s Plasterer Bee	*Colletes susannae*
Insect	The Unexpected Milkweed Moth	*Cycnia inopinatus*
Insect	White-cloaked Tiger Beetle	*Eunota togata latilabris*
Insect	Whiteish Sweat Bee	*Agopostemon sericeus*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Southern Bog Lemming	*Synaptomys cooperi*
Plants	Great Plains Ladies’-tresses	*Spiranthes magnicamporum*
Plants	Kansas Arrowhead	*Sagittaria ambigua*
Plants	Prairie Fameflower	*Talinum rugospermum*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Plains Hog-nosed Snake	*Heterdon nasicus*

6. Red Hills



The Red Hills Ecological Focus Area is located in south-central Kansas. It is characterized by beautiful prairie vistas, rich grazing lands, pristine streams and red soils with exposed gypsum canyon breaks and canyons. The area is dominated by mixed grass and sand-sage prairie communities dissected by spring-fed streams that flow into the Medicine, Salt Fork of the Arkansas, and Cimarron rivers. Known locally as the "Gyp Hills", this area has rich, highly diverse plant and wildlife communities. The region is ecologically important because it is Kansas' second largest intact tract of native prairie, one of the last expanses of contiguous mixed grass prairie, and is home to numerous state-listed threatened or endangered and SGCN species requiring large unfragmented tracts of native prairie. The majority of the land is privately owned, and often large parcels of the rangeland (thousands of acres) are owned and managed by a single family or ranching operation. Lack of proper grazing management, invasion of woody and herbaceous plants, improper prescribed fire frequency, and energy development are a few of the issues impacting this ecological focus area. Protected areas include the Big Basin Prairie Preserve (includes Big Basin, Little Basin and St. Jacob's well) and the Isabel Wetlands

EFA Development

This EFA captures a concentration of Large Natural Areas in the Red Hills and High Plains physiographic provinces. The final boundary is based on the Level 3 ecoregion (Southwestern Tablelands).

Conservation Issues

Agriculture

*Conversion of grasslands to other uses causes fragmentation, destroys native flora, and decreases habitat availability

*Practices such as wetland drainage and cropland cultivation degrades water quality from runoff and increases sedimentation

Energy Production

*Development and expansion of wind energy, solar arrays, and oil/gas fields infrastructure and activities in native grasslands—impacting grassland and migratory birds, bats, and other wildlife

Natural system modifications

*Suppression of fire alters composition of native grasslands

*Improperly applied use of prescribed fire (including periodicity and seasonality of fire

*The use of surface and ground-water for irrigation is lowering the groundwater level

Invasive and other problematic species and genes

*Invasive woody and herbaceous species (e.g. Eastern Red Cedar, Tamarisk, Old World Bluestem, etc.)

Pollution

*Pollution from point and non-point sources includes runoff of pesticides, fertilizers, and other chemicals

Conservation Actions

Land/water protection

*****Offer incentives to landowners not to sell land for private development

*Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

*****Offer incentives for constructing fences around seeps and springs to keep livestock out

Land/water management

*****Implement ecologically sensitive grazing and haying practices, including rest periods, for mixed grass prairie on private and public lands as well as promoting the responsible, well-planned use of prescribed fire as a management/restoration too

*****Provide incentives for mechanical control of woody invasive species

*****Implement procedures to discourage planting of invasive species, while encouraging the establishment of appropriate native species

*Implement Wildlife expert review of wind energy siting effects on prairie chickens, bats, etc., and make recommendations

*Develop and implement a Kansas invasive species plan

*Promote ecologically sound techniques for flood control, erosion control, non-point source pollution control, and bank stabilization

Education and awareness

*Conduct wildlife surveys for data-lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Continue disease monitoring (e.g. White Nose Syndrome, Chytrid Fungus, Ranavirus, etc.)

*****Research the effects of coal bed methane extraction on wildlife and water quality

*****Conduct pre and post studies on energy facility sites to determine the impact on wildlife and habitat. Research temperature and vegetation impacts caused by wind generators

*Develop plots to demonstrate best management practices on public and private lands

*Place special emphasis on programs to study and conserve grassland-nesting birds

*Research and investigate best management practices to control woody invasive species (e.g. Eastern Red Cedar and Old World Bluestems)

External capacity building

*****Work with county zoning boards to implement well thought out planning procedures

*****Cooperate with the state and federal Department of Agriculture in developing management strategies for coping with potential problems from exotic livestock and wildlife introductions

*Develop contingency plans for managing exotic wildlife

Species management

*****Develop and implement an effective information and educational program focused on the role and value of Black-tailed Prairie Dogs in native grasslands and the importance of ending removal policies for prairie dogs from public and private lands.

*Continue to support population and distributional surveys of the Black-tailed Prairie Dog.

*Develop and implement a Black-tailed Prairie Dog Management Plan.

*Initiate and continue distributional surveys of bats, Lesser Prairie Chickens, Northern Bobwhite quail and other SGCN

*For mammals, describe habitat associations and measure trends in habitat distribution
and quality in coordination with conservation societies

Species of Greatest Conservation Need

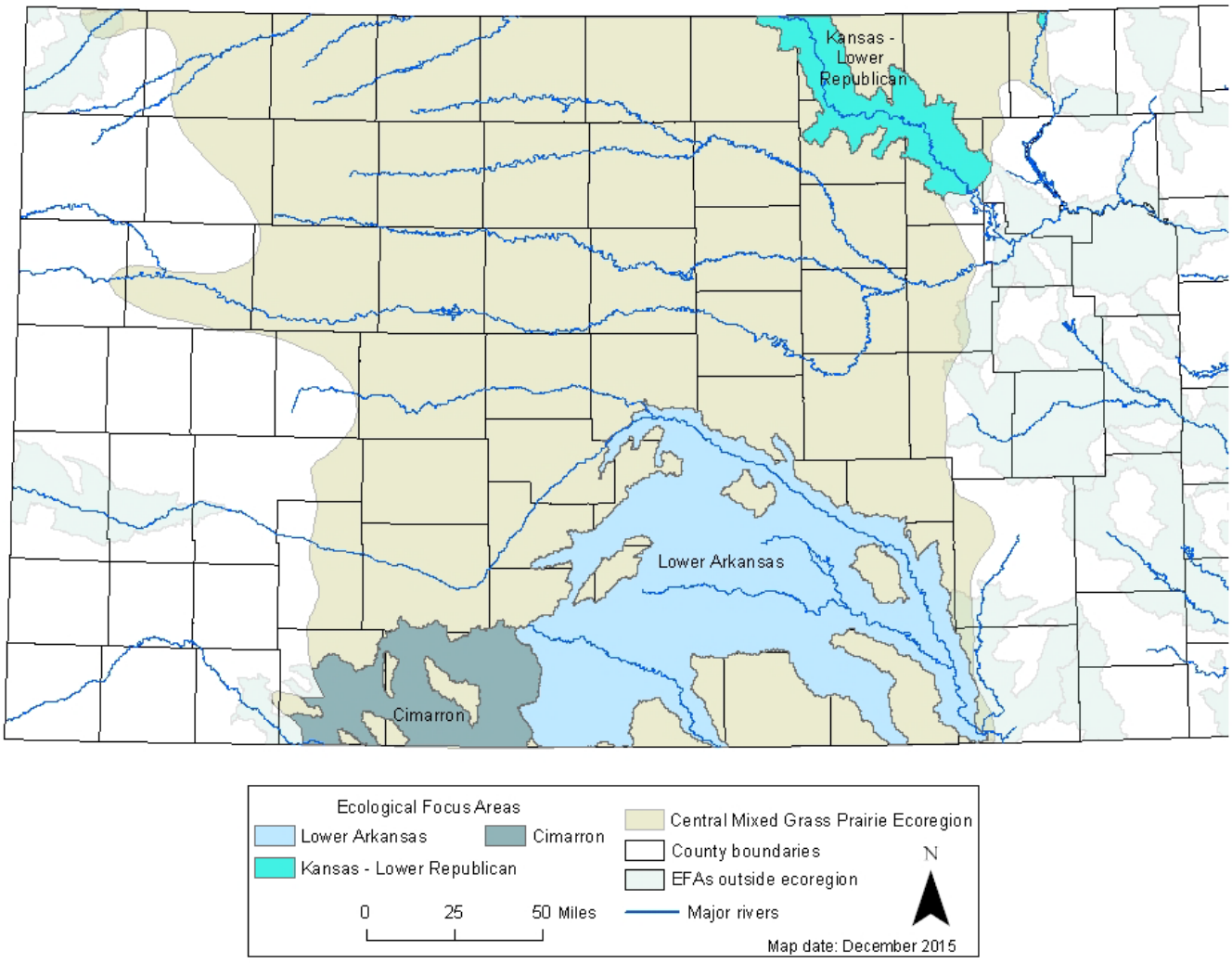
Tier 1 SGCN		
Amphibians	Strecker's Chorus Frog	*Pseudacris streckeri*
Birds	Least Tern	*Sternula antillarum*
Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*
Birds	Snowy Plover	*Charadrius alexandrinus*
Gastropods	A terrestrial snail	*Succinea pseudavara*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	A leafcutter bee	*Megachile amica*
Insect	A leafcutter bee	*Megachile integra*
Insect	A wool-carder bee	*Anthidium michenerorum*
Insect	A Cave Obligate Isopod	*Caecidotea tridentata*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Monarch	*Danaus plexippus*
Insect	Robust Sunflower Leafcutter Bee	*Megachile fortis*
Insect	Variable Cuckoo Bumble Bee	*Bombus variabilis*
Insect	Whitney's Underwing	*Catocala whitneyi*
Reptiles	Checkered Garter-snake	*Thamnophis marcianus*
Reptiles	New Mexico Threadsnake	*Rena dissectus*
Tier 2 SGCN		
Amphibians	Red-spotted Toad	*Anaxyrus punctatus*
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Birds	American Avocet	*Recurvirostra americana*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	American White Pelican	*Pelecanus erythrorhynchos*
Birds	Baird's Sparrow	*Centronyx bairdii*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Barn Owl	*Tyto alba*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Black Rail	*Laterallus jamaicensis*
Birds	Black-billed Cuckoo	*Coccyzus erythropthalmus*
Birds	Black-necked Stilt	*Himantopus mexicanus*
Birds	Bullock's Oriole	*Icterus bullockii*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Cassin's Sparrow	*Peucaea cassinii*
Birds	Chestnut-collared Longspur	*Calcarius ornatus*
Birds	Chuck-will's-widow	*Antrostomus carolinensis*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Common Poorwill	*Phalaenoptilus nuttallii*
Birds	Dickcissel	*Spiza americana*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Eastern Meadowlark	*Sturnella magna*
Birds	Golden Eagle	*Aquila chrysaetos*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Harris's Sparrow	*Zonotrichia querula*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Least Bittern	*Ixobrychus exilis*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	McCown's Longspur	*Rhynchopanes mccownii*
Birds	Mississippi Kite	*Ictinia mississippiensis*
Birds	Northern Bobwhite	*Colinus virginianus*
Birds	Painted Bunting	*Passerina ciris*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Rusty Blackbird	*Euphagus carolinus*
Birds	Scissor-tailed Flycatcher	*Tyrannus forficatus*
Birds	Short-eared Owl	*Asio flammeus*

Tier 2 SGCN		
Birds	Sprague's Pipit	*Anthus spragueii*
Birds	Swainson's Hawk	*Buteo swainsoni*
Birds	Upland Sandpiper	*Bartramia longicauda*
Birds	Western Kingbird	*Tyrannus verticalis*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Gastropods	Texas Liptooth	*Lininsa texasiana*
Insect	A callirhoe bee	*Melissodes intortus*
Insect	A dieunomia bee	*Dieunomia triangulifera*
Insect	A leafcutter bee	*Megachile mucorosa*
Insect	A longhorned beetle	*Tetraopes pilosus*
Insect	An oil-collecting bee	*Centris (Paracentris) lanosus*
Insect	A scarab beetle	*Alloblackburneus cynomysi*
Insect	A scarab beetle	*Cryptoscatomaseter paulseni*
Insect	A scarab beetle	*Cryptoscatomaseter salsburyi*
Insect	A scarab beetle	*Geomyphilus insolitus*
Insect	A scarab beetle	*Geomyphilus kiowensis*
Insect	A scarab beetle	*Geomyphilus viceversus*
Insect	A scarab beetle	*Onthophagus cynomysi*
Insect	A scarab beetle	*Orizabus pyriformis*
Insect	A scarab beetle	*Oscarinus pseudabusus*
Insect	A scarab beetle	*Pardalosus neodistinctus*
Insect	A scarab beetle	*Scabrostomus sepultus*
Insect	A scarab beetle	*Strategus mormon*
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*
Insect	A sweat bee	*Agopostemon coloradensis*
Insect	A sweat bee	*Dieunomia apacha*
Insect	A wool-carder bee	*Anthidium psoraleae*
Insect	Abberrant Cellophane Bee	*Colletes aberrans*
Insect	Arogos Skipper	*Atrytone arogos*
Insect	Bald-spot Sweat Bee	*Lasioglossum paraforbesii*
Insect	Bicoloured Sweat Bee	*Agopostemon virescens*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Burrow Small Dung Beetle	*Geomyphilus thomomysi*
Insect	Dotted Skipper	*Hesperia attalus attalus*
Insect	Ghost Tiger Beetle	*Ellipsoptera lepida*
Insect	Morrison’s Bumble Bee	*Bombus morrisoni*
Insect	Mottled Duskywing	*Erynnis martialis*
Insect	Occidental Digger Bee	*Anthophora occidentalis*
Insect	Orange-bellied Sweat Bee	*Agopostemon melliventris*
Insect	Ottoe Skipper	*Hesperia ottoe*
Insect	Pahaska Skipper	*Hesperia pahaska*
Insect	Particular Small Dung Beetle	*Scabrostonus peculiosis*
Insect	Red Satyr	*Megisto rubricata*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Soapberry Hairstreak	*Phaeostrymon alcestis*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Splendid Sweat Bee	*Agopostemon splendens*
Insect	Susan’s Plasterer Bee	*Colletes susannae*
Insect	The Unexpected Milkweed Moth	*Cycnia inopinatus*
Insect	White-cloaked Tiger Beetle	*Eunota togata latilabris*
Insect	Whiteish Sweat Bee	*Agopostemon sericeus*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*
Mammals	Fulvous Harvest Mouse	*Reithrodontomys fulvescens*
Mammals	Pallid Bat	*Antrozous pallidus*
Mammals	Townsend's Big-eared Bat	*Corynorhinus townsendii*
Mammals	Tricolored Bat	*Perimyotis subflavus*
Plants	Great Plains Ladies’-tresses	*Spiranthes magnicamporum*

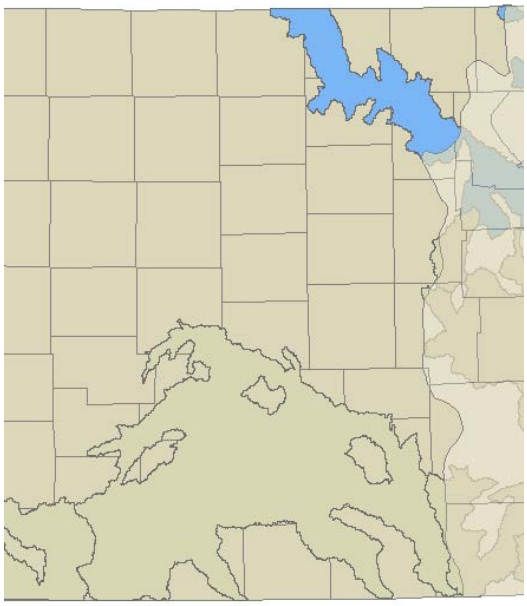
Tier 2 SGCN		
Plants	Oklahoma Phlox	*Phlox oklahomensis*
Plants	Sand-dune Broomspurge	*Euphorbia carunculata*
Reptiles	Chihuahuan Night-snake	*Hypsiglena jani*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Glossy Snake	*Arizona elegans*
Reptiles	Ground-snake	*Sonora semiannulata*
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*
Reptiles	Long-nosed Snake	*Rhinocheilus lecontei*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Prairie Rattlesnake	*Crotalus viridis*
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*

Aquatic EFAs

Figure 8. Aquatic Ecological Focus Areas of the Central Mixed Grass Prairie Conservation Region. These EFAs represent landscapes where conservation actions can be applied for maximum benefit to Kansas wildlife. Each EFA includes a suite of SGCN and priority habitats.



1. Kansas - Lower Republican



The Kansas - Lower Republican Ecological Focus Area is located from north-central to northeast Kansas. The Lower Republican River flows south from Nebraska until it joins the Smoky Hill River in Geary County to form the Kansas River. The majority of streams in this system have sand substrates. The portions disjunct from the main stem Lower Republican and Kansas rivers include parts of the Big Blue, Vermillion, and Delaware rivers and Soldier Creek. This EFA is broadly distributed among the following ecoregions: Rolling Plains and Breaks, Smoky Hills, Flint Hills, Loess and Glacial Drift Hills, and Osage Cuestas. Historically, the landscape ranged from Mixed Grass Prairie in the west to Tallgrass Prairie in the east, but much of the area has been converted to agriculture. Environmental concerns associated with agriculture in this region include high levels of pesticide and nutrient contaminants and sedimentation. Large reservoirs fragmenting the basin include Lovewell, Milford, Tuttle Creek, Perry, and Clinton reservoirs. Additionally, channelization and urbanization of streams near Manhattan have led to increased flooding issues. The Kansas – Lower Republican EFA contains habitat for several SGCN fish species.

Conservation Issues

Residential and commercial development

*Urbanization and impervious surfaces reduce water infiltration and increase runoff

*Storm water management in urban areas often results in channelized, concrete-lined streams that lead to intensified flooding events downstream

Agriculture

*****Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation, and nutrients issues

*Intense grazing regimes can degrade riparian habitats

*Livestock access to streams can increase nutrient input

Natural system modifications

*Sand dredging in the Kansas River impacts the river channel, riparian area, and tributaries

*The use of water from streams for irrigation, industries and municipalities is lowering the water level

* Structures that alter the water from its natural drainage are impacting natural hydrology of streams

*Bank destabilization (due to riparian management, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat.

*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Invasive species, such as White Perch, Bighead Carp, and Silver Carp, negatively impact native aquatic species and habitat.

*Introduced predatory species can impact populations of native aquatic species

Pollution

*Overuse/misapplication of pesticides and fertilizer also contribute to water quality degradation from runoff

*Urban runoff contains industrial and lawn chemicals that impact water quality

*The outflows from sewage plants of cities and towns impact water quality

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage.

*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors

*Acquire riparian corridor acreages through willing sellers/donors

*Acquire water rights as advisable and possible

*Encourage conservation easements on high quality habitats

Land/water management

*Encourage sand acquisition from off-channel sources such as the Kansas River valley and/or reservoirs to reduce impacts to the river channel

*Encourage use of permeable asphalt or pavement and Low Impact Development practices to improve storm water management by increasing infiltration of water and decreasing/replacing impervious surfaces

*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species

*Promote improved water quality standards

*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes

*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats, allowing agroforestry operations in the area farthest from the active channel

*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control, and bank stabilization

*Encourage engineering techniques that promote high habitat diversity

*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management

*Maximize habitat diversity for wildlife species

*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species

*Promote restoration of stream channels through natural stream design

*Promote restoration projects that increase floodplain connectivity in incised streams

*Promote conservation and restoration or oxbow habitats

*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage

*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit landowners as well as stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts

*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics.

*Investigate contaminant effects on reptilian and amphibian populations
*Continued disease monitoring (Chytrid Fungus, Ranavirus, etc.)
*Inform landowners and managers of and promote best management practices
*Research and develop engineering techniques for effective river and stream management
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Educate the public regarding the importance of preventing the spread of invasive species
*Study the impact of Bighead Carp, Silver Carp, and other introduced species on native species
*Inventory perched culverts and other structures that are preventing aquatic organism passage
*Educate public and developers on the effects of impervious surfaces and the potential for Low Impact Development
*Educate public about eco-friendly lawn care and effects of lawn chemicals on aquatic systems

External capacity building

*Promote and encourage formation of coalitions/associations such as The Comanche Pool Prairie Resource Foundation
*Work with other states and federal agencies to gain assurance that no species are being transported in Kansas
*Promote sound water quality standards and their enforcement through education and continued coordination with the Kansas Department of Health and Environment
*Work with county road departments and Kansas Department of Transportation to identify and replace structures that are preventing aquatic organism passage
*Promote the use of conservation culverts that retain natural stream bed features
*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat
*Work with the county zoning boards to implement good urban planning procedures
*Work with city and county public works to improve storm water management

Livelihood, economic and other incentives

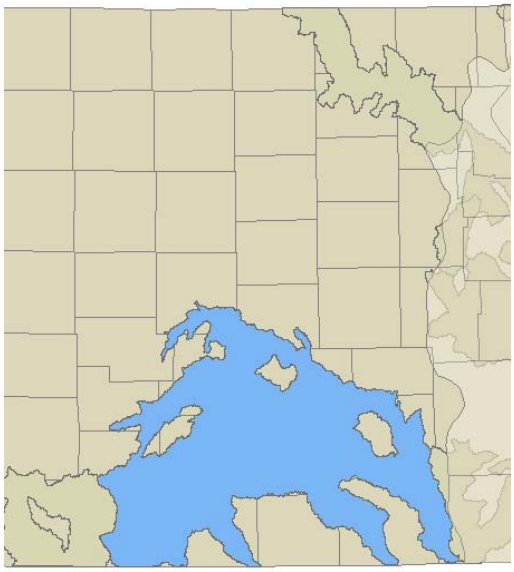
*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Fish	Blackside Darter	*Percina maculata*
Fish	Pallid Sturgeon	*Scaphirhynchus albus*
Fish	Plains Minnow	*Hybognathus placitus*
Fish	Shoal Chub	*Macrhybopsis hyostoma*
Fish	Sicklefin Chub	*Macrhybopsis meeki*
Fish	Silver Chub	*Macrhybopsis storeriana*
Fish	Sturgeon Chub	*Macrhybopsis gelida*
Fish	Topeka Shiner	*Notropis topeka*
Fish	Western Silvery Minnow	*Hybognathus argyritis*
Insect	A mayfly	*Apobaetis lakota*
Insect	A mayfly	*Heterocloeon grande*
Insect	A small minnow mayfly	*Plauditus texanus*
Mussels	Snuffbox	*Epioblasma triquetra*
Tier 2 SGCN		
Fish	American Eel	*Anguilla rostrata*
Fish	Black Buffalo	*Ictiobus niger*
Fish	Blue Sucker	*Cycleptus elongatus*

Tier 2 SGCN		
Fish	Brassy Minnow	*Hybognathus hankinsoni*
Fish	Cardinal Shiner	*Luxilus cardinalis*
Fish	Chestnut Lamprey	*Ichthyomyzon castaneus*
Fish	Common Shiner	*Luxilus cornutus*
Fish	Golden Redhorse	*Moxostoma erythrurum*
Fish	Highfin Carpsucker	*Carpiodes velifer*
Fish	Johnny Darter	*Etheostoma nigrum*
Fish	Lake Sturgeon	*Acipenser fulvescens*
Fish	Northern Plains Killifish	*Fundulus kansae*
Fish	Orangethroat Darter	*Etheostoma spectabile*
Fish	Ozark Logperch	*Percina caprodes fulvitaenia*
Fish	Paddlefish	*Polyodon spathula*
Fish	Quillback	*Carpiodes cyprinus*
Fish	River Redhorse	*Moxostoma carinatum*
Fish	River Shiner	*Notropis blennius*
Fish	Shorthead Redhorse	*Moxostoma macrolepidotum*
Fish	Shovelnose Sturgeon	*Scaphirhynchus platorynchus*
Fish	Slender Madtom	*Noturus exilis*
Fish	Slenderhead Darter	*Percina phoxocephala*
Fish	Southern Redbelly Dace	*Chrosomus erythrogaster*
Fish	Stonecat	*Noturus flavus*
Fish	White Sucker	*Catostomus commersonii*
Insect	A longhorned caddisfly	*Ceraclea spongillovorax*
Insect	A sand-filtering mayfly	*Homoeoneuria ammophila*
Mussels	Creeper	*Strophitus undulatus*
Mussels	Fatmucket	*Lampsilis siliquoidea*
Mussels	Fawnsfoot	*Truncilla donaciformis*
Mussels	Lilliput	*Toxolasma parvum*
Mussels	Pink Heelsplitter	*Potamilus alatus*
Mussels	Plain Pocketbook	*Lampsilis cardium*
Mussels	Pondhorn	*Uniomerus tetralasmus*
Mussels	Wabash Pigtoe	*Fusconaia flava*
Mussels	Yellow Sandshell	*Lampsilis teres*
Turtles	Smooth Softshell	*Apalone mutica*

2. Lower Arkansas



The Lower Arkansas Ecological Focus Area continues the course of the Arkansas River as it flows southeast and across southern Kansas until it crosses into Oklahoma south of Arkansas City. The area is part of the Central Great Plains and is primarily made up of the undulating to rolling sand plains of the Great Bend Sand Prairie and the flat lowland topography of the Wellington-McPherson Lowlands. Center pivot irrigation is implemented to a greater degree in the Great Bend Sand Prairie than surrounding regions. Loess and river valley deposits support extensive cropland agriculture of winter wheat and grain sorghum in the Wellington-McPherson Lowlands. The northern area contains the alluvial Equus beds, an aquifer important to the region. Much of the area has been impacted by urbanization from the city of Wichita and surrounding communities.

Conservation Issues

Residential and commercial development

*Urbanization and impervious surfaces reduce water infiltration and increase runoff

*Storm water management in urban areas often results in channelized, concrete-lined streams that lead to intensified flooding events downstream

Agriculture

*Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation, and nutrient issues

*Intense grazing regimes can degrade riparian habitats

*Livestock access to streams can increase nutrient input

Natural system modifications

*Use of ground water and surface water from rivers and streams for irrigation is lowering the water level, and as a result many miles of stream are drying

*Structures that alter the water from its natural drainage are impacting natural hydrology of streams

*Bank destabilization (due to riparian management, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat.

*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Introduced species such as White Perch, Zebra Mussels, negatively impact native aquatic species and habitat

*Introduced predatory species can impact populations of native aquatic species, fisheries management as it relates to stocking game fish can be detrimental to native species

*Eastern Red Cedar has reduced flows in many streams of the Lower Arkansas Basin

*Other invasive plants impact riparian areas

Pollution

*Overuse/misapplication of pesticides and fertilizer also contribute to water quality degradation from runoff

*Urban runoff contains industrial and lawn chemicals that impact water quality

*The outflows from sewage plants of cities and towns impact water quality

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage.

*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors

*Acquire riparian corridor acreages through willing sellers/donors

*Acquire water rights as advisable and possible

*Encourage conservation easements on high quality habitats

Land/water management

*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats

*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control and bank stabilization
*Encourage engineering techniques that promote high habitat diversity
*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management
*Promote improved water quality standards
*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes
*Maximize habitat diversity for wildlife species
*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species
*Expand cooperative programs that supply technical and direct assistance for non-native species removal
*Promote removal of Eastern Red Cedar
*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit landowners as well as stream and riparian habitats
*Encourage use of permeable asphalt or pavement and Low Impact Development practices to improve storm water management by increasing infiltration of water and decreasing/replacing impervious surfaces
*Promote restoration of stream channels through natural stream design
*Promote restoration projects that increase floodplain connectivity in incised streams
*Promote conservation and restoration of oxbow habitats
*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts
*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Inform landowners and managers of and promote best management practices
*Investigate contaminant effects on reptilian and amphibian populations
*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Continued disease monitoring (Chytrid Fungus, Ranavirus, etc.)
*Research and develop engineering techniques for effective river and stream management
*Study the impact of introduced species on native species
*Educate the public regarding the importance of preventing the spread of invasive species
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Inventory perched culverts and other structures that are preventing aquatic organism passage
*Educate landowners on the benefits of Eastern Red Cedar removal
*Educate public and developers on the effects of impervious surfaces and the potential for Low Impact Development
*Educate public about eco-friendly lawn care and effects of lawn chemicals on aquatic systems

External capacity building

*Promote and encourage formation of coalitions/associations such as the Comanche Pool Prairie Resource Foundation
*Work with neighboring states to gain compliance of interstate compacts in regard to water rights
*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage
*Work with the county zoning boards to implement good urban planning procedures
*Work with city and county public works to improve storm water management

*Promote the use of conservation culverts that retain natural stream bed features
*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

Livelihood, economic and other incentives

*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Amphibians	Strecker's Chorus Frog	*Pseudacris streckeri*
Fish	Arkansas Darter	*Etheostoma cragini*
Fish	Arkansas River Shiner	*Notropis girardi*
Fish	Peppered Chub	*Macrhybopsis tetranema*
Fish	Plains Minnow	*Hybognathus placitus*
Fish	Silver Chub	*Macrhybopsis storeriana*
Insect	A mayfly	*Heterocloeon grande*
Insect	A small minnow mayfly	*Plauditus texanus*
Tier 2 SGCN		
Amphibians	Red-spotted Toad	*Anaxyrus punctatus*
Fish	Black Buffalo	*Ictiobus niger*
Fish	Channel Darter	*Percina copelandi*
Fish	Freckled Madtom	*Noturus nocturnus*
Fish	Golden Redhorse	*Moxostoma erythrurum*
Fish	Northern Plains Killifish	*Fundulus kansae*
Fish	Orangethroat Darter	*Etheostoma spectabile*
Fish	Ozark Logperch	*Percina caprodes fulvitaenia*
Fish	Pealip Redhorse	*Moxostoma pisolabrum*
Fish	Quillback	*Carpiodes cyprinus*
Fish	Shorthead Redhorse	*Moxostoma macrolepidotum*
Fish	Slenderhead Darter	*Percina phoxocephala*
Fish	Southern Redbelly Dace	*Chrosomus erythrogaster*
Fish	Warmouth	*Lepomis gulosus*
Insect	A longhorned caddisfly	*Ceraclea spongillovorax*
Mussels	Bleufer	*Potamilus purpuratus*
Mussels	Lilliput	*Toxolasma parvum*
Mussels	Pondhorn	*Uniomerus tetralasmus*
Plants	Hall's Bulrush	*Schoenoplectiella hallii*
Plants	Missouri Mud-plaintain	*Heteranthera missouriensis*
Turtles	Smooth Softshell	*Apalone mutica*

Success Story – Fish Passage

Riverine habitat has been fragmented throughout the Great Plains and Kansas via drought and man-made structures such as low-head dams. This fragmentation has led to declines and extirpations of several fish species, particularly those that require long reaches of continuous habitat for reproduction. Fishways are a common mitigation technique to attempt to restore the longitudinal connectivity broken up by human-engineered structures. Most fishways have been built on high gradient, rocky streams that serve as migration routes for diadromous (migrating between fresh and saltwater) fishes. The Lincoln Street Fishway is one of the first of its kind, built on a low-gradient, sand-fed, Great Plains river for the use of smaller-bodied fishes such as Plains Minnow, Silver Chub, Peppered Chub, Arkansas River Shiner, and Arkansas Darter. Monitoring programs are not often implemented after fishways are installed, and because of this most fishway designs reflect those targeted at salmonids. Information from monitoring programs is vital to improve fishway designs and conservation efforts for imperiled small-bodied, warm-water species.

The Lincoln Street Fishway, which was partially funded by the State Wildlife Grant (SWG) program, was built on the Arkansas River alongside the Lincoln Street Dam in Wichita, KS. Concerted efforts from several partners were required for the funding, design, construction, and monitoring of the fishway (Kansas Department of Wildlife and Parks, U.S. Fish and Wildlife Service, City of Wichita, MKEC Engineering, Federal Highway Administration, Kansas Department of Transportation, U.S. Coast Guard, University of Illinois – Ven Te Chow Hydrosystems Laboratory, and Kansas State University). Construction was initially completed in 2012, but due to high flows and structural flaws the fishway remained in various states of repair until January of 2015. Beginning in March 2015, a SWG grant funded a graduate student at Kansas State University to conduct research on fish community use of the fishway. Preliminary results from sampling events throughout the summer of 2015 have documented 27 species and over 30,000 individuals using the fishway. Sampling of the fish community upstream of the dam and fishway has documented the return of Emerald Shiner to a reach of river from which it had previously disappeared. The City of Wichita conducted regular fish community sampling in the Arkansas River throughout the city including multiple reaches upstream of the dam from 1991-2008. Emerald Shiner were never collected above the dam during that 17-year period. In 2013, three individuals were collected directly upstream of the dam while repairs were being conducted on the fishway, and have been consistently found in upstream samples in 2015. Several species that were once abundant have been extirpated from the Arkansas River in Kansas due to the effects of fragmentation and habitat loss. The return of the Emerald Shiner to reaches upstream of the fishway is promising news, and showcases the role that fishways can play in restoring connectivity for small-bodied fishes in fragmented rivers. Lessons learned from the design and implementation of this unique fishway will guide future conservation of stream fishes in Kansas and the Great Plains.

Lincoln Street Fishway

Additional efforts to restore fish passage have been completed throughout the state. Over time stream crossings such as culverts often become perched above water levels, creating a barrier for upstream movement of aquatic organisms. Several Kansas counties have used Fish Passage funding from the U.S. Fish and Wildlife Service to replace aging structures with “fish friendly” designs that reconnect stream habitats.

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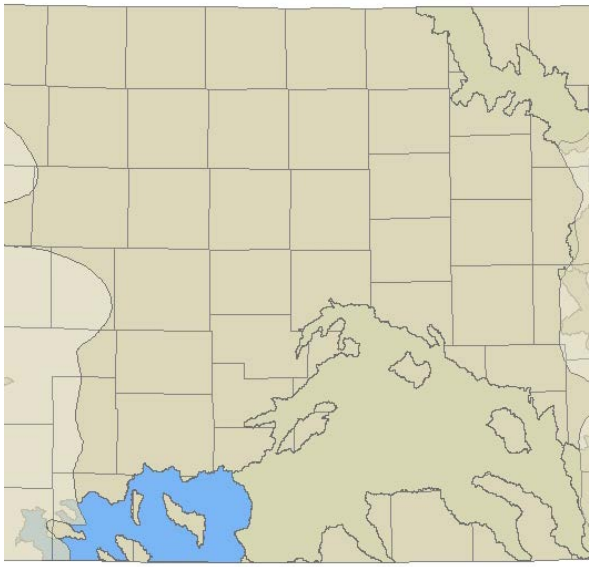
Replacement of perched culverts with a span bridge on Clear Fork Creek, Pottawatomie County

3. Cimarron



The Cimarron Ecological Focus Area is part of the Southwestern Tablelands comprised of the Cimarron Breaks and the Flatlands Tablelands and Valleys region. The Cimarron Breaks can be described as irregular, dissected slopes, bluffs, and gypsum-capped red buttes. Rangeland and grassland are the dominant land use and land cover with cattle grazing throughout the area. Croplands are much more common in the Flat Tablelands and Valleys region of this area. The region has many spring-fed streams, and stream bottoms tend to be sandy, and the water is more mineralized than in adjacent areas. The Cimarron River flows through this area. The Cimarron River is designated critical habitat for the presumed extirpated Arkansas River Shiner, Arkansas Darter and Plains Minnow.

<u>Conservation Issues</u>

Agriculture

*Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation, and nutrient issues

*Intense grazing regimes can degrade riparian habitats

*Livestock access to streams can increase nutrient input

Natural system modifications

*Use of ground water and surface water from rivers and streams for irrigation is lowering the water level, and as a result many miles of stream are drying

*Structures that alter the water from its natural drainage are impacting natural hydrology of streams

*Bank destabilization (due to riparian management, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat.

*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Invasive species such as Red River Pupfish and Red River Shiner negatively impact native aquatic species and habitat

*Introduced predatory species can impact populations of native aquatic species, fisheries management as it relates to stocking game fish can be detrimental to native species

*Salt Cedar (*Tamarix* spp) has become well-established in riparian areas of the Cimarron River Basin, and impacts stream habitats by reducing flows and armoring banks

*Other invasive plants impact riparian areas

Pollution

*Overuse/misapplication of pesticides and fertilizer also contribute to water quality degradation from runoff

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage

*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors

*Acquire riparian corridor acreages through willing sellers/donors

*Acquire water rights as advisable and possible

*Encourage conservation easements on high quality habitats

Land/water management

*Promote removal and control of Salt Cedar

*Promote mechanical removal of non-native, invasive plant species by utilizing local habitat partnerships

*Expand cooperative programs that supply technical and direct assistance for non-native species removal

*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species

*Promote improved water quality standards

*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes

*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats

*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control, and bank stabilization

*Encourage engineering techniques that promote high habitat diversity

*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management

*Maximize habitat diversity for wildlife species

*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species

*Promote restoration of stream channels through natural stream design

*Promote restoration projects that increase floodplain connectivity in incised streams

*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage
*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit landowners as well as stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts
*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Educate landowners on Salt Cedar control methods and the benefits of Salt Cedar removal
*Inform landowners and managers of and promote best management practices
*Investigate contaminant effects on reptilian and amphibian populations
*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Continued disease monitoring (Chytrid Fungus, Ranavirus, etc.)
*Research and develop engineering techniques for effective river and stream management
*Study the impact of Red River Pupfish, Red River Shiner, and other introduced species on native species
*Educate the public regarding the importance of preventing the spread of invasive species
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Inventory perched culverts and other structures that are preventing aquatic organism passage

External capacity building

*Promote and encourage formation of coalitions/associations such as the Comanche Pool Prairie Resource Foundation
*Work with local, state and federal agencies to reduce negative impacts to habitat from their programs
*Work with neighboring states to gain compliance of interstate compacts in regard to water rights
*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage
*Promote the use of conservation culverts that retain natural stream bed features
*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

Livelihood, economic and other incentives

*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Fish	Arkansas Darter	*Etheostoma cragini*
Fish	Arkansas River Shiner	*Notropis girardi*
Fish	Plains Minnow	*Hybognathus placitus*
Tier 2 SGCN		
Amphibians	Red-spotted Toad	*Anaxyrus punctatus*
Arachnida	An aquatic mite	*Tyrrellia hibbardi*
Fish	Golden Redhorse	*Moxostoma erythrurum*
Fish	Northern Plains Killifish	*Fundulus kansae*
Mussels	Lilliput	*Toxolasma parvum*
Mussels	Pondhorn	*Uniomerus tetralasmus*

Central Mixed Grass Prairie Conservation Region Partners (not listed on Statewide List)

- Bird Conservancy of the Rockies
- Comanche Pool Prairie Resource Foundation
- Great Plains Landscape Conservation Cooperative
- Great Plains Nature Center
- Kansas Prescribed Burn Association (local associations)
- Playa Lakes Joint Venture
- McConnell Air Force Base
- Smoky Hill Grazers

Success Story - Helping Private Landowners Conserve Wildlife Habitat

Kansas' Wildlife Action Plan identifies fragmentation of grasslands by agriculture and encroachment of woody species into native prairies as high priority threats to wildlife. KDWP developed the Private Landowner Incentive Program and subsequent Private Landowner Habitat Program to address these issues on private land for Species of Greatest Conservation Need. Creating conservation partnerships with private landowners is a high priority in Kansas' wildlife action plan as 97% of Kansas land is privately-owned and more than 90% of the state's endangered species are found on private land.

KDWP's Landowner Incentive and Private Lands Habitat programs were developed to provide financial and technical assistance to private landowners to help restore, enhance, and/or preserve habitat for wildlife. These initial programs focused implementation in the Shortgrass and Mixed grass ecoregions. To date, over 100 projects have been funded on over 50,000 privately owned acres with technical service provided to numerous other private landowners. Prescribed grazing, invasive tree/plant removal, prescribed burning, and perimeter fencing on expired CRP fields directly benefit over 25 at-risk species. These actions also benefit more common species that use the same resources, helping to conserve them before they become more vulnerable.

Chapter 6 -
EASTERN TALLGRASS PRAIRIE CONSERVATION REGION

Description

The Eastern Tallgrass Prairie Conservation Region is located in the eastern third of Kansas. It includes the Flint Hills, Glaciated Region, Osage Cuestas, Chautauqua Hills, Cherokee Lowlands, and Ozark Plateau physiographic regions (Figure 4).

The Flint Hills, the largest contiguous area of tallgrass prairie in the country (Duncan 1978), lies at the western edge of the tall-grass prairie. It is composed of flint-bearing limestone which is resistant to erosion. The topography consists of flat-topped hills which drop off steeply into valleys with rocky, clear-flowing streams. The soil is fertile but shallow and gravelly, discouraging the conversion of prairie to cropland. Woody vegetation is scarce. Forests occur along stream and river bottoms, and areas protected from fire (Busby and Zimmerman 2001; Kucera 1992).

The Glaciated Region occupies the northeast corner of the state. Shaped by the repeated southern advance and then northern retreat of glaciers during the Quaternary period, a wind-blown deposit of loess, often associated with glaciation, occurs throughout the region and is thickest along the Nebraska border (Physiographic 1997). The region is intensively farmed today because of its fertile soil. Woodlands are confined to the bluffs along the Missouri River and other major stream courses protected from fire (Busby and Zimmerman 2001).

The Osage Cuestas region occupies a large portion of eastern Kansas south of the Kansas River. The landscape of ridges and valleys were created by the weathering of the underlying deposits of limestone and shale. The weather resistant limestone makes up the east facing ridges, while the softer shale erodes away to form the valleys on the west facing side (Wilson 1984). The soils are mainly silt and clay loams. Steep slopes and land that isn't as fertile have been allowed to revert to woodland and shrubland. The forest in this region lies at the western edge of the Eastern Deciduous Forest. Woodlands are found along stream valleys and fire protected slopes. Also occurring along streams and rivers are marshes, oxbow lakes and wet prairies (Physiographic 1997).

The Chautauqua Hills region consists of a narrow band of hills that extend northeastward into Kansas from Oklahoma. The sediment of this region is composed mostly of sandstone. The more permeable soils support abundant tree growth. A savanna-type ecosystem, the dominant woody species are drought tolerant, fire adapted oak trees. The understory of the woodlands is primarily composed of prairie grasses. The major land use of the region is livestock grazing as the hills are too steep for crop production (Kansas Geological Survey 1997).

The Cherokee Lowlands lie in the southeast corner of Kansas. Developed on easily eroded shales and sandstone, the gently rolling landscape is crossed by shallow stream valleys (Busby and Zimmerman 2001). With relatively flat topography and deep, rich soils, this region is good for crop production. Trees generally grow only on hill slopes, large stream banks, and in abandoned mining areas (Kansas Geological Survey 1997). The Cherokee Lowlands have the most extensive coal deposits in the state, and as such coal mining is another important industry of the region.

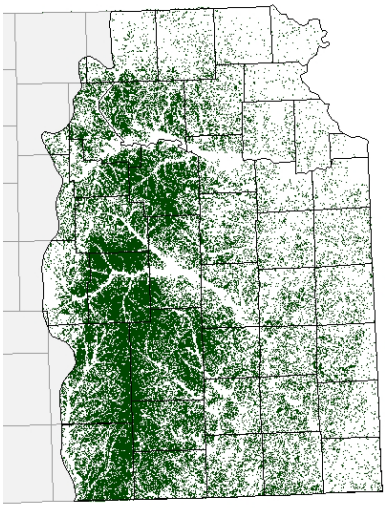
The Ozark Plateau region occurs in the extreme southeast corner of Kansas, and is part of the Ozarks of Missouri, Oklahoma, and Arkansas. Under this region lay thick deposits of limestone, creating the clear, high-gradient streams, springs, and extensive caves, the Ozarks are known for. The landscape consists of steep hills covered with hardwood forests along with other trees, shrubs, and vines. The thin rocky soil along with the steep terrain makes this region unsuitable for farming. Crop production is restricted to valley floors of rivers and streams. Some areas have also been cleared for pasture, but much of the Ozark Plateau still remains forested with little disturbance by human activity (Kansas Geological Survey 1997).

The Eastern Tallgrass Prairie Region is mostly prairie in the western portion, while the eastern portion is a mixture of prairie, woodlands and forests (Brooks 1985). The annual average rainfall is between 30 and 42 inches. The higher amount of rainfall in this region supports the growth and development of forests (Duncan 1978). The most common tree community in the deciduous forest region of Kansas is dominated by oak and hickory species (*Quercus/Carya spp)* (Brooks 1985). Historically, fire played an important role in preventing shrubby growth from invading, maintaining the tallgrass prairie. Today controlled burning and mowing are implemented to keep shrubby growth in check. This region is defined by the dominant tall grass species that occur in higher abundance than in the other conservation regions. The soil of this region is extremely fertile, but not always easily accessible for crop production (Kucera 1992). Farming still occurs over a large portion of this region but not to the same degree as the other regions. Crop production relies less on irrigation than in the western regions to produce crops such as corn, grain sorghum, and wheat (Duncan 1978). Population in this region is higher than in the Mixed Grass Prairie Conservation Region. There are a greater number of larger cities situated relatively close together. Major rivers are the Kansas and the Missouri in the north, the Marais des Cygnes in the middle, and the Neosho and Verdigris in the south.

A. Priority habitats in the Eastern Tallgrass Prairie Conservation Region

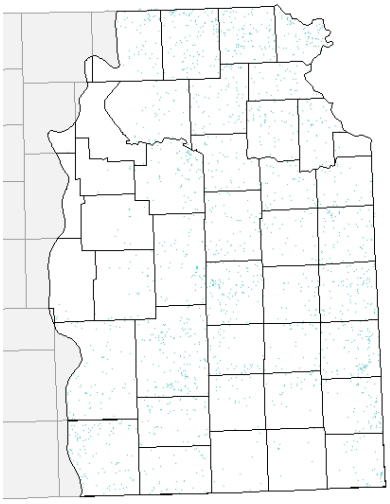
Priority habitats in the region include Tallgrass Prairie, Herbaceous Wetland, Eastern Streams/Small Rivers, Deciduous Forest, Eastern Large Rivers, and Deciduous Floodplain. The Tallgrass Prairie habitat is the primary habitat within this conservation region. Other habitats occurring in the region, but are not considered priority are: Evergreen (Cedar), CRP/Native, CRP/Cool Season, Cropland, Caves, Eastern Lentic, and Seeps and Springs.

Tallgrass Prairie



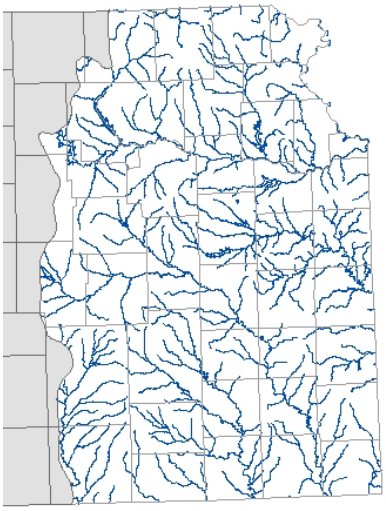
Tallgrass Prairie habitat is a core habitat in need of special emphasis. This habitat is dominated by warm-season grasses such as Big Bluestem (*Andropogon gerardii*), Switchgrass (*Panicum virgatum*), Little Bluestem (*Schizachyrium scoparium*), and Indian grass (*Sorghastrum nutans*) (Thompson 2011). Wildflowers such as violets (*Viola* spp.), *Echinacea* spp, *Oenothera* spp, *Lobelia* spp, beardtongues (*Penstemon* spp.), and sunflowers (Heliantheae tribe) can be found throughout the Tallgrass Prairie habitat. The largest remaining undisturbed tracts of the habitat occur in the Flint Hill Uplands, where the soils are too shallow to plow (Brooks 1985). East of the Flint Hills small tracts of tallgrass prairie still exist in areas not yet disrupted by agriculture.

Herbaceous Wetland Habitat



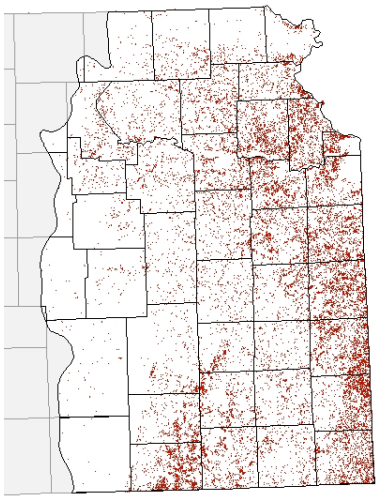
The Herbaceous Wetland habitat in the Eastern Tallgrass Prairie Conservation Region is comprised of low or wet Prairie, freshwater marsh, cattail marsh, and weedy marsh. These habitats are located in the floodplains along rivers and streams, in swales associated with rivers, or as margins of lakes and impoundments. These are mostly seasonal and permanent wetlands. The dominant species include Softstem Bulrush, (*Scirpus validus*), Spike Rush (*Eleocharis spp.*), and Sedges (*Carex spp.*). Prairie Cordgrass (*Spartina pectinata*) thrives in the low or wet prairies. Many bulrush (*Scirpus* spp.) and cattail (*Typha* spp.) species are found in freshwater and cattail marshes. Ragweeds (*Ambrosia* spp.) and Sorrel (*Rumex* spp.) dominate weedy marshes. The condition of the Herbaceous Wetlands can be significantly impacted by pollution from fertilizer and pesticide runoff from surrounding farm and pasture lands.

Aquatic-Eastern Streams/Small Rivers Habitat



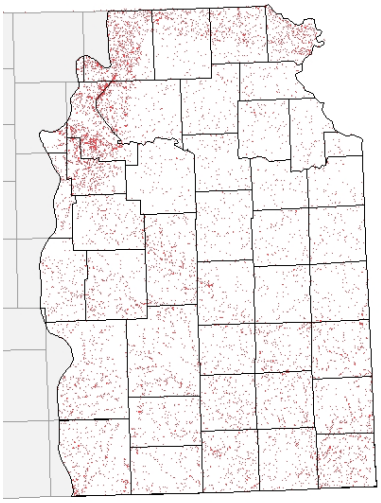
Aquatic-Eastern Streams/Small Rivers habitat includes the small rivers, streams and their tributaries in the Neosho, Missouri, Verdigris, Eastern Arkansas, Kansas, and Marais des Cygnes river basins in eastern Kansas. The relative quality and quantity of the Aquatic-Eastern Streams/Small Rivers Habitat is declining.

Deciduous Forest Habitat



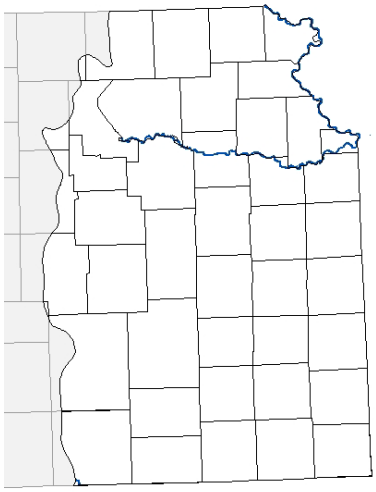
The Deciduous Forest habitat is a westward extension of the Eastern Deciduous Forest. The multi-layered forests are dominated by oaks and hickory species complemented by an understory of shrubs and herbaceous plants. Oak-hickory forests are composed primarily of black and red oaks and bitternut and shagbark hickories. Open groves of blackjack oak (*Quercus marilandica*) and post oak (*Quercus stellata*) occur in the southern portion on upland sandstone soils. Along the Missouri River bluffs, sugar maple (*Acer saccharum*) and basswood (*Tilia americana*) form an important part of the canopy community (Brooks 1985). Eastern cottonwoods (*Populus deltoids*) and black willows (*Salix nigra*) are common in lowland areas. Other common tree species are: White Oak (*Quercus alba*), Chinkapin Oak (*Quercus muehlenbergii*), Slippery Elm (*Ulmus rubra*), Osage Orange (*Malura pomifera*), and Honeylocust (*Gleditsia triacanthos*). The understory of the forest is composed of a number of shrubs and forbs. Grasses and grass-like plants are not common in the woodlands and when they occur, they are confined to scattered clumps (Brooks 1985).

Deciduous Floodplain Habitat



The Deciduous Floodplains are temporarily flooded habitats. In areas that often experience flooding from torrential rains that scour the ground, eastern cottonwoods (*Populus deltoids*) and willows (*Salix* spp.) are able to establish themselves quickly and thrive. Other dominant species are; Pecan (*Carya illinoinensis*), Bur Oak (*Quercus macrocarpa*), Green Ash (*Fraxinus pennsylvanica*), American Elm (*Ulmus americana*), Sugar Maple (*Acer saccharum*), River Birch (*Betula nigra*), and Hackberry (*Celtis occidentalis*). The understory varies depending on how well the woodlands drain after rainfall. Sedges, scouring rush, and weedy nettles can be found with common shrubs and forbs.

Aquatic Eastern Large Rivers Habitat



Aquatic Eastern Large Rivers habitat includes those portions of the Missouri, Arkansas, and Kansas rivers that either border or flow through the Eastern Tallgrass Prairie Conservation Region. The Missouri River is the largest stream in Kansas. It has a wide, shallow bed over which the stream flows in braided channels divided by sand islands. The water is often muddy with channels varying in depth and speed of current, from swift chutes to calm sloughs, backwaters, and oxbows. The Kansas and Arkansas rivers are small editions of the Missouri River, but with fewer deep chutes, sloughs, and oxbows. Human activities have had the greatest effect on aquatic habitat, such as water consumption and agriculture, depleting the water levels and polluting the remaining water (Cross 1995).

B. Ecological Focus Areas in the Eastern Tallgrass Prairie Conservation Region

Terrestrial

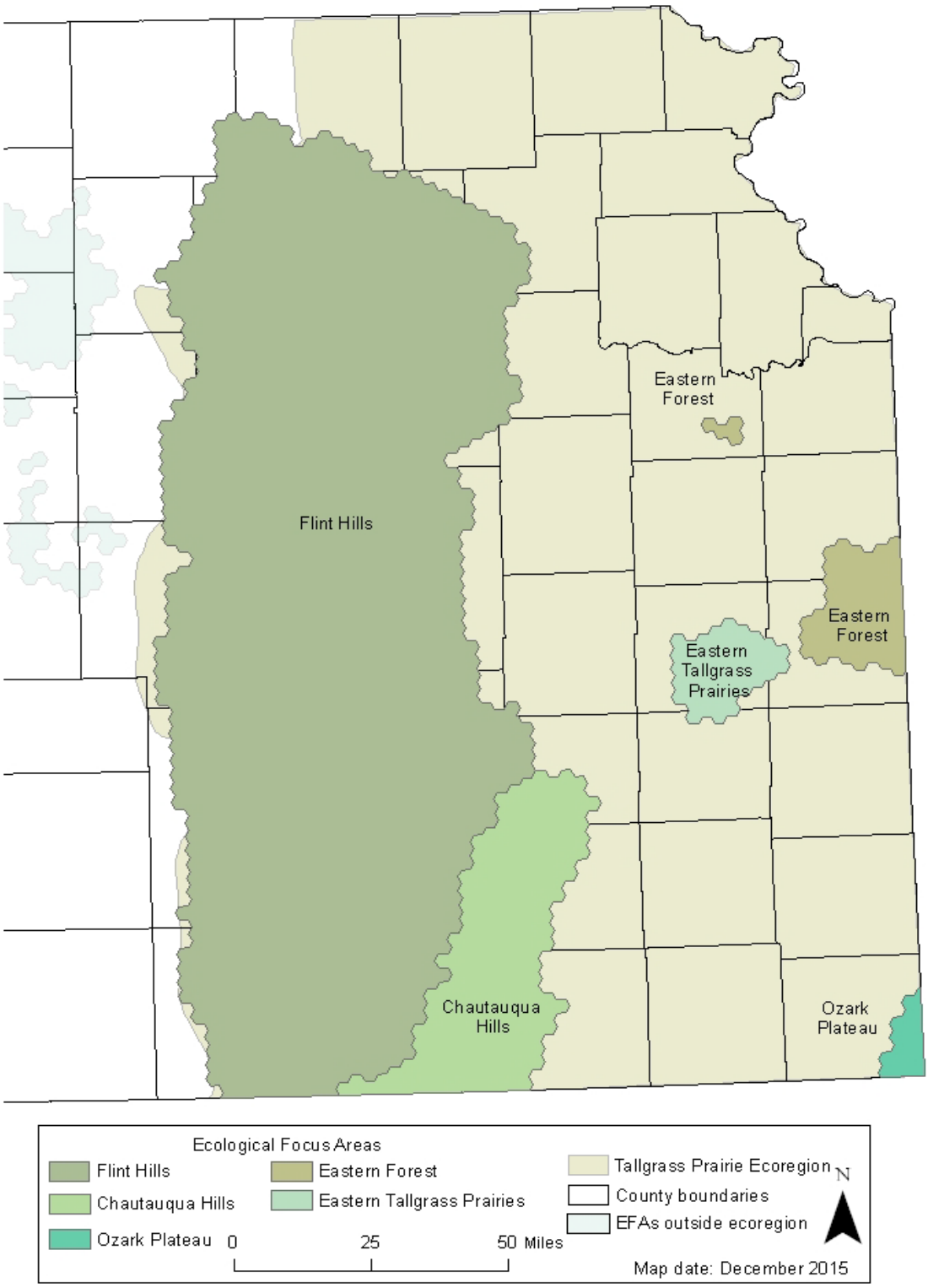
1. Flint Hills
2. Chautauqua Hills
3. Eastern Forest
4. Eastern Tallgrass Prairies
5. Ozark Plateau
3. Smoky Hill
4. Marais des Cygnes
5. Neosho
6. Verdigris
7. Walnut

Aquatic

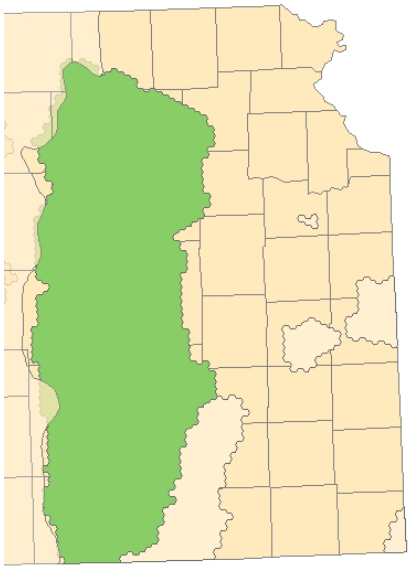
1. Missouri River
2. Kansas - Lower Republican

Terrestrial EFAs

Figure 9. Terrestrial Ecological Focus Areas of the Tallgrass Prairie Conservation Region. These EFAs represent landscapes where conservation actions can be applied for maximum benefit to Kansas wildlife. Each EFA includes a suite of SGCN and priority habitats.



1. Flint Hills



The Flint Hills Ecological Focus Area is located in east-central Kansas, within the Flint Hills ecoregion. This tallgrass prairie habitat is characterized by bands of rolling hills with abundant residual flint eroded from the bedrock that lies near the surface. The rocky uplands of this prairie are not conducive to cultivation, leaving this area still largely intact as native prairie well-suited for livestock production. The region is ecologically important because it is the largest remaining expanse of tallgrass prairie in the country. Disturbance from grazing and fire play important roles in preserving the dominance of herbaceous species and floristic diversity of the prairie. Numerous SGCN requiring large contiguous tracts of native prairie occur in this region.

EFA Development

This EFA is based on the Flint Hills Level 3 ecoregion with a modification of part of the western boundary to exclude large expanses of cropland. This western portion was designed to more closely follow the Large Natural Areas and 2.5 km hexagons with >= 50% Natural Vegetation.

Conservation Issues

Residential and commercial development

*The increase of urban, suburban, and exurban rural homes is reducing and fragmenting native habitat

Agriculture

*Inappropriate grazing practices on native grasslands decreases habitat heterogeneity and can change vegetative community composition

*Conversion of grasslands to other uses causes existing habitat creates fragmentation, destroys native flora, and decreases habitat availability

Energy Production

* Development and expansion of wind energy, solar arrays, and oil/gas fields infrastructure and activities in native grasslands—impacting grassland and migratory birds, bats, and other wildlife

Natural system modifications

*Improperly applied use of prescribed fire (*i.e.* prominence of annual burning is detrimental for some grassland nesting birds while, infrequent burning causes prairie to transition to shrubland or forest)

*Hydrological changes in the watersheds impacting the quality of wetlands

Invasive and other problematic species and genes

*Sericea lespedeza (*Lespedeza cuneata*) and Old World bluestems pose a serious threat to the biodiversity through competitive interaction with native species

*Woody species such as Osage orange and honey locust continue to encroach on native prairie

Pollution

*Pollution from point and non-point sources includes runoff of pesticides, fertilizers, and other chemicals

Conservation Actions

Land/water protection

*****Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

*Promote the use of USDA's Agriculture Conservation Easement Program, USFWS' Flint Hills Legacy Easement Program, or other conservation easements to maintain the integrity of tallgrass prairie wildlife habitat, stream water quality, and rich agricultural heritage of the Flint hills

*Provide landowners incentives to maintain wetlands

*Acquire water rights for wetlands as advisable and possible.

Land/water management

*Promote rangeland management tools, such as techniques for controlling invasive species, patch-burn-grazing, and drought management planning

*Develop an invasive species task force to create a state invasive plant and animal management plans

Education and awareness – actions directed at people to improve understanding and skills, and influence behavior

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Continue disease monitoring (e.g. Chytrid Fungus, Ranavirus, White Nose Syndrome and other potential diseases, etc.)

*****Research and investigate best management practices to control invasive species (*e.g.* Sericea Lespedeza, Old World Bluestems, etc.)

*****Implement surveys to quantify current wetlands, and identify priority areas

External capacity building – actions to build the infrastructure to do better conservation

*****Work with county zoning boards to implement well thought out planning procedures

*Develop partnerships to help private landowners conduct prescribed burns, providing education, equipment, expert advice and assistance

*Work with Kansas Dept. of Transportation for wise roadside vegetation management utilizing native species and to control invasive species

Species of Greatest Conservation Need

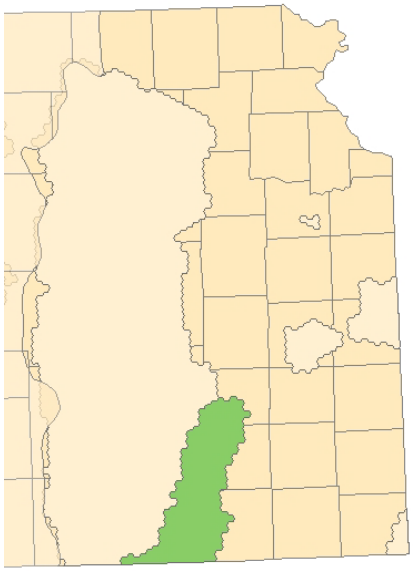
Tier 1 SGCN		
Amphipod	Kansas Well Amphipod	*Bactrurus hubrichti*
Birds	Least Tern	*Sternula antillarum*
Birds	Piping Plover	*Charadrius melodus*
Gastropods	Delta hydrobe	*Probythinella emarginata*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	A Cave Obligate Isopod	*Caecidotea tridentata*
Insect	A Cave Obligate Isopod	*Caecidotea metcalfi*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Konza Prairie Mayfly	*Leptophlebia konza*
Insect	Monarch	*Danaus plexippus*
Insect	Sage Sphinx	*Lintneria eremitoides*
Insect	Variable Cuckoo Bumble Bee	*Bombus variabilis*
Mammals	Eastern Spotted Skunk	*Spilogale putorius*
Planarians	Kansas Planarian	*Sphalloplana kansensis*
Plants	Mead's Milkweed	*Asclepias meadii*
Plants	Running Buffalo Clover	*Trifolium stoloniferum*
Plants	Western Prairie White-fringed Orchid	*Platanthera praeclara*

Tier 2 SGCN		
Amphibians	Common Mudpuppy	*Necturus maculosus*
Amphibians	Crawfish Frog	*Lithobates areolatus*
Amphibians	Tiger Salamander	*Ambystoma tigrinum*
Amphipod	Clanton's Cave Amphipod	Stygobromus clantoni
Amphipod	Onondaga Cave Amphipod	*Stygobromus onondagaensis*
Arachnida	a trap door spider	*Ummidia beatula*
Birds	American Golden-Plover	*Pluvialis dominica*
Birds	American Tree Sparrow	*Spizella arborea*

Tier 2 SGCN		
Birds	American White Pelican	*Pelecanus erythrorhynchos*
Birds	Baird's Sparrow	*Centronyx bairdii*
Birds	Bald Eagle	*Haliaeetus leucocephalus*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Black-billed Cuckoo	*Coccyzus erythropthalmus*
Birds	Bobolink	*Dolichonyx oryzivorus*
Birds	Buff-breasted Sandpiper	*Calidris subruficollis*
Birds	Burrowing Owl	*Athene cunicularia*
Birds	Chuck-will's-widow	*Antrostomus carolinensis*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Common Poorwill	*Phalaenoptilus nuttallii*
Birds	Dickcissel	*Spiza americana*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Eastern Meadowlark	*Sturnella magna*
Birds	Eastern Wood-Pewee	*Contopus virens*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Prairie-Chicken	*Tympanuchus cupido*
Birds	Harris's Sparrow	*Zonotrichia querula*
Birds	Henslow's Sparrow	*Centronyx henslowii*
Birds	Least Bittern	*Ixobrychus exilis*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Mississippi Kite	*Ictinia mississippiensis*
Birds	Northern Bobwhite	*Colinus virginianus*
Birds	Painted Bunting	*Passerina ciris*
Birds	Prothonotary Warbler	*Protonotaria citrea*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Rusty Blackbird	*Euphagus carolinus*
Birds	Scissor-tailed Flycatcher	*Tyrannus forficatus*
Birds	Smith's Longspur	*Calcarius pictus*
Birds	Sprague's Pipit	*Anthus spragueii*
Birds	Upland Sandpiper	*Bartramia longicauda*
Birds	Western Kingbird	*Tyrannus verticalis*
Birds	Yellow Rail	*Coturnicops noveboracensis*
Crustaceans	Ringed Crayfish	*Faxonius neglectus*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A nomia bee	*Nomia universitatis*
Insect	A scarab beetle	*Trox paulseni*
Insect	A sweat bee	*Agopostemon coloradensis*
Insect	Abbreviated Underwing	*Catocala abbreviatella*
Insect	Abberrant Cellophane Bee	*Colletes aberrans*
Insect	Arogos Skipper	*Atrytone arogos*
Insect	Bald-spot Sweat Bee	*Lasioglossum paraforbesii*
Insect	Bell's Roadside-Skipper	*Amblyscirtes belli*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Byssus Skipper	*Problema byssus*
Insect	Dotted Skipper	*Hesperia attalus attalus*
Insect	Maritime Sunflower Borer Moth	*Papaipema maritima*
Insect	Mottled Duskywing	*Erynnis martialis*
Insect	Occidental Digger Bee	*Anthophora occidentalis*
Insect	Ottoe Skipper	*Hesperia ottoe*
Insect	Prairie Mole Cricket	*Gryllotalpa major*
Insect	Regal Fritillary	*Speyeria idalia*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Whiteish Sweat Bee	*Agopostemon sericeus*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Isopod	Steeve’s Cave Isopod	*Caecidotea steevesi*
Mammals	Franklin’s Ground Squirrel	*Poliocitellus franklinii*

Tier 2 SGCN		
Mammals	Gray Fox	*Urocyon cinereoargenteus*
Mammals	Southern Bog Lemming	*Synaptomys cooperi*
Mammals	Southern Flying Squirrel	*Glaucomys volans*
Mammals	Tricolored Bat	*Perimyotis subflavus*
Plants	Bush's Poppy-mallow	*Callirhoe bushii*
Plants	Great Plains Ladies'-tresses	*Spiranthes magnicamporum*
Plants	Hancin's Dewberry	*Rubus hancinianus*
Plants	Missouri Mud-plantain	*Heteranthera missouriensis*
Plants	Narrowleaf Morning-glory	*Ipomoea shumardiana*
Plants	Oklahoma Phlox	*Phlox oklahomensis*
Plants	Osage Plains False Foxglove	*Agalinis densiflora*
Plants	Taper-tip Dodder	*Cuscuta attenuata*
Plants	Topeka Purple-coneflower	*Echinacea atrorubens*
Plants	Western Prairie White-fringed Orchid	*Platanthera praeclara*
Reptiles	Eastern Hog-nosed Snake	*Heterdon platirhinos*
Reptiles	Glossy Snake	*Arizona elegans*
Reptiles	Ground-snake	*Sonora semiannulata*
Reptiles	Lesser Easrless Lizard	*Holbrookia maculata*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Rough Earthsnake	*Haldea striatula*
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*
Reptiles	Timber Rattlesnake	*Crotalus horridus*
Turtles	Smooth Softshell	*Apalone mutica*

2. Chautauqua Hills



The Chautauqua Hills Ecological Focus Area is located in southeast Kansas just east of the Flint Hills. The area is the Kansas portion of a larger area often referred to as the Cross Timbers that extends south through Oklahoma and into Texas. The Chautauqua Hills are rolling uplands with sandstone bedrock underneath. Blackjack and post oaks are interspersed throughout the tallgrass prairie habitat. An open savannah landscape was probably more common before fire suppression occurred and may have kept the oak stands from becoming dense.

EFA Development

This EFA is defined by the Physiographic Province boundary (Kansas Geological Survey 1997) on the east and the Level 3 ecoregion boundary on the west.

Conservation Issues

Residential and commercial development

*The increase of urban, suburban and exurban/rural homes is reducing and fragmenting native habitat.

Agriculture

*Inappropriate grazing practices on native grasslands decreases habitat heterogeneity and can change vegetative community composition

*Conversion of grasslands to other uses causes fragmentation, destroys native flora, and decreases habitat availability

Natural system modifications

*Management of floodplain water levels by diking

*Improperly applied use of prescribed fire (*i.e.* prominence of annual burning is detrimental for some grassland nesting birds while infrequent burning causes prairie to transition to shrubland or forest)

Invasive and other problematic species and genes

*Spread of woody numerous invasive plant species, including: Eastern Red Cedar, Osage Orange, Sericea lespedeza (*Lespedeza cuneata*) and Old World Bluestems

*Invasive insect pests damaging habitats

Pollution

*Pollution from point and non-point sources includes runoff of pesticides, fertilizers, and other chemicals

Biological resource use

*Lack of proper timber harvest and market for low quality species

Conservation Actions

Land/water protection

*Provide incentives to landowners to maintain, improve, enhance key grassland sites and wetlands, and reduce intensified agricultural practices

*****Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

*****Acquire water rights for wetlands as advisable and possible

Land/water management

*Promote the use of USDA Agriculture Conservation Easement Program and other conservation easement programs to reverse trend of conversion of grassland to cropland, targeting efforts toward habitat that is being or has been degraded

*Promote rangeland management tools, such as techniques for controlling invasive species, patch-burn-grazing, and drought management planning

*Develop an invasive species task force to create state invasive plant and animal management plans

*Provide incentives for landowners to conserve listed species on their property

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Continue disease monitoring (e.g. Chytrid Fungus, Ranavirus, White Nose Syndrome and other potential diseases, etc.)

*****Research and investigate best management practices to control invasive species (*e.g*. Sericea Lespedeza, Old World Bluestems, etc.)

*****Implement surveys to quantify current wetlands, and identify priority areas

External capacity building

*****Work with county zoning boards to implement well thought out planning procedures—especially on issues like wind farm construction or conversion of zoned land uses

*Develop partnerships to help private landowners conduct prescribed burns, providing education, equipment, expert advice and assistance

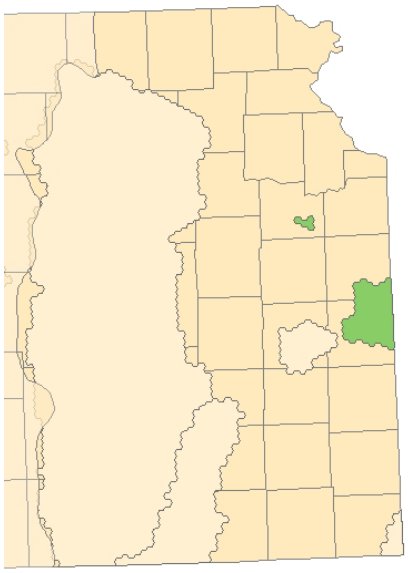
*Work with Kansas Dept. of Transportation to determine appropriate species to plant along roads

Species of Greatest Conservation Need

Tier 1 SGCN		
Gastropods	Delta Hydrobe	*Probythinella emarginata*
Gastropods	Slope Ambersnail	*Catinella wandae*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	American Burying Beetle	*Nicrophorus americanus*
Insect	Monarch	*Danaus plexippus*
Mammals	Eastern Spotted Skunk	*Spilogale putorius*
Tier 2 SGCN		
Amphibians	Crawfish Frog	*Lithobates areolatus*
Amphibians	Common Mudpuppy	*Necturus maculosus*
Amphipod	Kansas Well Amphipod	*Bactrurus hubrichti*
Arachnida	a trap door spider	*Ummidia beatula*
Birds	American Golden-Plover	*Pluvialis dominica*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	American White Pelican	*Pelecanus erythrorhynchos*
Birds	Bald Eagle	*Haliaeetus leucocephalus*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Buff-breasted Sandpiper	*Calidris subruficollis*
Birds	Chuck-will's-widow	*Antrostomus carolinensis*
Birds	Common Nighthawk	*Chordeiles minor*
Birds	Dickcissel	*Spiza americana*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Eastern Meadowlark	*Sturnella magna*
Birds	Eastern Wood-Pewee	*Contopus virens*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Prairie-Chicken	*Tympanuchus cupido*
Birds	Henslow's Sparrow	*Centronyx henslowii*
Birds	Kentucky Warbler	*Geothlypis formosa*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Northern Bobwhite	*Colinus virginianus*
Birds	Painted Bunting	*Passerina ciris*
Birds	Prothonotary Warbler	*Protonotaria citrea*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Rusty Blackbird	*Euphagus carolinus*
Birds	Smith's Longspur	*Calcarius pictus*
Birds	Yellow-throated Warbler	*Setophaga dominica*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A scarab beetle	*Trox paulseni*
Insect	Bell's Roadside-Skipper	*Amblyscirtes belli*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Byssus Skipper	*Problema byssus*
Insect	Dotted Skipper	*Hesperia attalus attalus*
Insect	Gray Petaltail	*Tachopteryx thoreyi*
Insect	Lichen Grasshopper	*Trimerotropis saxatilis*
Insect	Ozark Emerald	*Somatochlora ozarkensis*
Insect	Prairie Mole Cricket	*Gryllotalpa major*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Fulvous Harvest Mouse	*Reithrodontomys fulvescens*
Mammals	Gray Fox	*Urocyon cinereoargenteus*
Mammals	Southern Flying Squirrel	*Glaucomys volans*
Mammals	Texas Deermouse	*Peromyscus attwateri*
Plants	Buffalo Clover	*Trifolium reflexum*
Plants	Earleaf False Foxglove	*Agalinis auriculata*

Tier 2 SGCN		
Plants	Great Plains Ladies'-tresses	*Spiranthes magnicamporum*
Plants	Hancin's Dewberry	*Rubus hancinianus*
Plants	Kansas Arrowhead	*Sagittaria ambigua*
Plants	Oklahoma Phlox	*Phlox oklahomensis*
Plants	Pale False Foxglove	*Agalinis skinneriana*
Plants	Topeka Purple-coneflower	*Echinacea atrorubens*
Reptiles	Coal Skink	*Plestiodon anthracinus*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Ground-snake	*Sonora semiannulata*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*
Reptiles	Rough Earthsnake	*Haldea striatula*
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*
Reptiles	Timber Rattlesnake	*Crotalus horridus*

3. Eastern Forest



The Eastern Forest Ecological Focus Area is comprised of two areas in eastern Kansas; the Baldwin Woods section in Douglas County and the Marais des Cygnes section in Miami and Linn counties. Both sections occur within the Osage Cuestas physiographic province (Kansas Geological Survey 1997) and include isolated tallgrass prairie remnants, fragmented oak/hickory forests and oak savannah ecosystems; the Marais des Cygnes section also includes the Marais des Cygnes River and its associated floodplain and wetlands. The Baldwin Woods section includes over 1000 acres of priority deciduous forest habitat which are being actively managed and protected through Landscape Forest Stewardship planning and the Forest Legacy Program. These protection efforts capitalize on partnerships among many public and private entities. The Marais des Cygnes section includes La Cygne Wildlife Area and La Cygne Lake, Marais des Cygnes Wildlife Area, and Marais des Cygnes Wildlife Refuge. The Kansas Department of Wildlife and Parks and the U.S. Fish and Wildlife Service implement native tree plantings, invasive species removal, and prescribed fires to manage the woodland habitats. Common threats include invasive species, miss-management, and fragmentation of intact native woodlands.

EFA Development

This EFA captures high-quality forest habitat that occurs in areas that were forested prior to European settlement and that are in the range of forest-dependent Tier 1 species. To create the boundary of the Marais des Cygnes section we selected 2.5 km hexagons that intersect one of the following: Marais des Cygnes Wildlife Area or National Wildlife Refuge; locations of Tier 1 species; or forested areas at La Cygne Lake WA or along Big Sugar Creek. To create the Baldwin Woods section, we selected 2.5 km hexagons that intersect the historic forest polygon that contains the currently protected areas.

Conservation Issues

Residential and commercial development

*The increase of urban, suburban and exurban/rural homes is reducing and fragmenting forests

Agriculture

*Conversion of forest to agricultural purposes and inappropriate grazing practices in forested areas fragmented habitat and decreases its quality and quantity

*Conversion of forest to agricultural purposes creates fragmentation, decreases habitat quality and availability

Natural system modifications

*Floodplain hydrology has been modified by dikes and impoundments. Reduced flooding has allowed conversion to agriculture and changed ecological conditions for remaining floodplain forests

*Increased fire suppression or lack of well-planned fire management changes species dominance (fewer oaks) and forest structure (savanna has become very rare)

Invasive and other problematic species and genes

*Spread of invasive species affecting understory and canopy

* Invasive insect pests are damaging habitats

Pollution

*Pollution from point and non-point sources includes runoff of pesticides, fertilizers, and other chemicals

Biological resource use

*Lack of proper timber harvest and market for low quality species

Success Story – Collaboration with Private Landowners

Bill Sproul is a rancher in Chautauqua County who was presented the first Aldo Leopold Conservation Award in Kansas in 2015. He earned this honor due to his tireless efforts to treat the land he owns, manages, and leases as a community and not as a commodity. By community, Bill includes all native plants and wildlife plus people that work the land or consume products resulting from his labors. Bill encourages plant and wildlife surveys and research on the Sproul Ranch including plant transect sampling, livestock exclosures, and annual nesting bird surveys. In addition, Bill allows pollinator research, insect, reptile and amphibian surveys on the ranch. He does this to develop a better understanding of the entire biotic community.

Regarding the importance of wildlife community, Bill likes to use the lowly dung beetle as an example. This insect provides services to the ranching community by breaking up and redistributing cow patties on the ranch. By doing so, dung beetles are spreading fertilizer, assisting with rainfall infiltration into the soil profile, enhancing seed germination of native grasses, and breaking the horn fly cycle that develops in cow patties. Horn flies are a serious pest to grazing cattle and the dung beetle helps to keep them in check.

Bill has implemented, and is constantly evaluating, a patch burn grazing system on the Sproul Ranch. The burning of 1/3 of the pasture each year provides nesting cover for some grassland birds that are in national decline. Data from past Sproul Ranch bird surveys show that Northern Bobwhites have increased dramatically, are the third most detected bird species on the ranch, nearly as common as the abundant Dickcissel and Eastern Meadowlark. Even species considered rare are found on the Sproul Ranch and are probably benefiting from the patch-burn grazing regime. These include the Henslow's Sparrow and the American Burying Beetle.

Bill Sproul's curiosity about the wildlife community and his ability to communicate this to the outside world in his unique cowboy rancher way makes Bill a conservation spokesman and a fitting recipient of the first Aldo Leopold Conservation Award given in Kansas.

Conservation Actions

Land/water protection

*****Identify and conserve large forests tracts through landowner friendly methods, such as conservation forestry incentive programs and conservation easements. Identify opportunities to connect large forest tracts

*****Work with willing landowners to protect and maintain high-quality forest

Land/water management

*Promote proper forest management tools, such as techniques for controlling invasive species, patch burn grazing, timber stand improvement, and sustainable harvest

*Assess dike removal and other structural modifications needed to return floodplains to their natural hydrology

*Restore forests, especially in strategic situations such as in sensitive environments (steep slopes, riparian zones, etc.), to connect existing important forest tracts, or for public use

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Continue disease monitoring (White Nose Syndrome, Chytrid Fungus, Ranavirus, etc.)

*****Research and investigate best management practices to control invasive species (*e.g.* Sericea Lespedeza, Honeylocust, etc.)

*****Educate landowners, managers and natural resource managers in the proper use of pesticides and fire

*Promote the ecosystem services provided by forests and natural floodplains to municipalities to encourage habitat protection in urban areas

External capacity building

*****Work with county zoning boards to implement well thought out planning procedures—especially on issues like wind farm construction or conversion of zoned land uses

*Develop partnerships to help private landowners conduct prescribed burns, providing education, equipment, expert advice and assistance

*Work with Kansas Dept. of Transportation to determine appropriate management activities and species to plant along roads

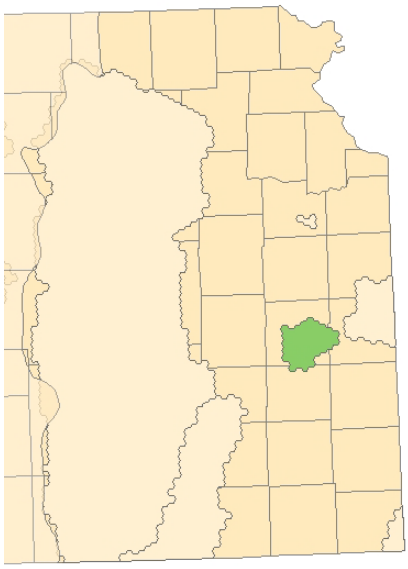
Species of Greatest Conservation Need

Tier 1 SGCN		
Amphibians	Eastern Newt	*Notophthalmus viridescens*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Monarch	*Danaus plexippus*
Plants	Running Buffalo Clover	*Trifolium stoloniferum*
Reptiles	Broad-headed Skink	*Plestiodon laticeps*
Turtles	Northern Map Turtle	*Graptemys geographica*

Tier 2 SGCN		
Amphibians	Crawfish Frog	*Lithobates areolatus*
Amphibians	Spring Peeper	*Pseudacris crucifer*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	American White Pelican	*Pelecanus erythrorhynchos*
Birds	Bald Eagle	*Haliaeetus leucocephalus*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Black-billed Cuckoo	*Coccyzus erythropthalmus*
Birds	Cerulean Warbler	*Setophaga cerulea*
Birds	Chuck-will's-widow	*Antrostomus carolinensis*

Tier 2 SGCN		
Birds	Dickcissel	*Spiza americana*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Eastern Meadowlark	*Sturnella magna*
Birds	Eastern Whip-poor-will	*Antrostomus vociferus*
Birds	Eastern Wood-Pewee	*Contopus virens*
Birds	Harris's Sparrow	*Zonotrichia querula*
Birds	Henslow's Sparrow	*Centronyx henslowii*
Birds	Kentucky Warbler	*Geothlypis formosa*
Birds	Least Bittern	*Ixobrychus exilis*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Northern Bobwhite	*Colinus virginianus*
Birds	Prothonotary Warbler	*Protonotaria citrea*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Rusty Blackbird	*Euphagus carolinus*
Birds	Scissor-tailed Flycatcher	*Tyrannus forficatus*
Birds	Yellow Rail	*Coturnicops noveboracensis*
Birds	Yellow-throated Warbler	*Setophaga dominica*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Insect	A scarab beetle	*Trox paulseni*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Franklin’s Ground Squirrel	*Poliocitellus franklinii*
Mammals	Gray Fox	*Urocyon cinereoargenteus*
Mammals	Southern Flying Squirrel	*Glaucomys volans*
Mammals	Tricolored Bat	*Perimyotis subflavus*
Reptiles	Coal Skink	*Plestiodon anthracinus*
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*
Reptiles	Red-bellied Snake	*Storeria occipitomaculata*
Reptiles	Smooth Earthsnake	*Virginia valeriae*
Reptiles	Timber Rattlesnake	*Crotalus horridus*
Turtles	Smooth Softshell	*Apalone mutica*

4. Eastern Tallgrass Prairies



The Eastern Tallgrass Prairie Ecological Focus Area is located in Anderson County in eastern Kansas in the Osage Cuestas physiographic province (Kansas Geological Survey 1997). It is dominated by unglaciated tallgrass prairie and is one of the largest tracts of unbroken prairie east of the Flint Hills. Livestock grazing is the primary land use (both native rangeland and tame pastures) along with some hay and crop production. The area is home to many grassland-dependent SGCN including the Greater Prairie-Chicken, Grasshopper Sparrow, Regal Fritillary, and Prairie Mole Cricket. Overgrazing of native pastures, conversion to tame/cool-season pastures, and indiscriminate herbicide application to native range and haymeadows are some of the dominant issues impacting biodiversity in the EFA.

EFA Development

This EFA is based on the delineation of the TNC portfolio site “Anderson County prairies” from the Flint Hills/Osage Cuestas Ecoregional Plan.

Conservation Issues

Agriculture

*Conversion of native prairie to other uses causes fragmentation, destroys native flora and decreases habitat availability

*Inappropriate grazing and haying practices on native ranglands decreases habitat heterogeneity and can change vegetative community composition

Natural system modifications

*****Improperly applied use of prescribed fire (*i.e.* prominence of annual burning is detrimental for some grassland nesting birds while infrequent burning causes prairie to transition to shrubland or forest)

*****Excessive run-off due to hydrological alteration, past erosion and wetland drainage

Invasive and other problematic species and genes

*Spread of invasive species, particularly Sericea Lespedeza, Eastern Red Cedar, and Osage Orange

Pollution

*Pollution from point and non-point sources includes runoff of pesticides, fertilizers, and other chemicals

Conservation Actions

Land/water protection

*****Work with willing donors/sellers to prevent further prairie fragmentation and expand connectivity corridors by using conservation easements and other tools

Land/water management

*Provides incentives to landowners for conservation management through State and USDA programs.

*Promote rangeland management tools, such as techniques for controlling invasive species, patch burn grazing, and drought management planning

*Develop an invasive species task force to create state invasive plant and animal management plans

Education and awareness

*Conduct wildlife surveys for data lacking species. Surveys should be rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Continue disease monitoring (e.g. Chytrid Fungus, Ranavirus, White Nose Syndrome and other potential diseases)

*Research and investigate best management practices to control invasive species (*e.g.* Sericea Lespedeza, Old World Bluestems, etc.)

External capacity building

*Work with county zoning boards to implement planning procedures—especially on issues like wind farm construction or conversion of zoned land uses

*Develop partnerships to help private landowners conduct prescribed burns, providing education, equipment, expert advice, and assistance

*Encourage formation of a local grazing association to address and inform land management issues.

*Continue to communicate and initiate planning efforts with public and private organizations that are involved with land management issues

Species of Greatest Conservation Need

Tier 1 SGCN		
Amphipod	Kansas Well Amphipod	*Bactrurus hubrichti*
Gastropods	Kaw Whitelip	*Webbhelix chadwicki*
Gastropods	Slope Ambersnail	*Catinella wandae*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	A leafcutter bee	*Megachile amica*

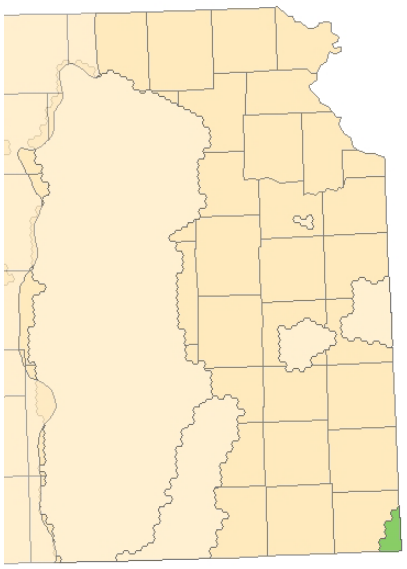
Insect	A leafcutter bee	*Megachile integra*
Insect	A Cave Obligate Isopod	*Caecidotea tridentata*
Insect	A Spur-throat Grasshopper	*Melanoplus beameri*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Arogos Skipper	*Atrytone arogos*
Insect	Fedor Digger Bee	*Anthophora fedorica*
Insect	Linda's Roadside Skipper	*Amblyscirtes linda*
Insect	Monarch	*Danaus plexippus*
Insect	Robust Sunflower Leafcutter Bee	*Megachile fortis*
Insect	Variable Cuckoo Bumble Bee	*Bombus variabilis*
Mammals	Eastern Spotted Skunk	*Spilogale putorius*
Plants	Mead's Milkweed	*Asclepias meadii*
Plants	Western Prairie White-fringed Orchid	*Platanthera praeclara*

Tier 2 SGCN

Amphibians	Crawfish Frog	*Lithobates areolata*
Amphipod	Clanton's Cave Amphipod	*Stygobromus clantoni*
Arachnida	a trap door spider	*Antrodiaetus lincolnianus*
Arachnida	a trap door spider	*Sphodros fitchi*
Arachnida	a trap door spider	*Ummidia beatula*
Birds	American Golden-Plover	*Pluvialis dominica*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Black-billed Cuckoo	*Coccyzus erythropthalmus*
Birds	Buff-breasted Sandpiper	*Calidris subruficollis*
Birds	Chuck-will's-widow	*Antrostomus carolinensis*
Birds	Dickcissel	*Spiza americana*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Eastern Meadowlark	*Sturnella magna*
Birds	Eastern Whip-poor-will	*Antrostomus vociferus*
Birds	Eastern Wood-Pewee	*Contopus virens*
Birds	Grasshopper Sparrow	*Ammodramus savannarum*
Birds	Greater Prairie-Chicken	*Tympanuchus cupido*
Birds	Harris's Sparrow	*Zonotrichia querula*
Birds	Henslow's Sparrow	*Centronyx henslowii*
Birds	Kentucky Warbler	*Geothlypis formosa*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Northern Bobwhite	*Colinus virginianus*
Birds	Painted Bunting	*Passerina ciris*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Rusty Blackbird	*Euphagus carolinus*
Birds	Scissor-tailed Flycatcher	*Tyrannus forficatus*
Birds	Smith's Longspur	*Calcarius pictus*
Birds	Upland Sandpiper	*Bartramia longicauda*
Gastropods	Domed Supercoil	*Paravitera significans*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Gastropods	Texas Liptooth	*Lininsa texasiana*
Gastropods	Oldfield Coil	*Lucilla inermis*
Gastropods	Ozark Threetooth	*Triodopsis neglecta*
Gastropods	Ozark Whitelip	*Neohelix divesta*
Insect	A leafcutter bee	*Megachile mucorosa*
Insect	A nomia bee	*Nomia universitatis*
Insect	A scarab beetle	*Onthophagus knausi*
Insect	A scarab beetle	*Phyllophaga albina*
Insect	A scarab beetle	*Trox paulseni*
Insect	An underwing moth	*Catocala frederici*
Insect	An underwing moth	*Catocala nuptialis*
Insect	Bald-spot Sweat Bee	*Lasioglossum paraforbesii*

Tier 2 SGCN		
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Byssus Skipper	*Problema byssus*
Insect	Columbine Duskywing	*Erynnis lucilius*
Insect	Delilah Underwing	*Catocala delilah*
Insect	Interrupted Cuckoo Nomad Bee	*Epeolis interruptus*
Insect	Low-ridged Pygmy Grasshopper	*Nomotettix parvus*
Insect	Maculated Flower Chafer	*Gnorimella maculosa*
Insect	Morrison's Bumble Bee	*Bombus morrisoni*
Insect	Mottled Duskywing	*Erynnis martialis*
Insect	Ottoe Skipper	*Hesperia ottoe*
Insect	Prairie Mole Cricket	*Gryllotalpa major*
Insect	Regal Fritillary	*Argynnis idalia*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Whiteish Sweat Bee	*Agopostemon sericeus*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Mammals	Gray Fox	*Urocyon cinereoargenteus*
Plants	Buffalo Clover	*Trifolium reflexum*
Plants	Bush's Poppy-mallow	*Callirhoe bushii*
Plants	Earleaf False Foxglove	*Agalinis auriculata*
Plants	Great Plains Ladies-tresses	*Spiroanthes magnicamporum*
Plants	Kansas Arrowhead	*Sagittaria ambigua*
Plants	Missouri Mud-plantain	*Heteranthera missouriensis*
Plants	Osage Plains False Foxglove	*Agalinis densiflora*
Plants	Pale False Foxglove	*Agalinis skinneriana*
Plants	Topeka Purple-coneflower	*Echinacea atrorubens*
Reptiles	Western Massasauga	*Sistrurus tergeminus*
Reptiles	Smooth Earthsnake	*Virginia valeriae*
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*
Reptiles	Timber Rattlesnake	*Crotalus horridus*

5. Ozark Plateau



The Ozark Plateau Ecological Focus Area represents the Kansas extent of a much larger physiographic province that extends into Missouri, Oklahoma, and Arkansas. Although this EFA is quite small (55 sq. miles) it contains flora and fauna not found anywhere else in the state. Its caves and fast flowing streams support species such as the Cave Salamander and Banded Sculpin.

EFA Development

This EFA follows the boundary of Ozark Plateau physiographic province (Kansas Biological Survey 1997).

Conservation Issues

Residential and commercial development

*The increase of urban, suburban and exurban/rural homes and development reduces and fragments native habitat

Natural system modifications

*Management of floodplain water levels by diking

Invasive and other problematic species and genes

*Spread of invasive plant species

*Invasive insect pests damage habitats

Pollution

*Pollution from point and non-point sources includes runoff of pesticides, fertilzers, and other chemicals

Conservation Actions

Land/water protection

*****Provide landowners incentives and education to properly maintain and manage wetlands

*****Work with willing donors/sellers to acquire/protect important habitats, especially wetlands, by using conservation easements and other tools

*Acquire water rights for wetlands as advisable and possible

Land/water management

*****Increase funding for USDA Agricultural Conservation Easement Program and other easement programs to reverse trend of conversion of grassland to cropland, targeting efforts toward habitat that is being or has been degraded

*Promote rangeland management tools, such as techniques for controlling invasive species, patch burn grazing, and drought management planning

*Develop an invasive species task force to create state invasive plant and animal management plans.

*****Increase funding for USDA Agricultural Conservation Easement Program and other easement programs to reverse trend of conversion of grassland to cropland, targeting efforts toward habitat that is being or has been degraded

*Promote rangeland management tools, such as techniques for controlling invasive species, patch burn grazing, and drought management planning

*Develop an invasive species task force to create state invasive plant and animal management plans

*Provide incentives for landowners to conserve listed species on their property

Education and awareness

*Conduct wildlife surveys for data-lacking species. Surveys should be rigorous, repeatable, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Continue disease monitoring (e.g. Chytrid Fungus, Ranavirus, White Nose Syndrome and other potential diseases, etc.)

*****Research and investigate best management practices to control invasive species (*e.g.* Sericea Lespedeza, Old World Bluestems, etc.)

*****Implement surveys to quantify current wetlands, and identify priority areas

External capacity building

*****Work with county zoning boards to implement well thought out planning procedures—especially on issues like wind farm construction or conversion of zoned land uses.

*Develop partnerships to help private landowners conduct prescribed burns, providing education, equipment, expert advice and assistance

*Work with Kansas Dept. of Transportation to determine appropriate species to plant along roads

Species of Greatest Conservation Need

Tier 1 SGCN		
Amphibians	Cave Salamander	*Eurycea lucifuga*
Amphibians	Eastern Narrowmouth Toad	*Gastrophryne carolinensis*
Amphibians	Eastern Newt	*Notophthalmus viridescens*
Amphibians	Green Frog	*Lithobates clamitans*
Amphibians	Grotto Salamander	*Eurycea spelaea*
Amphibians	Long-tailed Salamander	*Eurycea longicauda*
Gastropods	Sharp Hornsnail	*Pleurocera acuta*
Gastropods	Slope Ambersnail	*Catinella wandae*
Gastropods	Xeric Ambersnail	*Succinea vaginacontorta*
Insect	American Bumble Bee	*Bombus pensylvanicus*
Insect	Monarch	*Danaus plexippus*
Insect	Spring Plains Groundwater Isopod	*Caecidotea simulator*
Plants	Kansas Arrowhead	*Sagittaria ambigua*
Plants	Oklahoma Grass-pink	*Calopogon oklahomensis*
Reptiles	Broad-headed Skink	*Plestiodon laticeps*
Turtles	Northern Map Turtle	*Graptemys geographica*

Tier 2 SGCN		
Amphibians	Crawfish Frog	*Lithobates areolatus*
Amphibians	Spring Peeper	*Pseudacris crucifer*
Birds	American Tree Sparrow	*Spizella arborea*
Birds	Baltimore Oriole	*Icterus galbula*
Birds	Bell's Vireo	*Vireo bellii*
Birds	Chuck-will's-widow	*Antrostomus carolinensis*
Birds	Dickcissel	*Spiza americana*
Birds	Eastern Kingbird	*Tyrannus tyrannus*
Birds	Eastern Meadowlark	*Sturnella magna*
Birds	Eastern Whip-poor-will	*Antrostomus vociferus*
Birds	Eastern Wood-Pewee	*Contopus virens*
Birds	Harris's Sparrow	*Zonotrichia querula*
Birds	Kentucky Warbler	*Geothlypis formosa*
Birds	Lark Sparrow	*Chondestes grammacus*
Birds	Loggerhead Shrike	*Lanius ludovicianus*
Birds	Northern Bobwhite	*Colinus virginianus*
Birds	Prothonotary Warbler	*Protonotaria citrea*
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Birds	Rusty Blackbird	*Euphagus carolinus*
Birds	Scissor-tailed Flycatcher	*Tyrannus forficatus*
Birds	Yellow-throated Warbler	*Setophaga dominica*
Crustaceans	Neosho Midget Crayfish	*Faxonius macrus*
Crustaceans	Ringed Crayfish	*Faxonius neglectus*
Crustaceans	White River Crawfish	*Procambarus acutus*
Gastropods	Mudbank Ambersnail	*Catinella vagans*
Gastropods	Ozark Threetooth	*Triodopsis neglecta*
Insect	A scarab beetle	*Trox paulseni*
Insect	Bell's Roadside-Skipper	*Amblyscirtes belli*
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*
Insect	Mottled Duskywing	*Erynnis martialis*
Insect	Southern Plains Bumble Bee	*Bombus fraternus*
Insect	Steeve’s Cave Isopod	*Caecidotea steevesi*
Insect	Yellow Bumble Bee	*Bombus fervidus*
Isopods	Steeve's Cave Isopod	Caecidotea steevesi
Mammals	Fulvous Harvest Mouse	*Reithrodontomys fulvescens*
Mammals	Gray Fox	*Urocyon cinereoargenteus*
Mammals	Southern Flying Squirrel	*Glaucomys volans*

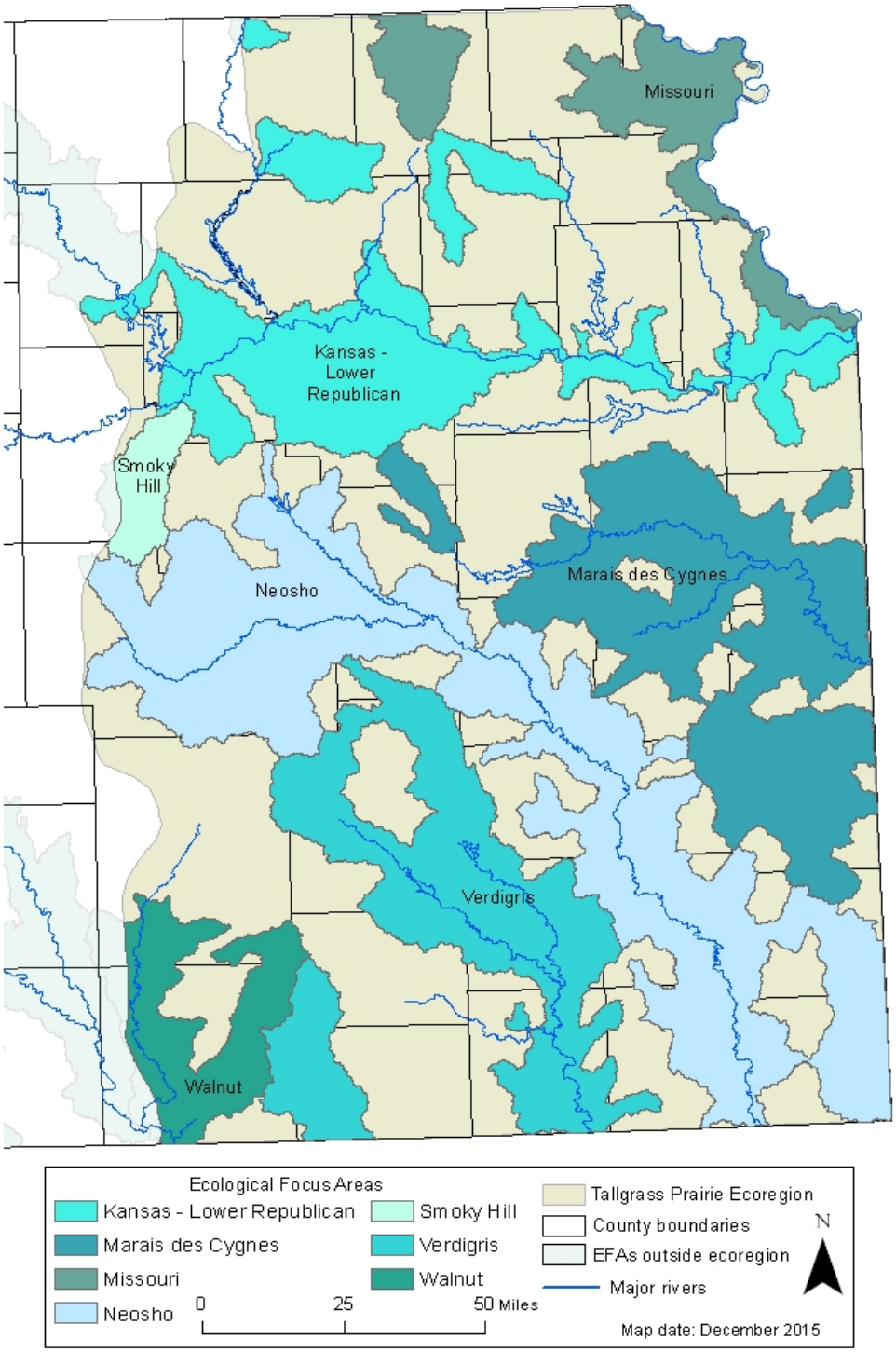
Tier 2 SGCN		
Mammals	Tricolored Bat	*Perimyotis subflavus*
Plants	Buffalo Clover	*Trifolium reflexum*
Plants	Delta Bulrush	*Schoenoplectus deltarum*
Plants	Royal Catchfly	*Silene regia*
Reptiles	Coal Skink	*Plestiodon anthracinus*
Reptiles	Red-bellied Snake	*Storeria occipitomaculata*
Reptiles	Rough Earthsnake	*Haldea striatula*

Success Story – Collaboration with Conservation Partners

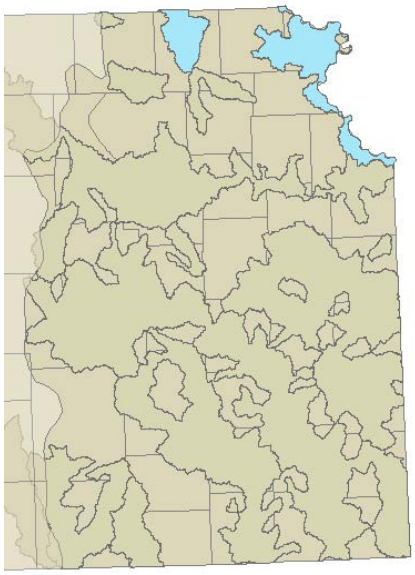
The Rabbitsfoot mussel is a Species of Greatest Conservation Need in Oklahoma's wildlife action plan and a species recently listed as a threatened species by the U.S. Fish and Wildlife Service. The Oklahoma Department of Wildlife Conservation has partnered with the Kansas Department of Wildlife and Parks, Oklahoma State University, and Missouri State University to re-establish the Rabbitsfoot in the upper Verdigris River. The recent discovery of a reproducing Rabbitsfoot population in the Oklahoma portion of the Verdigris River provides an opportunity to collect juvenile mussels in Oklahoma to raise and release in Kansas. Restoring the Rabbitsfoot mussel will benefit the health of wildlife and people and may prevent the need to keep this species federally listed as threatened.

Aquatic EFAs

Figure 10. Aquatic Ecological Focus Areas of the Tallgrass Prairie Conservation Region. These EFAs represent landscapes where conservation actions can be applied for maximum benefit to Kansas wildlife. Each EFA includes a suite of SGCN and priority habitats.



1. Missouri River



The Missouri River Ecological Focus Area is composed of the Missouri River, which forms the northeastern border of the state, and the Nemaha River system, which flows north out of Nemaha County into Nebraska where it enters the Missouri River. The substrate of the main stem Missouri River is predominately sand but silt, clay, and gravel are common. This EFA is located in portions of the following ecoregions: Loess and Glacial Drift Hills, Nebraska/Kansas Loess Hills, Missouri Alluvial Plains, and Osage Cuestas. Formerly, the landscape in this area was Tallgrass Prairie but much of the area has been converted to corn agriculture which has led to sedimentation and increased nitrogen loads in these aquatic systems. Additionally, much of the Missouri River bordering Kansas has been channelized and impacted by the urbanization of Kansas City and surrounding communities. The Missouri River contains numerous fish SGCN and the Nemaha River system is the only area of the state where the Western Blacknose Dace occurs.

Conservation Issues

Residential and commercial development

*Urbanization and impervious surfaces reduce water infiltration and increase runoff

*Storm water management in urban areas often results in channelized, concrete-lined streams that lead to intensified flooding events downstream

*Commercial barge shipping practices impact the hydrology of these rivers

Agriculture

*Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation, and nutrient issues

Natural system modifications

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

*Dredging the Missouri River for commercial barge traffic and flood capacity impacts bed and bank stability, riparian areas, and tributaries

*The management strategies of other states in the watershed impact this habitat

*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction

Invasive and other problematic species and genes

*Introduced invasive species such as Bighead and Silver Carp negatively impact native aquatic species and habitat

Pollution

*Runoff of pesticides and fertilizers have negative impacts on the flora and fauna

*Urban runoff contains industrial and lawn chemicals that impact water quality

*The outflows from sewage plants of cities and towns impact water quality

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage

*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors
*Acquire riparian corridor acreages through willing sellers/donors
*Acquire water rights as advisable and possible
*Encourage conservation easements on high quality habitats

Land/water management

*Encourage use of permeable asphalt or pavement and Low Impact Development practices to improve storm water management by increasing infiltration of water and decrease/replace impervious surfaces
*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species
*Promote improved water quality standards
*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes
*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats
*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control, and bank stabilization
*Encourage engineering techniques that promote high habitat diversity
*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management
*Expand cooperative programs that supply technical and direct assistance for non-native species removal
*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species
*Promote mechanical removal of non-native, invasive plant species by utilizing local habitat partnerships
*Promote restoration of stream channels through natural stream design
*Promote restoration projects that increase floodplain connectivity in incised streams
*Promote conservation and restoration of oxbow habitats
*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage
*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts
*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Research and develop engineering techniques for effective river and stream management
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Investigate contaminant effects on reptilian and amphibian populations
*Continue disease monitoring (Chytrid Fungus, Ranavirus, etc.)
*Educate the public regarding the importance of preventing the spread of invasive species
*Inventory perched culverts and other structures that are preventing aquatic organism passage
*Educate public and developers on the effects of impervious surfaces and the potential for Low Impact Development
*Educate public about eco-friendly lawn care and effects of lawn chemicals on aquatic systems
*Study impacts of Bighead Carp and Silver Carp on native species

External capacity building

*Promote sound water quality standards and their enforcement through education and continued coordination with the Kansas Department of Health and Environment

*Improve the coordination of mitigation activities with the Army Corps of Engineers

*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage

*Promote the use of conservation culverts that retain natural stream bed features

*Work with the county zoning boards to implement good urban planning procedures

*Work with city and county public works to improve storm water management

*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

Livelihood, economic and other incentives

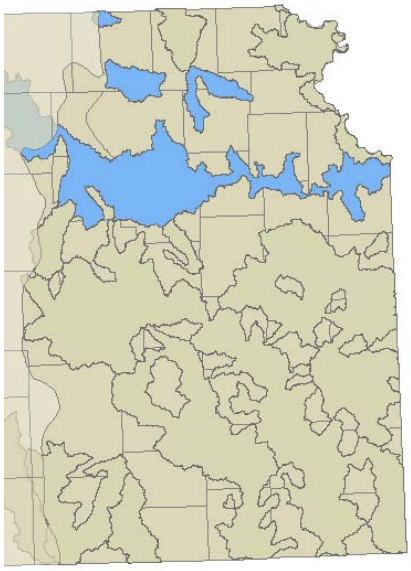
*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats

*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Fish	Flathead Chub	*Platygobio gracilis*
Fish	Pallid Sturgeon	*Scaphirhynchus albus*
Fish	Plains Minnow	*Hybognathus placitus*
Fish	Shoal Chub	*Macrhybopsis hyostoma*
Fish	Sicklefin Chub	*Macrhybopsis meeki*
Fish	Silver Chub	*Macrhybopsis storeriana*
Fish	Sturgeon Chub	*Macrhybopsis gelida*
Fish	Western Silvery Minnow	*Hybognathus argyritis*
Insect	Whiting's Flat-headed Mayfly	*Heptagenia whitingi*
Tier 2 SGCN		
Fish	American Eel	*Anguilla rostrata*
Fish	Black Buffalo	*Ictiobus niger*
Fish	Blue Sucker	*Cycleptus elongatus*
Fish	Brassy Minnow	*Hybognathus hankinsoni*
Fish	Johnny Darter	*Etheostoma nigrum*
Fish	Quillback	*Carpiodes cyprinus*
Fish	River Shiner	*Notropis blennius*
Fish	Shorthead Redhorse	*Moxostoma macrolepidotum*
Fish	Shovelnose Sturgeon	*Scaphirhynchus platorynchus*
Fish	Silverband Shiner	*Notropis shumardi*
Fish	Spotted Gar	*Lepisosteus oculatus*
Fish	Stonecat	*Noturus flavus*
Fish	White Sucker	*Catostomus commersonii*
Mussels	Creeper	*Strophitus undulatus*
Mussels	Fatmucket	*Lampsilis siliquoidea*
Mussels	Lilliput	*Toxolasma parvum*
Mussels	Pink Heelsplitter	*Potamilus alatus*
Mussels	Pondhorn	*Uniomerus tetralasmus*
Mussels	Spectaclecase	*Cumberlandia monodonta*
Mussels	Wabash Pigtoe	*Fusconaia flava*
Mussels	Yellow Sandshell	*Lampsilis teres*

2. Kansas - Lower Republican



The Kansas - Lower Republican Ecological Focus Area is located from north-central to northeast Kansas. The Lower Republican River flows south from Nebraska until it joins the Smoky Hill River in Geary County to form the Kansas River. The majority of streams in this system have sand substrates. The portions disjunct from the main stem Lower Republican and Kansas rivers include parts of the Big Blue, Vermillion, and Delaware rivers and Soldier Creek. This EFA is broadly distributed among the following ecoregions: Rolling Plains and Breaks, Smoky Hills, Flint Hills, Loess and Glacial Drift Hills, and Osage Cuestas. Historically, the landscape ranged from Mixed Grass Prairie in the west to Tallgrass Prairie in the east, but much of the area has been converted to agriculture. Environmental concerns associated with agriculture in this region include high levels of pesticide and nutrient contaminants and sedimentation. Large reservoirs fragmenting the basin include Lovewell, Milford, Tuttle Creek, Perry, and Clinton reservoirs. Additionally, channelization and urbanization of streams near Manhattan have led to increased flooding issues. The Kansas – Lower Republican EFA contains habitat for several SGCN fish species.

Conservation Issues

Residential and commercial development

*Urbanization and impervious surfaces reduce water infiltration and increase runoff

*Storm water management in urban areas often results in channelized, concrete-lined streams that lead to intensified flooding events downstream

Agriculture

*****Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation, and nutrient issues

*Intense grazing regimes can degrade riparian habitats

*Livestock access to streams can increase nutrient input

Natural system modifications

*Sand dredging in the Kansas River impacts the river channel, riparian area, and tributaries

*The use of water from streams for irrigation, industries and municipalities is lowering the water level

* Structures that alter the water from its natural drainage are impacting natural hydrology of streams

*Bank destabilization (due to riparian management, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat.

*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Introduced species, such as Bighead and Silver Carp, negatively impact native aquatic species and habitat.

*Introduced predatory species can impact populations of native aquatic species

Pollution

*Runoff of pesticides and fertilizers have negative impacts on the flora and fauna

*Urban runoff contains industrial and lawn chemicals that impact water quality

*The outflows from sewage plants of cities and towns impact water quality

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage

*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors

*Acquire riparian corridor acreages through willing sellers/donors

*Acquire water rights as advisable and possible

*Encourage conservation easements on high quality habitats

Land/water management

*Encourage sand acquisition from the Kansas River valley and/or reservoirs to reduce impacts to the river channel

*Encourage use of permeable asphalt or pavement and Low Impact Development practices to improve storm water management by increasing infiltration of water and decreasing/replacing impervious surfaces

*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species

*Promote improved water quality standards

*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes

*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats, allowing agroforestry operations in the area farthest from the active channel

*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control, and bank stabilization

*Encourage engineering techniques that promote high habitat diversity

*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management

*Maximize habitat diversity for wildlife species

*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species

*Promote restoration of stream channels through natural stream design

*Promote restoration projects that increase floodplain connectivity in incised streams

*Promote conservation and restoration of oxbow habitats

*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage

*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit landowners as well as stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts

*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics

*Investigate contaminant effects on reptilian and amphibian populations

*Continued disease monitoring (Chytrid Fungus, Ranavirus, etc.)

*Inform landowners and managers of and promote best management practices

*Research and develop engineering techniques for effective river and stream management

*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Educate the public regarding the importance of preventing the spread of invasive species
*Study the impact of Bighead Carp, Silver Carp, and other introduced species on native species
*Inventory perched culverts and other structures that are preventing aquatic organism passage
*Educate public and developers on the effects of impervious surfaces and the potential for Low Impact Development
*Educate public about eco-friendly lawn care and effects of lawn chemicals on aquatic systems

External capacity building

*Promote and encourage formation of coalitions/associations such as The Comanche Pool Prairie Resource Foundation
*Work with other states and federal agencies to gain assurance that no species are being transported in Kansas
*Promote sound water quality standards and their enforcement through education and continued coordination with the Kansas Department of Health and Environment
*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage
*Promote the use of conservation culverts that retain natural stream bed features
*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat
*Work with the county zoning boards to implement good urban planning procedures
*Work with city and county public works to improve storm water management

Livelihood, economic and other incentives

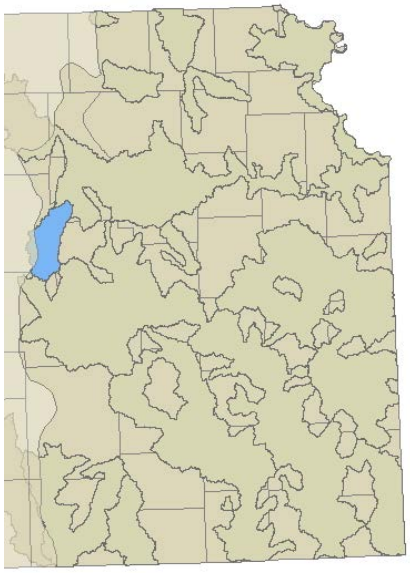
*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Fish	Blackside Darter	*Percina maculata*
Fish	Pallid Sturgeon	*Scaphirhynchus albus*
Fish	Plains Minnow	*Hybognathus placitus*
Fish	Shoal Chub	*Macrhybopsis hyostoma*
Fish	Sicklefin Chub	*Macrhybopsis meeki*
Fish	Silver Chub	*Macrhybopsis storeriana*
Fish	Sturgeon Chub	*Macrhybopsis gelida*
Fish	Topeka Shiner	*Notropis topeka*
Fish	Western Silvery Minnow	*Hybognathus argyritis*
Insect	A mayfly	*Apobaetis lakota*
Insect	A mayfly	*Heterocloeon grande*
Insect	A small minnow mayfly	*Plauditus texanus*
Insect	Konza Prairie Mayfly	*Leptophlebia konza*
Mussels	Snuffbox	*Epioblasma triquetra*
Plants	Narrowleaf Morning-glory	*Ipomoea shumardiana*
Tier 2 SGCN		
Fish	American Eel	*Anguilla rostrata*
Fish	Black Buffalo	*Ictiobus niger*
Fish	Blue Sucker	*Cycleptus elongatus*
Fish	Brassy Minnow	*Hybognathus hankinsoni*
Fish	Cardinal Shiner	*Luxilus cardinalis*

Tier 2 SGCN		
Fish	Chestnut Lamprey	*Ichthyomyzon castaneus*
Fish	Common Shiner	*Luxilus cornutus*
Fish	Golden Redhorse	*Moxostoma erythrurum*
Fish	Highfin Carpsucker	*Carpiodes velifer*
Fish	Johnny Darter	*Etheostoma nigrum*
Fish	Lake Sturgeon	*Acipenser fulvescens*
Fish	Northern Plains Killifish	*Fundulus kansae*
Fish	Orangethroat Darter	*Etheostoma spectabile*
Fish	Ozark Logperch	*Percina caprodes fulvitaenia*
Fish	Paddlefish	*Polyodon spathula*
Fish	Quillback	*Carpiodes cyprinus*
Fish	River Redhorse	*Moxostoma carinatum*
Fish	River Shiner	*Notropis blennius*
Fish	Shorthead Redhorse	*Moxostoma macrolepidotum*
Fish	Shovelnose Sturgeon	*Scaphirhynchus platorynchus*
Fish	Slender Madtom	*Noturus exilis*
Fish	Slenderhead Darter	*Percina phoxocephala*
Fish	Southern Redbelly Dace	*Chrosomus erythrogaster*
Fish	Spotfin Shiner	*Cyprinella spiloptera*
Fish	Stonecat	*Noturus flavus*
Fish	White Sucker	*Catostomus commersonii*
Insect	A longhorned caddisfly	*Ceraclea spongillovorax*
Insect	A sand-filtering mayfly	*Homoeoneuria ammophilasmo*
Insect	Wallace's Deepwater Mayfly	*Spinadis simplex*
Insect	Rock Island Springfly	*Isogenoides varians*
Mussels	Creeper	*Strophitus undulatus*
Mussels	Fatmucket	*Lampsilis siliquoidea*
Mussels	Fawnsfoot	*Truncilla donaciformis*
Mussels	Lilliput	*Toxolasma parvum*
Mussels	Pink Heelsplitter	*Potamilus alatus*
Mussels	Plain Pocketbook	*Lampsilis cardium*
Mussels	Pondhorn	*Uniomerus tetralasmus*
Mussels	Wabash Pigtoe	*Fusconaia flava*
Mussels	Yellow Sandshell	*Lampsilis teres*
Plants	Missouri Mud-plantain	*Heteranthera missouriensis*
Turtles	Smooth Softshell	*Apalone mutica*

3. Smoky Hill River



The Smoky Hill River Ecological Focus Area occupies a small, downstream portion of the Smoky Hill-Saline River Basin where the Smoky Hill and Republic rivers join to form the Kansas River. Substrates in this system are predominately sand-silt. Most of the EFA occurs in the Flint Hills ecoregion, but a small portion lies within the Smoky Hills. The landscape of the area is predominately Tallgrass Prairie, with some Mixed Grass Prairie in the west. Impacts to the Smoky Hill River EFA are mostly agricultural, with high levels of nutrient and oxygen demanding pollutants common. Farther upstream in the basin, oil and gas development is common, but to a lesser degree within the EFA. The Smoky Hill River EFA contains a few SGCN, but the most notable is the Topeka Shiner.

Conservation Issues

Agriculture

*Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation, and nutrient issues

*Intense grazing regimes can degrade riparian habitats

*Livestock access to streams can increase nutrient input

*Fisheries management, as it relates to stocking game fish, can be detrimental to native species

Natural system modifications

*Use of ground water and surface water from rivers and streams for irrigation is lowering the water level, and as a result many miles of stream are drying

*Structures that alter the water from its natural drainage are impacting natural hydrology of streams

*Bank destabilization (due to riparian management, stream incision, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat

*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Introduced species negatively impact native aquatic species and habitat (i.e Zebra Mussels)

*Introduced predatory species can impact populations of native aquatic species

Pollution

*Runoff of pesticides and fertilizers have negative impacts on the flora and fauna

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage

*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors

*Acquire riparian corridor acreages through willing sellers/donors

*Acquire water rights as advisable and possible

*Encourage conservation easements on high quality habitats

Land/water management

*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes

*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats

*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control, and bank stabilization

*Encourage engineering techniques that promote high habitat diversity

*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management

*Expand cooperative programs that supply technical and direct assistance for non-native species removal

*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species

*Promote mechanical removal of non-native, invasive plant species by utilizing local habitat partnerships
*Promote restoration of stream channels through natural stream design
*Promote restoration projects that increase floodplain connectivity in incised streams
*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage
*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species
*Promote improved water quality standards
*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts
*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Inform landowners and managers of and promote best management practices
*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Continue disease monitoring (Chytrid Fungus, Ranavirus, etc.)
*Investigate contaminant effects on reptilian and amphibian populations
*Research and develop engineering techniques for effective river and stream management
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Study the impact of introduced species on native species
*Educate the public regarding the importance of preventing the spread of invasive species
*Inventory perched culverts and other structures that are preventing aquatic organism passage

External capacity building

*Promote sound water quality standards and their enforcement through education and continued coordination with the Kansas Department of Health and Environment
*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage
*Promote the use of conservation culverts that retain natural stream bed features
*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

Livelihood, economic and other incentives

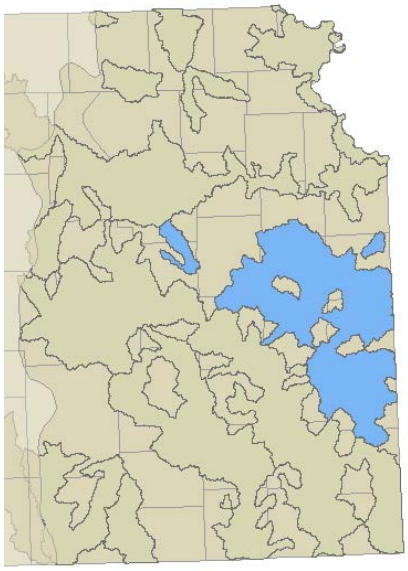
*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Fish	Topeka Shiner	*Notropis topeka*
Tier 2 SGCN		
Fish	Common Shiner	*Luxilus cornutus*
Fish	Johnny Darter	*Etheostoma nigrum*
Fish	Orangethroat Darter	*Etheostoma spectabile*
Fish	Ozark Logperch	*Percina caprodes fulvitaenia*
Fish	Shorthead Redhorse	*Moxostoma macrolepidotum*

Tier 2 SGCN		
Fish	Slender Madtom	*Noturus exilis*
Fish	Southern Redbelly Dace	*Chrosomus erythrogaster*
Fish	Stonecat	*Noturus flavus*
Fish	White Sucker	*Catostomus commersonii*
Insect	A sand-filtering mayfly	*Homoeoneuria ammophila*
Mussels	Creeper	*Strophitus undulatus*
Mussels	Pink Heelsplitter	*Potamilus alatus*
Mussels	Pondhorn	*Uniomerus tetralasmus*
Mussels	Wabash Pigtoe	*Fusconaia flava*

4. Marais des Cygnes



The Marais des Cygnes Ecological Focus Area is located in east-central and southeast Kansas. The Marmaton and Little Osage rivers join the Marais des Cygnes River in Missouri, but make up a considerable portion of the watershed in Kansas. Stream substrates in this system are mostly gravel. Most of the Marais des Cygnes EFA occurs in the Osage Cuestas and Wooded Osage Plains ecoregions, but small portions lie within the Flint Hills and Cherokee Plains. The landscape of the area ranges from a mosaic of Tallgrass Prairie and Oak-Hickory Forest in the west, to dense woodlands in the east. One of the most prevalent impacts in this EFA is fragmentation of river systems due to large reservoirs (Melvern, Pomona, and Hillsdale) and heavy construction of watershed impoundments that continues today. Agricultural inputs have also led to high loads of nutrient and oxygen demanding pollutants. The Marais des Cygnes EFA contains several SGCN species including fish, mussels, and herpetofauna.

Conservation Issues

Agriculture

*Land management practices within the watershed are impacting water quality

*Livestock access to streams can increase nutrient input

*Fisheries management, as it relates to stocking game fish, can be detrimental to native species

Natural system modifications

*Dams and impoundments built for flood control impede aquatic organism movement and reproduction

*Structures that alter the water from its natural drainage are impacting natural hydrology of streams

*Bank destabilization (due to riparian management, stream incision, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Introduced species, such as Zebra Mussels, negatively impact native aquatic species and habitat

Pollution

*Runoff of pesticides and fertilizers have negative impacts on the flora and fauna

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage

*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors
*Acquire riparian corridor acreages through willing sellers/donors
*Acquire water rights as advisable and possible
*Encourage conservation easements on high quality habitats

Land/water management

*Promote removal of aging watershed dams to increase stream connectivity
*Promote alternatives to watershed impoundments for flood control such as off-channel wetlands, high quality riparian buffers, etc.
*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species
*Promote improved water quality standards
*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes
*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats, allowing agroforestry operations in the area farthest from the active channel
*Encourage engineering techniques that promote high habitat diversity
*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management
*Expand cooperative programs that supply technical and direct assistance for non-native species removal
*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species
*Promote mechanical removal of non-native, invasive plant species by utilizing local habitat partnerships
*Promote restoration of stream channels through natural stream design
*Promote restoration projects that increase floodplain connectivity in incised streams
*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage
*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts
*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Study the effects of removing watershed impoundments and reservoirs
*Educate landowners on the benefits of natural stream restoration and wetland creation for flood control
*Research and develop engineering techniques for effective river and stream management
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Inform landowners and managers of and promote best management practices
*Study the impact of introduced species on native species
*Conduct wildlife surveys. Surveys should be rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Investigate contaminant effects on reptilian and amphibian populations
*Continue disease monitoring (Chytrid Fungus, Ranavirus, etc.)

*Educate the public regarding the importance of preventing the spread of invasive species
*Inventory perched culverts and other structures that are preventing aquatic organism passage

External capacity building

*Promote sound water quality standards and their enforcement through education and continued coordination with the Kansas Department of Health and Environment
*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage
*Work with Watershed Management Districts to update and improve Watershed Management Plans to include ecologically sound flood control practices like off-channel wetlands
*Promote the use of conservation culverts that retain natural stream bed features
*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

Livelihood, economic and other incentives

*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife
*Encourage and incentivize use of flood control practices that do not fragment stream habitat such as creating off-channel wetlands, high quality riparian areas, etc.

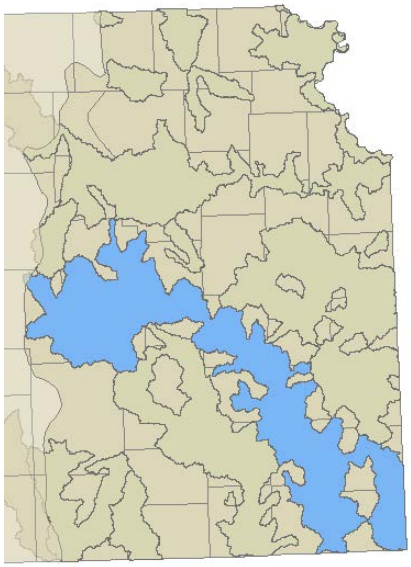
Species of Greatest Conservation Need

Tier 1 SGCN		
Amphibians	Spring Peeper	*Pseudacris crucifer*
Fish	Hornyhead Chub	*Nocomis biguttatus*
Gastropods	Sharp Hornsnail	*Campeloma crassulum*
Mussels	Butterfly	*Ellipsaria lineolata*
Mussels	Flat Floater	*Utterbackiana suborbiculata*
Mussels	Flutedshell	*Lasmigona costata*
Mussels	Mucket	*Actinonaias ligamentina*
Mussels	Rock-Pocketbook	*Arcidens confragosus*
Mussels	Snuffbox	*Epioblasma triquetra*
Plants	Kansas Arrowhead	*Sagittaria ambigua*
Turtles	Northern Map Turtle	*Graptemys geographica*

Tier 2 SGCN		
Amphibians	Common Mudpuppy	*Necturus maculosus*
Fish	Black Buffalo	*Ictiobus niger*
Fish	Fantail Darter	*Etheostoma flabellare*
Fish	Freckled Madtom	*Noturus nocturnus*
Fish	Golden Redhorse	*Moxostoma erythrurum*
Fish	Greenside Darter	*Etheostoma blennioides*
Fish	Johnny Darter	*Etheostoma nigrum*
Fish	Orangethroat Darter	*Etheostoma spectabile*
Fish	Ozark Logperch	*Percina caprodes fulvitaenia*
Fish	Paddlefish	*Polyodon spathula*
Fish	Pealip Redhorse	*Moxostoma pisolabrum*
Fish	Quillback	*Carpiodes cyprinus*
Fish	Shorthead Redhorse	*Moxostoma macrolepidotum*
Fish	Slender Madtom	*Noturus exilis*
Fish	Slenderhead Darter	*Percina phoxocephala*
Fish	Spotted Gar	*Lepisosteus oculatus*
Fish	Spotted Sucker	*Minytrema melanops*
Fish	Stonecat	*Noturus flavus*
Fish	Warmouth	*Lepomis gulosus*

Tier 2 SGCN		
Fish	White Sucker	*Catostomus commersonii*
Insect	A microcaddisfly	*Neotrichia falca*
Insect	A Prongill Mayfly	*Paraleptophlebia calcarica*
Mussels	Creeper	*Strophitus undulatus*
Mussels	Deertoe	*Truncilla truncata*
Mussels	Fatmucket	*Lampsilis siliquoidea*
Mussels	Fawnsfoot	*Truncilla donaciformis*
Mussels	Lilliput	*Toxolasma parvum*
Mussels	Pink Heelsplitter	*Potamilus alatus*
Mussels	Plain Pocketbook	*Lampsilis cardium*
Mussels	Pondhorn	*Uniomerus tetralasmus*
Mussels	Purple Wartyback	*Cyclonaias tuberculata*
Mussels	Round Pigtoe	*Pleurobema sintoxia*
Mussels	Spike	*Eurynia dilatata*
Mussels	Wabash Pigtoe	*Fusconaia flava*
Mussels	Wartyback	*Quadrula nodulata*
Mussels	Washboard	*Megalonaias nervosa*
Mussels	Yellow Sandshell	*Lampsilis teres*
Plants	Missouri Mud-plantain	*Heteranthera missouriensis*
Turtles	Smooth Softshell	*Apalone mutica*

5. Neosho River



The Neosho River Ecological Focus Area follows the Neosho River as it flows in a general southeast direction from Morris County to Cherokee County before leaving Kansas. The Neosho River has two major tributaries: The Cottonwood and Spring rivers. Streams in this system have predominately gravel substrates, a product of the limestone soils through which the Neosho River runs. Most of this EFA is located within the Flint Hills, Osage Cuestas, and Cherokee Plains ecoregions, but small portions lie within the Smoky Hills and Ozark Plateau. The landscape of the Neosho River EFA ranges from Tallgrass Prairie in the west to Oak-Hickory Forest in the east. The Neosho River Basin is highly fragmented by watershed impoundments, three federal reservoirs (Cottonwood River: Marion Reservoir; Neosho River: Council Grove and John Redmond reservoirs), and several dams on the Neosho River main stem. Other impacts include lead and zinc mining in the southeast, gravel dredging, and high sediment loads. This EFA contains multiple SGCN species including fish, mussels, and herpetofauna.

Conservation Issues

Agriculture

*Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation, and nutrient issues

*Livestock access to streams can increase nutrient input

*Fisheries management, as it relates to stocking game fish, can be detrimental to native species

Natural system modifications

*Bank destabilization (due to riparian management, stream incision, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat
*Gravel dredging affects stream morphology and spawning habitats
*Structures that alter the water from its natural drainage are impacting natural hydrology of streams
*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction
*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Introduced species, such as Zebra Mussels, impact native aquatic species and habitat

Pollution

*Runoff of pesticides and fertilizers have negative impacts on the flora and fauna

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors
*Acquire riparian corridor acreages through willing sellers/donors
*Acquire water rights as advisable and possible
*Encourage conservation easements on high quality habitats

Land/water management

*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control, and bank stabilization
*Encourage engineering techniques that promote high habitat diversity
*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species
*Promote improved water quality standards
*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes
*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats, allowing agroforestry operations in the area farthest from the active channel
*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management
*Expand cooperative programs that supply technical and direct assistance for non-native species removal
*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species
*Promote mechanical removal of non-native, invasive plant species by utilizing local habitat partnerships
*Promote restoration of stream channels through natural stream design
*Promote restoration projects that increase floodplain connectivity in incised streams
*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage
*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts
*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Inform landowners and managers of and promote best management practices

*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Continue disease monitoring (Chytrid Fungus, Ranavirus, etc.)
*Investigate contaminant effects on reptilian and amphibian populations
*Research and develop engineering techniques for effective river and stream management
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Study the impact of introduced species on native species
*Educate the public regarding the importance of preventing the spread of invasive species
*Inventory perched culverts and other structures that are preventing aquatic organism passage

External capacity building

*****Promote sound water quality standards and their enforcement through education and continued coordination with the Kansas Department of Health and Environment
*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage
*Promote the use of conservation culverts that retain natural stream bed features
*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

Livelihood, economic and other incentives

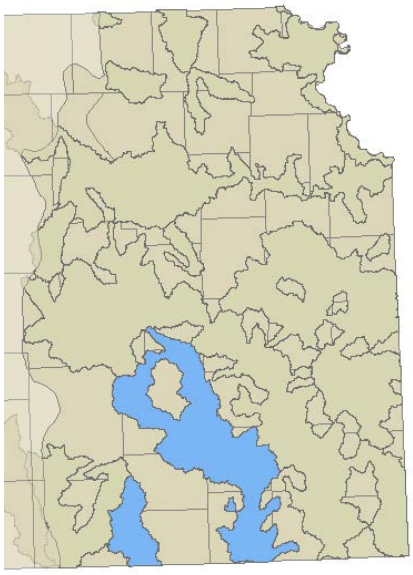
*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Amphibians	Green Frog	*Lithobates clamitans*
Amphibians	Spring Peeper	*Pseudacris crucifer*
Fish	Arkansas Darter	*Etheostoma cragini*
Fish	Neosho Madtom	*Noturus placidus*
Fish	Redspot Chub	*Nocomis asper*
Fish	Topeka Shiner	*Notropis topeka*
Insect	A mayfly	*Heterocloeon grande*
Mussels	Butterfly	*Ellipsaria lineolata*
Mussels	Elktoe	*Alasmidonta marginata*
Mussels	Ellipse	*Venustaconcha ellipsiformis*
Mussels	Flat Floater	*Utterbackiana suborbiculata*
Mussels	Flutedshell	*Lasmigona costata*
Mussels	Neosho Mucket	*Lampsilis rafinesqueana*
Mussels	Ouachita Kidneyshell	*Ptychobranchus occidentalis*
Mussels	Rabbitsfoot	*Theliderma cylindrica*
Mussels	Western Fanshell	*Cyprogenia aberti*
Plants	Kansas Arrowhead	*Sagittaria ambigua*
Plants	Narrowleaf Morning-glory	*Ipomoea shumardiana*
Turtles	Northern Map Turtle	*Graptemys geographica*
Tier 2 SGCN		
Fish	Banded Darter	*Etheostoma zonale*
Fish	Banded Sculpin	*Cottus carolinae*
Fish	Bigeye Shiner	*Notropis boops*
Fish	Black Buffalo	*Ictiobus niger*
Fish	Black Redhorse	*Moxostoma duquesnei*
Fish	Blue Sucker	*Cycleptus elongatus*

Tier 2 SGCN		
Fish	Bluntnose Darter	*Etheostoma chlorosoma*
Fish	Brindled Madtom	*Noturus miurus*
Fish	Cardinal Shiner	*Luxilus cardinalis*
Fish	Channel Darter	*Percina copelandi*
Fish	Common Shiner	*Luxilus cornutus*
Fish	Fantail Darter	*Etheostoma flabellare*
Fish	Freckled Madtom	*Noturus nocturnus*
Fish	Golden Redhorse	*Moxostoma erythrurum*
Fish	Gravel Chub	*Erimystax x-punctatus*
Fish	Greenside Darter	*Etheostoma blennioides*
Fish	Highfin Carpsucker	*Carpiodes velifer*
Fish	Highland Darter	*Etheostoma teddyroosevelt*
Fish	Johnny Darter	*Etheostoma nigrum*
Fish	Northern Hog Sucker	*Hypentelium nigricans*
Fish	Orangethroat Darter	*Etheostoma spectabile*
Fish	Ozark Logperch	*Percina caprodes fulvitaenia*
Fish	Ozark Minnow	*Notropis nubilus*
Fish	Paddlefish	*Polyodon spathula*
Fish	Pealip Redhorse	*Moxostoma pisolabrum*
Fish	Redfin Darter	*Etheostoma whipplei*
Fish	River Darter	*Percina shumardi*
Fish	River Redhorse	*Moxostoma carinatum*
Fish	Shorthead Redhorse	*Moxostoma macrolepidotum*
Fish	Slender Madtom	*Noturus exilis*
Fish	Slenderhead Darter	*Percina phoxocephala*
Fish	Slough Darter	*Etheostoma gracile*
Fish	Southern Redbelly Dace	*Chrosomus erythrogaster*
Fish	Spotfin Shiner	*Cyprinella spiloptera*
Fish	Spotted Gar	*Lepisosteus oculatus*
Fish	Spotted Sucker	*Minytrema melanops*
Fish	Stonecat	*Noturus flavus*
Fish	Striped Shiner	*Luxilus chrysocephalus*
Fish	Sunburst Darter	*Etheostoma mihileze*
Fish	Warmouth	*Lepomis gulosus*
Fish	White Sucker	*Catostomus commersonii*
Insect	A longhorned caddisfly	*Ceraclea spongillovorax*
Insect	A spiny crawler mayfly	*Ephemera traverae*
Insect	A primitive minnow mayfly	*Siphlonurus minnoi*
Insect	Ozark Springfly	*Helopicus nalatus*
Insect	Ouachita Stripetail	*Isoperla ouachita*
Mussels	Bleufer	*Potamilus purpuratus*
Mussels	Creeper	*Strophitus undulatus*
Mussels	Deertoe	*Truncilla truncata*
Mussels	Fatmucket	*Lampsilis siliquoidea*
Mussels	Fawnsfoot	*Truncilla donaciformis*
Mussels	Lilliput	*Toxolasma parvum*
Mussels	Plain Pocketbook	*Lampsilis cardium*
Mussels	Pondhorn	*Uniomerus tetralasmus*
Mussels	Round Pigtoe	*Pleurobema sintoxia*
Mussels	Spike	*Eurynia dilatata*
Mussels	Wabash Pigtoe	*Fusconaia flava*
Mussels	Wartyback	*Quadrula nodulata*
Mussels	Washboard	*Megalonaias nervosa*
Mussels	Yellow Sandshell	*Lampsilis teres*
Mussels	Alligator Snapping Turtle	*Macrochelys temminckii*
Plants	Missouri Mud-plantain	*Heteranthera missouriensis*
Turtles	Smooth Softshell	*Apalone mutica*

6. Verdigris



The Verdigris Ecological Focus Area is comprised of the Central Oklahoma/Texas Plains and part of the Central Irregular Plains. The Central Oklahoma/Texas Plains are considered a transitional area between prairie vegetation to the west and forested regions to the south. Kansas contains the northern extent of the region. The Cross Timbers area separates this region from the tallgrass prairie of the Flint Hills, and the mosaic of oak-hickory forest and tallgrass prairie of the Osage Cuestas to the east. The Verdigris, Fall, and Elk rivers are the major aquatic systems in this EFA. The Ouachita Kidneyshell mussel is listed as threatened in the Caney River while the Brindled Madtom, Redfin Darter, and Spotted Sucker are all species in need of conservation (SINC) within this area.

Conservation Issues

Agriculture

*Land management practices within the watershed are impacting water quality
*Livestock access to streams can increase nutrient input
*Fisheries management, as it relates to stocking game fish, can be detrimental to native species

Natural system modifications

*Structures that alter the water from its natural drainage are impacting natural hydrology of streams
*Bank destabilization (due to riparian management, stream incision, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat
*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction
*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Introduced species negatively impact native aquatic species and habitat

Pollution

*Runoff of pesticides and fertilizers have negative impacts on the flora and fauna

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage
*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors
*Acquire riparian corridor acreages through willing sellers/donors
*Acquire water rights as advisable and possible
*Encourage conservation easements on high quality habitats

Land/water management

*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species
*Promote improved water quality standards
*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes
*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats, allowing agroforestry operations in the area farthest from the active channel
*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control, and bank stabilization
*Encourage engineering techniques that promote high habitat diversity
*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management
*Expand cooperative programs that supply technical and direct assistance for non-native species removal
*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species
*Promote mechanical removal of non-native, invasive plant species by utilizing local habitat partnerships
*Promote restoration of stream channels through natural stream design
*Promote restoration projects that increase floodplain connectivity in incised streams
*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage
*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit stream and riparian habitats

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts
*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Inform landowners and managers of and promote best management practices
*Study the impact of removing watershed impoundments and reservoirs
*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Investigate contaminant effects on reptilian and amphibian populations
*Continue disease monitoring (Chytrid Fungus, Ranavirus, etc.)
*Research and develop engineering techniques for effective river and stream management
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Study the impact of introduced species on native species
*Educate the public regarding the importance of preventing the spread of invasive species
*Inventory perched culverts and other structures that are preventing aquatic organism passage

External capacity building

*Promote sound water quality standards and their enforcement through education and continued coordination with the Kansas Department of Health and Environment
*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage
*Promote the use of conservation culverts that retain natural stream bed features
*Improve the coordination of mitigation activities with the Army Corps of Engineers
*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

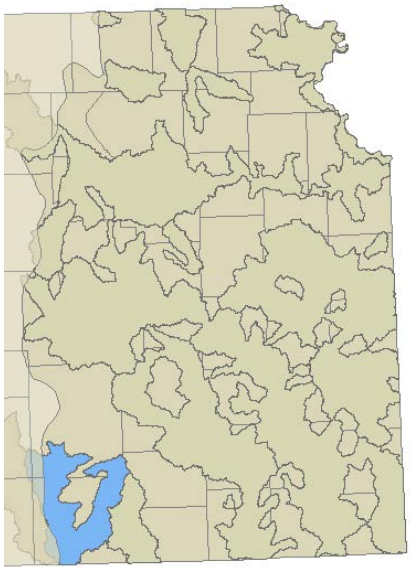
Livelihood, economic and other incentives

*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats
*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Insect	A mayfly	*Heterocloeon grande*
Insect	Grey Petaltail	*Tachopteryx thoreyi*
Mussels	Butterfly	*Ellipsaria lineolata*
Mussels	Neosho Mucket	*Lampsilis rafinesqueana*
Mussels	Ouachita Kidneyshell	*Ptychobranchus occidentalis*
Mussels	Western Fanshell	*Cyprogenia aberti*
Plants	Kansas Arrowhead	*Sagittaria ambigua*
Tier 2 SGCN		
Amphibians	Common Mudpuppy	*Necturus maculosus*
Fish	Banded Darter	*Etheostoma zonale*
Fish	Bigeye Shiner	*Notropis boops*
Fish	Black Buffalo	*Ictiobus niger*
Fish	Brindled Madtom	*Noturus miurus*
Fish	Channel Darter	*Percina copelandi*
Fish	Fantail Darter	*Etheostoma flabellare*
Fish	Freckled Madtom	*Noturus nocturnus*
Fish	Golden Redhorse	*Moxostoma erythrurum*
Fish	Highfin Carpsucker	*Carpiodes velifer*
Fish	Orangethroat Darter	*Etheostoma spectabile*
Fish	Ozark Logperch	*Percina caprodes fulvitaenia*
Fish	Pealip Redhorse	*Moxostoma pisolabrum*
Fish	Quillback	*Carpiodes cyprinus*
Fish	Redfin Darter	*Etheostoma whipplei*
Fish	Slenderhead Darter	*Percina phoxocephala*
Fish	Slough Darter	*Etheostoma gracile*
Fish	Spotted Gar	*Lepisosteus oculatus*
Fish	Spotted Sucker	*Minytrema melanops*
Fish	Stonecat	*Noturus flavus*
Fish	Warmouth	*Lepomis gulosus*
Insect	A longhorned caddisfly	*Ceraclea spongillovorax*
Insect	A midge	*Oliveridia hugginsi*
Insect	A Prongill Mayfly	*Paraleptophlebia calcarica*
Insect	Gray Petaltail	*Tachopteryx thoreyi*
Insect	Ozark Emerald	*Somatochlora ozarkensis*
Mussels	Bleufer	*Potamilus purpuratus*
Mussels	Creeper	*Strophitus undulatus*
Mussels	Deertoe	*Truncilla truncata*
Mussels	Fatmucket	*Lampsilis siliquoidea*
Mussels	Fawnsfoot	*Truncilla donaciformis*
Mussels	Lilliput	*Toxolasma parvum*
Mussels	Plain Pocketbook	*Lampsilis cardium*
Mussels	Pondhorn	*Uniomerus tetralasmus*
Mussels	Round Pigtoe	*Pleurobema sintoxia*
Mussels	Wabash Pigtoe	*Fusconaia flava*
Mussels	Wartyback	*Quadrula nodulata*
Mussels	Washboard	*Megalonaias nervosa*
Mussels	Yellow Sandshell	*Lampsilis teres*
Turtles	Alligator Snapping Turtle	*Macrochelys temminckii*

7. Walnut



The Walnut Ecological Focus Area is part of the Flint Hills ecoregion. The area can be characterized by rolling hills, rocky soils and humid wet summers. Due to the rocky surface, the region supports little cropland agriculture. The prairie is used for range and pasture land. Some cropland agriculture has been implemented in river valleys and along the periphery of the Flint Hills that contains level topography. The Walnut River is the major system in this EFA. While there are no species listed as threatened or endangered by the state of Kansas, the species diversity within this area and proximity to areas containing listed species is noteworthy. The effects of urbanization are ever present with the city of Wichita located to the west.

Conservation Issues

Residential and commercial development

*Urbanization and impervious surfaces reduce water infiltration and increase runoff that often contains contaminants

*Storm water management in urban areas often results in channelized, concrete-lined streams that lead to intensified flooding events downstream

Agriculture

*Farming near stream channels impacts riparian habitats, resulting in erosion, sedimentation, and nutrient issues

*Intense grazing regimes can degrade riparian habitats

*Livestock access to streams can increase nutrient input

*Fisheries management, as it relates to stocking game fish, can be detrimental to native species

Natural system modifications

*Structures that alter the water from its natural drainage are impacting natural hydrology of streams

*Bank destabilization (due to riparian management, stream incision, headcuts, etc.) and some subsequent stabilization methods can cause stream incision and loss of riparian habitat.

*Fragmentation from low-head dams and other impoundments impedes aquatic organism movement and reproduction

*Channelization reduces stream habitat, and causes stream incision which reduces floodplain connectivity

Invasive and other problematic species and genes

*Introduced species impact native aquatic species and habitat.

*Introduced predatory species can impact populations of native aquatic species

Pollution

*Runoff of pesticides and fertilizers have negative impacts on the flora and fauna

Transportation and service corridors

*Perched culverts and stream crossings prevent aquatic organism passage

*Reinforced concrete box and corrugated metal pipe culverts replace stream bed habitat with artificial surfaces

Conservation Actions

Land/water protection

*Acquire rare, critical and/or important habitats through willing sellers/donors
*Acquire riparian corridor acreages through willing sellers/donors
*Acquire water rights as advisable and possible
*Encourage conservation easements on high quality habitats

Land/water management

*Identify pollution problem areas and improve conditions detrimental to biodiversity and endangered species
*Promote improved water quality standards
*Promote effective instream flow management through the development and implementation of ecologically appropriate flow regimes
*Encourage planting of native riparian buffers at least twice the active channel-width to improve aquatic habitats, allowing agroforestry operations in the area farthest from the active channel
*Promote ecologically sound techniques for flood control, erosion control, nonpoint source pollution control, and bank stabilization
*Encourage engineering techniques that promote high habitat diversity
*Encourage the use of fences where necessary to manage riparian corridors, and otherwise conduct proper grazing management
*Expand cooperative programs that supply technical and direct assistance for non-native species removal
*Develop plans to prevent the invasion and spread of Aquatic Nuisance Species
*Promote mechanical removal of non-native, invasive plant species by utilizing local habitat partnerships
*Promote restoration of stream channels through natural stream design
*Promote restoration projects that increase floodplain connectivity in incised streams
*Promote fish passage designs for new in-stream structures and retro-fit old structures to allow passage
*Coordinate with NRCS and other partners to develop and implement grazing and land management practices that benefit stream and riparian habitats
*Encourage use of permeable asphalt or pavement and Low Impact Development practices to improve storm water management by increasing infiltration of water and decrease/replace impervious surfaces

Species management

*Propagate imperiled species for reintroduction and population augmentation efforts
*Work with landowners and partners to identify appropriate reintroduction sites for imperiled species

Education and awareness

*Inform landowners and managers of and promote best management practices
*Conduct wildlife surveys that are rigorous, quantifiable, and focused on species/habitat relationships, population demography, and community dynamics
*Continue disease monitoring (Chytrid Fungus, Ranavirus, etc.)
*Investigate contaminant effects on reptilian and amphibian populations
*Research and develop engineering techniques for effective river and stream management
*Educate the public about the value of wetlands and streams, including riparian corridors, so they will support increased funding
*Educate landowners and managers on the value of rare species
*Study the impact of introduced species on native species
*Educate the public regarding the importance of preventing the spread of invasive species
*Inventory perched culverts and other structures that are preventing aquatic organism passage
*Educate public and developers on the effects of impervious surfaces and the potential for Low Impact Development

*Educate public about eco-friendly lawn care and effects of lawn chemicals on aquatic systems

External capacity building

*Promote sound water quality standards and their enforcement through education and continue coordination with the Kansas Department of Health and Environment

*Work with county road departments and Kansas Dept. of Transportation to identify and replace structures that are preventing aquatic organism passage

*Promote the use of conservation culverts that retain natural stream bed features

*Improve the coordination of mitigation activities with the Army Corps of Engineers

*Coordinate with Watershed Restoration and Protection Strategy groups to improve water quality and habitat

*Work with city and county public works to improve storm water management

Livelihood, economic and other incentives

*Offer incentive to private landowners to preserve native habitats, remove invasive species, and use best management practices that benefit stream and riparian habitats

*Develop practices that provide benefits to landowners and to wildlife

Species of Greatest Conservation Need

Tier 1 SGCN		
Fish	Arkansas Darter	*Etheostoma cragini*
Tier 2 SGCN		
Fish	Bigeye Shiner	*Notropis boops*
Fish	Black Buffalo	*Ictiobus niger*
Fish	Channel Darter	*Percina copelandi*
Fish	Freckled Madtom	*Noturus nocturnus*
Fish	Golden Redhorse	*Moxostoma erythrurum*
Fish	Orangethroat Darter	*Etheostoma spectabile*
Fish	Ozark Logperch	*Percina caprodes fulvitaenia*
Fish	Pealip Redhorse	*Moxostoma pisolabrum*
Fish	Slenderhead Darter	*Percina phoxocephala*
Fish	Spotted Sucker	*Minytrema melanops*
Fish	Stonecat	*Noturus flavus*
Mussels	Bleufer	*Potamilus purpuratus*
Mussels	Creeper	*Strophitus undulatus*
Mussels	Fatmucket	*Lampsilis siliquoidea*
Mussels	Lilliput	*Toxolasma parvum*
Mussels	Plain Pocketbook	*Lampsilis cardium*
Mussels	Pondhorn	*Uniomerus tetralasmus*
Mussels	Round Pigtoe	*Pleurobema sintoxia*
Mussels	Wabash Pigtoe	*Fusconaia flava*
Mussels	Yellow Sandshell	*Lampsilis teres*

Success Story – Freshwater Mussel Surveys

Survey and research regarding freshwater mussels of Kansas rivers and streams have led to several discoveries and conservation successes in the last 25 years. Because freshwater mussels are deemed one of the most imperiled groups of aquatic organisms, research into their life cycle is critical in the development of strategies to conserve the ecological integrity of Kansas' aquatic systems.

One of the national leaders in the reproductive research of freshwater mussels has been Dr. Chris Barnhart of Missouri State University. He and his students have discovered fish hosts required for development of larval mussels (glochidia) for several species considered threatened or endangered. Prior to his research, fish hosts for the Kansas populations of Rabbitsfoot, Neosho Mucket, Western Fanshell and Ouachita Kidneyshell were unknown. The elaborate lures that females use to attract fish hosts were described. The need for sufficient water clarity so the fish host can see a visual lure is apparent and demonstrates the importance of watershed-level management.

Regarding management implications, this research led to techniques of propagating juvenile mussels in the lab and growing them to the point that they could be released into the wild. A conservation strategy of propagating mussels for reintroduction into rivers where a species has been extirpated, or simply to augment a low population, is now a viable option.

One example of a mussel propagation and reintroduction effort that is occurring regards the Neosho Mucket. This species uses a lure that is only successful if bass are attracted to it to act as the fish host. The tiny glochidia clamp onto the gill filaments of the bass (Largemouth, Smallmouth or Spotted) and encyst there for a few weeks until the glochidia metamorphose to the juvenile stage and drop off. To date, several thousand Neosho Mucket juveniles have been propagated and released into the Cottonwood River. Apparently, the Cottonwood River once had a good population of Neosho Muckets, evident from relic shells still found on gravel bars. Past pollution events and current improving water quality made this river a target for a reintroduction effort. It will probably take many years to determine whether or not this effort has been a success. Thanks to Dr. Barnhart's work on the life cycle of this mussel, a propagation and reintroduction conservation strategy is currently being implemented in an attempt to recover the endangered Neosho Mucket population.

Tallgrass Prairie Conservation Region Partners (not listed on Statewide List)

- Eastern Tallgrass and Big River Landscape Conservation Cooperative
- Friends of the Kaw
- Kaw Valley Heritage Alliance
- Konza Prairie Preserve
- Military Installations
- Missouri River Natural Resources Committee
- Mississippi Interstate Cooperative Resource Association
- Tallgrass Legacy Alliance
- Grassland Heritage Foundation
- Upper Mississippi Great Lakes Joint Venture
- Walnut Council

Chapter 7 - PLAN TO REVIEW AND REVISE

Plan Review and Revision

Element 6 of the "Eight Required Elements for State Wildlife Action Plans" direct each state to review its SWAP at least every ten years. KDWP proposes to implement an interim review every five years. This interim review will provide a foundation for the next required ten-year comprehensive review and allow for a periodic review of the plan or its parts if needed in order to address emerging issues, new information on changes in abundance, distribution, population trends, listing status of species and habitat conditions. This initial 5-year period will also allow for KDWP and conservation partners to evaluate the Ecological Focus Area approach and update any new emerging issues or actions not identified This 3rd edition review serves as this initial 5-year period review.

KDWP will continue to annually collect and collate species occurrence, status, and trends data obtained through direct research by KDWP and conservation partners. Habitat data will be updated using new land cover products, data collected in the field, and other new products as they become available.

Ongoing communication and coordination among conservation partners will help track progress and identify new circumstances and changing situations. Conservation partners will review the relevance of the plan and identify opportunities for work sharing and joint budgeting of projects. This process will be facilitated by KDWP but will involve many members of the conservation community in Kansas.

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Appendix 1
Selection and Ranking Criteria for
Species of Greatest Conservation Need

Step 1: Selection of Species of Greatest Conservation Need; a species must meet at least one or more of the following criteria.

1. Native species, which are classified as federally threatened, endangered or candidate under the Endangered Species Act (ESA).

2. Native species, which are classified as Kansas threatened, endangered, or Species In Need of Conservation (SINC).

3. Native species, which have been assigned a global conservation status rank of G1, G2 or G3 by NatureServe.*

4. Native species which have been identified as conservation priorities through a range wide status assessment, or assessment of large taxonomic divisions or which has significant conservation implication, or has major conservation contribution to the state; or are indicative of a diversity and health of the state's wildlife.
   Assessments include: American Fisheries Society assessments of freshwater fish, freshwater mussels, and crayfish. Partners in Flight Conservation Plan, Playa Lakes Joint Venture, and the U.S. Fish and Wildlife Service Region 6 Priority Birds.

5. Native species, which are regionally endemic (distribution confined to central states) regardless of their conservation status.

Step 2: Ranking of Species of Greatest Conservation Need

1. Federal and/or Kansas threatened, endangered species, and/or with a global conservation status rank of G1 or G2 = Tier I species
2. Remaining Species of Greatest Conservation Need = Tier II species

Appendix 2
Species of Greatest Conservation Need

This table includes Kansas' Species of Greatest Conservation Need along with the selection criteria number, tier ranking, Global and State conservation status ranks, and the Conservation Region(s) in which the species occur. Codes following common names are as follows: T = Threatened, E = Endangered, C = Candidate SINC = Species In Need of Conservation, and X = extirpated.

									Conservation Region		
Group	**Common Name**	**Scientific Name**	**Federal Status**	**State Status**	**Selection Criteria**	**Tier**	**G Rank (Rounded)**	**S Rank**	**Shortgrass Prairie**	**Central MixedGrass Prairie**	**Eastern Tallgrass Prairie**
Amphibians	Cave Salamander	*Eurycea lucifuga*		E	2	I	G5	S1			x
Amphibians	Crawfish Frog	*Lithobates areolata*		SINC	2	I	G4	S3			x
Amphibians	Eastern Narrow-mouthed Toad	*Gastrophryne carolinensis*		T	2	II	G5	S1			x
Amphibians	Eastern Newt	*Notophtalmus viridescens*		T	2	II	G5	S2			x
Amphibians	Green Frog	*Lithobates clamitans*		T	2	I	G5	S1			x
Amphibians	Green Toad	*Anaxyrus debilis*		T	2,5	I	G5	S2	x		
Amphibians	Grotto Salamander	*Eurycea spelaeas*		E	2,5	I	G4	S1			x
Amphibians	Long-tailed Salamander	*Eurycea longicauda*		T	2	I	G5	S2			x
Amphibians	Common Mudpuppy	*Necturus maculosus*			4	I	G5	S3			x
Amphibians	Red-spotted Toad	*Anaxyrus punctatus*		SINC	2	II	G5	S2		x	
Amphibians	Spring Peeper	*Pseudacris crucifer*		SINC	2	II	G5	S3			x
Amphibians	Strecker's Chorus Frog	*Pseudacris streckeri*		T	2,5	I	G5	S2		x	
Amphibians	Tiger Salamander	*Ambystoma tigrinum*			4	II	G5	S5	x	x	x
Amphipod	Clanton's Cave Amphipod	*Stygobromus clantoni*			4,5	II	G3	S2S3			x
Amphipod	Kansas Well Amphipod	*Bactrurus hubrichti*			5	I	G1	S3S4			x
Amphipod	Onondaga Cave Amphipod	*Stygobromus onondagaensis*			3	II	G3	SNR			x
Arachnida	A trap door spider	*Antrodiaetus lincolnianus*			5	II					x
Arachnida	A trap door spider	*Sphodros fitchi*			5	II					x
Arachnida	A trap door spider	*Ummidia beatula*			5	II					x
Arachnida	An aquatic mite	*Tyrrellia hibbardi*			5	II				x	
Birds	American Avocet	*Recurvirostra americana*			4	II	G5	S2BS3N	x	x	
Birds	American Bittern	*Botaurus lentiginosus*			4	II	G5	S1B	x	x	x
Birds	American Golden-Plover	*Pluvialis dominica*			4	II	G5	S3N	x	x	x
Birds	American Tree Sparrow	*Spizella arborea*			4	II	G5	S5N	x	x	x
Birds	American White Pelican	*Pelecanus erythrorhynchos*			4	II	G4	S5N	x	x	x
Birds	Baird's Sandpiper	*Calidris bairdii*			4	II	G5	S4N	x	x	x
Birds	Baird's Sparrow	*Centronyx bairdii*			4	II	G4	SNA	x	x	x
Birds	Bald Eagle	*Haliaeetus leucocephalus*			4	II	G5	S2BS4N	x	x	x
Birds	Baltimore Oriole	*Icterus galbula*			4	II	G5	S5B	x	x	x
Birds	Barn Owl	*Tyto alba*			4	II	G5	S3	x	x	x

Appendix 2
Species of Greatest Conservation Need

Group	Common Name	Scientific Name	Federal Status	State Status	Selection Criteria	Tier	G Rank (Rounded)	S Rank	Conservation Region		
									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Birds	Bell's Vireo	*Vireo bellii*			4	II	G5	S4B	x	x	x
Birds	Black Rail	*Laterallus jamaicensis*	T	SINC	2,3	II	G3	S1B		x	
Birds	Black Tern	*Chlidonias niger*		SINC	2	II	G5	S1B	x	x	x
Birds	Black-bellied Plover	*Pluvialis squatarola*			4	II	G5	S3N	x	x	x
Birds	Black-billed Cuckoo	*Coccyzus erythropthalmus*			4	II	G5	S3B	x	x	x
Birds	Black-necked Stilt	*Himantopus mexicanus*			4	II	G5	S1B	x	x	
Birds	Bobolink	*Dolichonyx orzivorus*		SINC	2	II	G5	S1B		x	x
Birds	Buff-breasted Sandpiper	*Calidris subruficollis*			4	II	G4	SNA	x	x	x
Birds	Bullock's Oriole	*Icterus bullockii*			4	II	G5	S3B	x	x	
Birds	Burrowing Owl	*Athene cunicularia*			4	II	G4	S3B	x	x	
Birds	Canvasback	*Aythya valisineria*			4	II	G5	S3N	x	x	x
Birds	Cassin's Sparrow	*Peucaea cassinii*			4,5	II	G5	S3B	x	x	
Birds	Cerulean Warbler	*Setophaga cerulea*		SINC	2	II	G4	S1B			x
Birds	Chestnut-collared Longspur	*Calcarius ornatus*			4	II	G5	S3N	x	x	
Birds	Chihuahuan Raven	*Corvus cryptoleucus*		SINC	2,4	II	G5	S1	x		
Birds	Chuck-will's-widow	*Antrostomus carolinensis*			4	II	G5	S4B		x	x
Birds	Common Nighthawk	*Chordeiles minor*			4	II	G5	S5B	x	x	x
Birds	Common Poorwill	*Phalaenoptilus nuttallii*			4	II	G5	S3B	x	x	x
Birds	Curve-billed Thrasher	*Toxostoma curvirostre*		SINC	2	II	G5	S1B	x		
Birds	Dickcissel	*Spiza americana*			4	II	G5	S5B	x	x	x
Birds	Eared Grebe	*Podiceps nigricollis*			4	II	G5	S1B	x	x	
Birds	Eastern Kingbird	*Tyrannus tyrannus*			4	II	G5	S5B	x	x	x
Birds	Eastern Meadowlark	*Sturnella magna*			4	II	G5	S5BS3N	x	x	x
Birds	Eastern Whip-poor-will	*Antrostomus vociferus*		SINC	2	II	G5	S3B			x
Birds	Eastern Wood-Pewee	*Contopus virens*			4	II	G5	S5B		x	x
Birds	Ferruginous Hawk	*Buteo regalis*		SINC	2	II	G4	S2BS4N	x	x	
Birds	Forster's Tern	*Sterna forsteri*			4	II	G5	S1B	x	x	x
Birds	Golden Eagle	*Aquila chrysaetos*		SINC	2	II	G5	S1BS2N	x	x	
Birds	Grasshopper Sparrow	*Ammodramus savannarum*			4	II	G5	S5B	x	x	x
Birds	Greater Prairie-Chicken	*Tympanuchus cupido*			4	II	G4	S4	x	x	x
Birds	Greater Yellowlegs	*Tringa melanoleuca*			4	II	G5	S4N	x	x	x
Birds	Harris's Sparrow	*Zonotrichia querula*			4	II	G5	S4N			x
Birds	Henslow's Sparrow	*Centronyx henslowii*		SINC	2,4	II	G4	S3B		x	x
Birds	Hudsonian Godwit	*Limosa haemastica*			4	II	G4	S3N	x	x	x
Birds	Kentucky Warbler	*Geothlypis formosa*			4	II	G5	S3B			x

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Group	Common Name	Scientific Name	Federal Status	State Status	Selection Criteria	Tier	G Rank (Rounded)	S Rank	Conservation Region		
									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Birds	Ladder-backed Woodpecker	*Dryobates scalaris*		SINC	2	II	G5	S1	x		
Birds	Lark Bunting	*Calamospiza melanocorys*			4	II	G5	S5B	x	x	
Birds	Lark Sparrow	*Chondestes grammacus*			4	II	G5	S5B	x	x	x
Birds	Least Bittern	*Ixobrychus exilis*			4	II	G5	S2B	x	x	x
Birds	Least Sandpiper	*Calidris minutilla*			4	II	G5	S4N	x	x	x
Birds	Least Tern	*Sternula antillarum*	E	E	1,2,4	I	G4	S1B	x	x	x
Birds	Lesser Prairie-Chicken	*Tympanuchus pallidicinctus*		T	1,3,5	I	G3	S3	x	x	
Birds	Lesser Yellowlegs	*Tringa flavipes*			4	II	G5	S4N	x	x	x
Birds	Loggerhead Shrike	*Lanius ludovicianus*			4	II	G4	S4BS2N	x	x	x
Birds	Long-billed Curlew	*Numenius americanus*		SINC	2,4	II	G5	S1BS2N	x	x	
Birds	Long-billed Dowitcher	*Limnodromus scolopaceus*			4	II	G5	S4N	x	x	x
Birds	Marbled Godwit	*Limosa fedoa*			4	II	G5	S3N	x	x	x
Birds	McCown's Longspur	*Rhynchopanes mccownii*			4	II	G4	S3N	x		
Birds	Mississippi Kite	*Ictinia mississippiensis*			4	II	G5	S4B	x	x	x
Birds	Mountain Plover	*Charadrius montanus*		SINC	2,3	II	G3	S1B	x		
Birds	Northern Bobwhite	*Colinus virginianus*			4	II	G5	S5	x	x	x
Birds	Northern Pintail	*Anas acuta*			4	II	G5	S1BS4N	x	x	x
Birds	Painted Bunting	*Passerina ciris*			4	II	G5	S4B		x	x
Birds	Pectoral Sandpiper	*Calidris melanotos*			4	II	G5	S4N	x	x	x
Birds	Peregrine Falcon	*Falco peregrinus*			4	II	G4	S1BS3N	x	x	x
Birds	Piping Plover	*Charadrius melodus*	T	T	1,2,3	I	G3	S1BS2N	x	x	x
Birds	Prothonotary Warbler	*Protonotaria citrea*			4	II	G5	S3B			x
Birds	Red-headed Woodpecker	*Melanerpes erythrocephalus*			4	II	G5	S5B	x	x	x
Birds	Red Knot	*Calidris canutus rufa*	T		1	I	G4	SNA		x	
Birds	Rusty Blackbird	*Euphagus carolinus*			4	II	G4	SNA	x	x	x
Birds	Scaled Quail	*Callipepla squamata*			4	II	G5	S2	x		
Birds	Scissor-tailed Flycatcher	*Tyrannus forficatus*			4,5	II	G5	S5B	x	x	x
Birds	Semipalmated Sandpiper	*Calidris pusilla*			4	II	G5	S4N	x	x	x
Birds	Short-eared Owl	*Asio flammeus*		SINC	2,4	II	G5	S2BS3N	x	x	
Birds	Smith's Longspur	*Calcarius pictus*			4	II	G5	S2S3N		x	x
Birds	Snowy Plover	*Charadrius nivosus*	T	T	2,3	I	G3	S1B	x	x	x
Birds	Spotted Towhee	*Pipilo maculatus*			4	II	G5	S2BS3N	x		
Birds	Sprague's Pipit	*Anthus spragueii*			4	II	G4	SNA	x	x	x
Birds	Stilt Sandpiper	*Calidris himantopus*			4	II	G5	S4N	x	x	x
Birds	Swainson's Hawk	*Buteo swainsoni*			4	II	G5	S4B	x	x	x

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Group	Common Name	Scientific Name	Federal Status	State Status	Selection Criteria	Tier	G Rank (Rounded)	S Rank	Conservation Region		
									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Birds	Upland Sandpiper	*Bartramia longicauda*			4	II	G5	S4B	x	x	x
Birds	Western Grebe	*Aechmophorus occidentalis*			4	II	G5	S1B	x	x	
Birds	Western Kingbird	*Tyrannus verticalis*			4	II	G5	S5B	x	x	x
Birds	White-rumped Sandpiper	*Calidris fuscicollis*			4	II	G5	S4N	x	x	x
Birds	Whooping Crane	*Grus americana*	E	E	1,2,3	I	G1	S1N	x	x	x
Birds	Wilson's Phalarope	*Phalaropus tricolor*			4	II	G5	S2BS4N	x	x	
Birds	Yellow Rail	*Coturnicops noveborancensis*			4	II	G4	SNA			x
Birds	Yellow-throated Warbler	*Setophaga dominica*		SINC	2	II	G5	S1B			x
Crustaceans	Calico Crayfish	*Faxonius immunis*			4	II	G5	S4			x
Crustaceans	Devil Crayfish	*Lacunicambarus diogenes*			4	II	G5	S3S4	x	x	x
Crustaceans	Golden Crayfish	*Faxonius luteus*			4,5	II	G5	S3S4			x
Crustaceans	Gray-speckled Crayfish	*Faxonius palmeri*			4	II	G5	S2?			x
Crustaceans	Kansas Fairy Shrimp	*Branchinecta mediospinosa*			4	II	GNR	S1		x	
Crustaceans	Neosho Midget Crayfish	*Faxonius macrus*			2,4,5	II	G4	S1			x
Crustaceans	Prairie Crayfish	*Procambarus gracilis*			4	II	G5	S5			x
Crustaceans	Ringed Crayfish	Faxonius neglectus			4	II	G5	S2S3	x	x	
Crustaceans	Southern Plains Crayfish	*Procambarus simulans*			4,5	II	G5	S5	x	x	x
Crustaceans	Virile Crayfish	*Faxonius virilis*			4	II	G5	S5			x
Crustaceans	Water Nymph Crayfish	*Faxonius nais*			4,5	II	G5	S5	x		x
Crustaceans	White River Crawfish	*Procambarus acutus*			5	II		S2			x
Fish	American Eel	*Anguilla rostrata*			4	II	G4	S2			x
Fish	Arkansas Darter	*Etheostoma cragini*		SINC	2,3,5	II	G3	S2	x	x	x
Fish	Arkansas River Shiner	*Notropis girardi*	T	T	1,2,3,4,5	I	G2	S1	x	x	x
Fish	Banded Darter	*Etheostoma zonale*		SINC	2	II	G5	S1			x
Fish	Banded Sculpin	*Cottus carolinae*		SINC	2	II	G5	S1			x
Fish	Bigeye Shiner	*Notropis boops*		SINC	4	II	G5	S2S3			x
Fish	Black Buffalo	*Ictiobus niger*			4	II	G5	S5		x	x
Fish	Black Redhorse	*Moxostoma duquesnei*		SINC	2	II	G5	S1			x
Fish	Blackside Darter	*Percina maculate*		T	2	I	G5	S1			x
Fish	Blue Sucker	*Cycleptus elongatus*		SINC	2,3	II	G3	S3			x
Fish	Bluntnose Darter	*Etheostoma chlorosoma*		SINC	2	II	G5	S2			x
Fish	Brassy Minnow	*Hybognathus hankinsoni*		SINC	2	II	G5	S1	x	x	x
Fish	Brindled Madtom	*Noturus miurus*		SINC	2	II	G5	S1			x
Fish	Cardinal Shiner	*Luxilus cardinalis*		SINC	2,4,5	II	G4	S3			x
Fish	Channel Darter	*Percina copelandi*			4	II	G4	S3			x

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Group	Common Name	Scientific Name	Federal Status	State Status	Selection Criteria	Tier	G Rank (Rounded)	S Rank	Conservation Region		
									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Fish	Chestnut Lamprey	*Ichthyomyzon castaneus*		SINC	2	II	G4	S1S2		x	x
Fish	Common Shiner	*Luxilus cornutus*		SINC	2,4	II	G5	S3	x	x	x
Fish	Fantail Darter	*Etheostoma flabellare*			4	II	G5	S3			x
Fish	Flathead Chub	*Platygobio gracilis*		T	2	I	G5	S1	x	x	x
Fish	Freckled Madtom	*Noturus nocturnus*			4	II	G5	S4			x
Fish	Golden Redhorse	*Moxostoma erythrurum*			4	II	G5	S5		x	x
Fish	Gravel Chub	*Erimystax x-punctatus*		SINC	2	II	G4	S2S3			x
Fish	Greenside Darter	*Etheostoma blennioides*		SINC	2	II	G5	S2			x
Fish	Highfin Carpsucker	*Carpiodes velifer*		SINC	2	II	G4	S2			x
Fish	Highland Darter	*Etheostoma teddyroosevelt*			2	II	GNR	S1S2			x
Fish	Hornyhead Chub	*Nocomis biguttatus*		T	2	I	G5	S1			x
Fish	Johnny Darter	*Etheostoma nigrum*		SINC	2,4	II	G5	S3		x	x
Fish	Lake Sturgeon	*Acipenser fulvescens*		SINC	2	II	G3	SH			x
Fish	Least Darter	*Etheostoma microperca*			4	II	G5	SH			x
Fish	Neosho Madtom	*Noturus placidus*	T	T	1,2,3,5	I	G2	S2			x
Fish	Northern Hog Sucker	*Hypentelium nigricans*		SINC	2	II	G5	S1			x
Fish	Northern Plains Killifish	*Fundulus kansae*			4	II	G5	S3	x	x	
Fish	Orangethroat Darter	*Etheostoma spectabile*			4	II	G5	S5	x	x	x
Fish	Ozark Logperch	*Percina caprodes fulvitaenia*			4	II	G5	S5		x	x
Fish	Ozark Minnow	*Notropis nubilus*		SINC	2	II	G5	S1			x
Fish	Paddlefish	*Polyodon spathula*			4	II	G4	S3			x
Fish	Pallid Sturgeon	*Scaphirhynchus albus*	E	E	1,2,3	I	G2	S1			x
Fish	Pealip Redhorse	*Moxostoma pisolabrum*			4	II	G5	SNR		x	x
Fish	Peppered Chub	*Macrhyhopsis tetranema*	E	E	1,2,3,4,5	I	G1	S1	x		
Fish	Plains Minnow	*Hybognathus placitus*		T	2	I	G4	S2S3	x	x	x
Fish	Quillback	*Carpiodes cyprinus*			4	II	G5	S3S4		x	x
Fish	Redfin Darter	*Etheostoma whipplei*		SINC	2,4,5	II	G4	S3			x
Fish	Redspot Chub	*Nocomis asper*		T	2,5	I	G4	S1			x
Fish	River Darter	*Percina shumardi*		SINC	2	II	G5	S1S2			x
Fish	River Redhorse	*Moxostoma carinatum*		SINC	2,4	II	G4	S1S2			x
Fish	River Shiner	*Notropis blennius*		SINC	2	II	G5	S3	x	x	x
Fish	Shoal Chub	*Macrhybopsis hyostoma*		T	2,4	I	G5	S3		x	x
Fish	Shorthead Redhorse	*Moxostoma macrolepidotum*			4	II	G5	S5		x	x
Fish	Shovelnose Sturgeon	*Scaphirhynchus platorynchus*			1,4	II	G4	S3			x
Fish	Sicklefin Chub	*Macrhybopsis meeki*		E	2,3	I	G3	S1			x

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Group	Common Name	Scientific Name	Federal Status	State Status	Selection Criteria	Tier	G Rank (Rounded)	S Rank	Conservation Region		
									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Fish	Silver Chub	*Macrhybopsis storeriana*		E	2	I	G5	S3		x	x
Fish	Silverband Shiner	*Notropis shumardi*		SINC	2	II	G5	SH			x
Fish	Slender Madtom	*Noturus exilis*			4	II	G5	S4			x
Fish	Slenderhead Darter	*Percina phoxocephala*			4	II	G5	S5			x
Fish	Slough Darter	*Etheostoma gracile*		SINC	2	II	G5	S1S2			x
Fish	Southern Redbelly Dace	*Chrosomus erythrogaster*		SINC	2,4	II	G5	S2S3		x	x
Fish	Speckled Darter	*Etheostoma stigmaeum*			2	II	G5	-			x
Fish	Spotfin Shiner	*Cyprinella spiloptera*		SINC	2	II	G5	S1			x
Fish	Spotted Gar	*Lespisosteus oculatus*			4	II	G5	S1S2			x
Fish	Spotted Sucker	*Minytrema melanops*		SINC	2	II	G5	S3			x
Fish	Stonecat	*Noturus flavus*			4	II	G5	S5	x	x	x
Fish	Striped Shiner	*Luxilus chrysocephalus*		SINC	2	II	G5	S1			x
Fish	Sturgeon Chub	*Macrhybopsis gelida*		T	2,3	I	G3	S1		x	x
Fish	Sunburst Darter	*Etheostoma mihileze*		SINC	2,5	II	G4	S1			x
Fish	Tadpole Madtom	*Noturus gyrinus*		SINC	2	II	G5	S2S3			x
Fish	Topeka Shiner	*Notropis topeka*	E	T	1,2,3,5	I	G3	S2	x	x	x
Fish	Warmouth	*Lepomis gulosus*			4	II	G5	S4S5			x
Fish	Western Blacknose Dace	*Rhinichthys obtusus*		SINC	2	II	G5	S1			x
Fish	Western Silvery Minnow	*Hybognathus argyritis*		T	2	I	G4	S2		x	x
Fish	White Sucker	*Catostomus commersonii*			4	II	G5	S5	x	x	x
Gastropod	A snail	*Lucilla inermis*			5	II					x
Gastropod	A terrestrial snail	*Succinea pseudavara*			3	I	G1	SNR		x	
Gastropod	Delta hydrobe	*Probythinella emarginata*		T	2	I	G5	S1			x
Gastropod	Domed Supercoil	*Paravitrea significans*			3	II	G3	SNR			x
Gastropod	Kaw Whitelip	*Webbhelix chadwicki*			3	I	G1	SNR			x
Gastropod	Mudbank Ambersnail	*Catinella vagans*			3	II	G3	SNR	x	x	x
Gastropod	Ozark Liptooth	*Daedalochila jacksoni*			3	II	G3	SNR			x
Gastropod	Ozark Threetooth	*Triodopsis neglecta*			3	II	G3	SNR			x
Gastropod	Ozark Whitelip	*Neohelix divesta*			3	II	G3	SNR			x
Gastropod	Ponderous Campeloma	*Campeloma crassulum*			4,5	II	G5	SNR			
Gastropod	Ruidoso Snaggletooth	*Gastrocopta ruidosensis*			3	I	G1	SH		x	
Gastropod	Sharp Hornsnail	*Pleurocera acuta*		T	2	I	G5	S1		x	x
Gastropod	Slender Walker	*Pomatiopsis lapidaria*		E	2	I	G5	S1			x
Gastropod	Slope Ambersnail	*Catinella wandae*			3	I	G2	SNR			x
Gastropod	Texas Liptooth	*Linisa texasiana*			3	II	G3	SNR		x	x

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									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Gastropod	Xeric Ambersnail	*Succinea vaginacontorta*			3	I	G2	SNR	x	x	x
Insect	A callirhoe bee	*Melissodes intortus*			4	II			x	x	x
Insect	A dieunomia bee	*Dieunomia triangulifera*			3	II	G3	SNR	x	x	x
Insect	A digger bee	*Anthophora montana*			5	II				x	
Insect	A leafcutter bee	*Megachile amica*			3	I	G2	SH		x	x
Insect	A leafcutter bee	*Megachile deflexa*			3	I	G2	SH		x	
Insect	A leafcutter bee	*Megachile integra*			3	I	G2	SNR		x	x
Insect	A leafcutter bee	*Megachile mucorosa*			3	II	G3	SNR		x	x
Insect	A longhorned beetle	*Tetraopes pilosus*			5	II			x	x	
Insect	A longhorned caddisfly	*Ceraclea spongillovorax*			3	II	G3	SNR		x	x
Insect	A mayfly	*Apobaetis lakota*			3	I	G2	SNR		x	x
Insect	A mayfly	*Heterocloeon grande*			3	I	G2	SNR		x	x
Insect	A microcaddisfly	*Neotrichia falca*			3	II	G3	SNR			x
Insect	A midge	*Oliveridia hugginsi*			5	II					x
Insect	A nomia bee	*Nomia universitatis*			3	II	G3	SNR	x	x	x
Insect	A primitive minnow mayfly	*Siphlonurus minnoi*			3	II	G3	S1S2			x
Insect	A prongill Mayfly	*Paraleptophlebia calcarica*			3,5	I	G1	SNR			x
Insect	A sand-filtering mayfly	*Homoeoneuria ammophila*			3	II		S1		x	x
Insect	A scarab beetle	*Alloblackburneus cynomysi*			5	II				x	
Insect	A scarab beetle	*Cryptoscatomaseter paulseni*			5	II			x	x	
Insect	A scarab beetle	*Cryptoscatomaseter salsburyi*			5	II				x	
Insect	A scarab beetle	*Geomyphilus insolitus*			5	II				x	
Insect	A scarab beetle	*Geomyphilus kiowensis*			5	II			x	x	
Insect	A scarab beetle	*Geomyphilus viceversus*			5	II			x	x	
Insect	A scarab beetle	*Onthophagus cynomysi*			5	II				x	
Insect	A scarab beetle	*Onthophagus knausi*			5	II			x		x
Insect	A scarab beetle	*Orizabus pyriformis*			5	II			x	x	
Insect	A scarab beetle	*Oscarinus pseudabusus*			5	II				x	
Insect	A scarab beetle	*Pardalosus neodistinctus*			5	II			x	x	
Insect	A scarab beetle	*Phyllophaga albina*			5	II					x
Insect	A scarab beetle	*Scabrostomus sepultus*			5	II				x	
Insect	A scarab beetle	*Strategus mormon*			5	II				x	
Insect	A scarab beetle	*Tetraclipeoides dentigerulus*			5	II			x	x	
Insect	A scarab beetle	*Trox paulseni*			5	II			x		x
Insect	A small minnow mayfly	*Plauditus texanus*			3	I	G2	SNR		x	x

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									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Insect	A spiny crawler mayfly	*Ephemera traverae*			5	II	G4	SNR			x
Insect	A spur-throated grasshopper	*Melanoplus beameri*			3,5	I	G2	SNR			x
Insect	A sweat bee	*Agopostemon coloradensis*			5	II			x	x	x
Insect	A sweat bee	*Dieunomia apacha*			3	II	G3	SNR	x	x	
Insect	A wool-carder bee	*Anthidium maculosum*			5	II			x		
Insect	A wool-carder bee	*Anthidium michenerorum*			3	I	G2	SNR		x	
Insect	A wool-carder bee	*Anthidium psoraleae*			3	II	G3			x	
Insect	Abbreviated Underwing	*Catocala abbreviatella*			3,4	II	G3	SNR			x
Insect	Aberrant Cellophane Bee	*Colletes aberrans*			4	II			x	x	x
Insect	American Bumble Bee	*Bombus pensylvanicus*	C		3	I	G3	SNR	x	x	x
Insect	American Burying Beetle	*Nicrophorus americanus*	T	E	1,2,3	I	G2	S1			x
Insect	An oil-collecting bee	*Centris (Paracentris) lanosus*			5	II				x	
Insect	An underwing moth	*Catocala frederici*			3	II	G3	SNR			x
Insect	An underwing moth	*Catocala texanae*			3	II	G3	SNR			
Insect	Arogos Skipper	*Atrytone arogos*			3	I	G2	S3S4		x	x
Insect	Austin Springfly	*Hydroperla fugitans*			3	II	G4	SNR		x	x
Insect	Bald-spot Sweat Bee	*Lasioglossum paraforbesii*			4	II				x	x
Insect	Bell's Roadside Skipper	*Amblyscirtes belli*			3	II	G4	S2S3			x
Insect	Bicoloured Sweat Bee	*Agopostemon virescens*			5	II		SNR	x	x	
Insect	Black-and-gold Bumble Bee	*Bombus auricomus*			4	II		SNR	x	x	x
Insect	Bleached Skimmer	*Libellula composita*			3	II	G3	S2S2			x
Insect	Burrow Small Dung Beetle	*Geomyphilus thomomysi*			5	II			x	x	
Insect	Byssus Skipper	*Problema byssus*			3	II	G4	S2S3			x
Insect	Columbine Duskywing	*Erynnis lucilius*			3, 4	II	G3	SNR			x
Insect	Delilah Underwing	*Catocala delilah*			3	II	G3	SNR			x
Insect	Dotted Skipper	*Hesperia attralus*			3,5	II	G3	S2S3		x	
Insect	Evening Primrose Leafcutter Bee	*Megachile anograe*			3	II	G3	SNR	x	x	
Insect	Fedor Digger Bee	*Anthophora fedorica*			3	I	G2	SNR			x
Insect	Frosted Elfin	*Callophrys irus*			3, 4	I	G2	SNR			
Insect	Ghost Tiger Beetle	*Ellipsoptera lepida*			3, 5	II	G3	S4	x	x	x
Insect	Globe Mallow Bee	*Diadasia diminuta*			5	II			x		
Insect	Gray Petaltail	*Tachopteryx thoreyi*		SINC	2	II	G4	S1			x
Insect	Great Plains Giant Tiger Beetle	*Amblycheila cylindriformis*			5	II		S5	x		
Insect	Hunt's Bumble Bee	*Bombus huntii*			5	II		SNR	x		
Insect	Interrupted Cuckoo Nomad Bee	*Epeolus interruptus*			4	II					x

Appendix 2
Species of Greatest Conservation Need

									Conservation Region			
Group	**Common Name**	**Scientific Name**	**Federal Status**	**State Status**	**Selection Criteria**	**Tier**	**G Rank (Rounded)**	**S Rank**	**Shortgrass Prairie**	**Central MixedGrass Prairie**	**Eastern Tallgrass Prairie**	
Insect	Konza Prairie Mayfly	*Leptophlebia konza*			3,5	I	G1	S1?			x	
Insect	Lichen Grasshopper	*Trimerotropis saxatilis*			3	II		SNR			x	
Insect	Linda's Roadside Skipper	*Amblyscirtes linda*			3,5	I	G2	S1?			x	
Insect	Low-ridged Pygmy Grasshopper	*Nomotettix parvus*			3	II	G3	SNR			x	
Insect	Maculated Flower Chafer	*Gnorimella maculosa*			5	II					x	
Insect	Maritime Sunflower Borer Moth	*Papaipema maritima*			3	II	G3	SNR		x	x	
Insect	Married Underwing	*Catocala nuptialis*			3	II	G3	SNR			x	
Insect	Monarch	*Danaus plexippus*	C		4	II	G4	S5B	x	x	x	
Insect	Morrison’s Bumble Bee	*Bombus morrisoni*			3	II	G3	SNR	x	x	x	
Insect	Mottled Duskywing	*Erynnis martialis*			3	II	G3	S2		x	x	
Insect	Nevada Bumble Bee	*Bombus nevadensis*			5	II	G4	SNR	x			
Insect	Occidental Digger Bee	*Anthophora occidentalis*			3	II	G3	SNR		x	x	
Insect	Old World Swallowtail	*Papilio machaon*			5	II	G5	SNR	x			
Insect	Orange-bellied Sweat Bee	*Agopostemon melliventris*			5	II	G5	SNR	x	x		
Insect	Ottoe Skipper	*Hesperia ottoe*			3	II	G3	S2S3			x	
Insect	Ouachita Stripetail	*Isoperla ouachita*			3,5	II	G3				x	
Insect	Ozark Emerald	*Somatochlora ozarkensis*		SINC	2,3,5	II	G3	S1			x	
Insect	Ozark Springfly	*Helopicus nalatus*			3	II	G3	SNR			x	
Insect	Pahaska Skipper	*Hesperia pahaska*			5	II	G5	SNR		x		
Insect	Paricular Small Dung Beetle	*Scabrostonus peculiosis*			5	II				x		
Insect	Pocket Gopher Flower Beetle	*Euphoria discicollis*			5	II			x			
Insect	Prairie Mole Cricket	*Gryllotalpa major*		SINC	2,3,5	II	G3	S3			x	
Insect	Punctured Small Dung Beetle	*Cryptoscatomaseter punctissimus*			5	II			x	x		
Insect	Red Satyr	*Megisto rubricata*			5	II	G5	S2		x		
Insect	Red-belted Bumble Bee	*Bombus rufocinctus*			5	II	G5	SNR	x			
Insect	Regal Fritillary	*Speyeria idalia*			3	II	G3	S4	x	x	x	
Insect	Robust Sunflower Leafcutter Bee	*Megachile fortis*			3	I	G2	SNR		x	x	
Insect	Rock Island Springfly	*Isogenoides varians*			3	II	G3	SNR			x	
Insect	Sage Sphinx	*Lintneria eremitoides*			3,5	I	G2	SNR	x		x	
Insect	Scott Riffle Beetle	*Optioservus phaeus*		E	2,3,5	I	G1	S1	x			
Insect	Soapberry Hairstreak	*Phaeostrymon alcestis*			5	II	G5	S3		x		
Insect	Southern Chimney Bee	*Diadasia australis*			5	II			x			
Insect	Southern Plains Bumble Bee	*Bombus fraternus*			3, 4	II	G3	SNR	x	x	x	
Insect	Splendid Sweat Bee	*Agopostemon splendens*			5	II	G5	SNR	x	x		
Insect	Susan's Plasterer Bee	*Colletes susannae*			4	II				x		

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Species of Greatest Conservation Need

Group	Common Name	Scientific Name	Federal Status	State Status	Selection Criteria	Tier	G Rank (Rounded)	S Rank	Conservation Region		
									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Insect	The Unexpected Milkweed Moth	*Cycnia inopinatus*			*5*	II				x	x
Insect	Two-spotted Skipper	*Euphyes bimacula*			4	II	G4	S1?	x	x	x
Insect	Variable Cuckoo Bumble Bee	*Bombus variabilis*			*3, 4*	I	G1	SNR		x	x
Insect	Wallace's Deepwater Mayfly	*Spinadis simplex*			*3*	II	G3	SNR			x
Insect	White-cloaked Tiger Beetle	*Eunota togata latilabris*			*5*	II	G5	S5		x	
Insect	Whiteish Sweat Bee	*Agopostemon sericeus*			*5*	II	G5	SNR		x	x
Insect	Whiting's Flat-headed Mayfly	*Heptagenia whitingi*			*3*	I	G2	SNR			x
Insect	Whitney's Underwing	*Catocala whitneyi*			3	II	G3	SNR		x	
Insect	Wiest's Sphinx Moth	*Euproserpinus wiesti*			*3*	II	G3	SNR			
Insect	Yellow Bumble Bee	*Bombus fervidus*			*3*	II	G3	SNR	x	x	x
Isopod	A cave obligate isopod	*Caecidotea metcalfi*			3,5	I	G1	SNR			x
Isopod	A cave obligate isopod	*Caecidotea tridentata*			3,5	I	G1	SNR			x
Isopod	Spring Plain Groundwater Isopod	*Caecidotea simulator*			3,5	I	G2	SNR			x
Isopod	Steeve's Cave Isopod	*Caecidotea steevesi*			3	II	G3	SNR			x
Mammals	Black-footed Ferret	*Mustela nigripes*	E	E	1,2,3	I	G1	S1	x	x	
Mammals	Black-tailed Prairie Dog	*Cynomys ludovicianus*			4	II	G4	S3	x	x	
Mammals	Cougar	*Puma concolor*			4	II	G5		x	x	x
Mammals	Eastern Spotted Skunk	*Spilogale putorius*		T	2	I	G4	S1	x	x	x
Mammals	Franklin's Ground Squirrel	*Poliocitellus franklinii*		SINC	2	II	G5	S2		x	x
Mammals	Fulvous Harvest Mouse	*Reithrodontomys fulvescens*			4	II	G5	S3			x
Mammals	Gray Fox	*Urocyon cinereoargenteus*			4	II	G5	S3			x
Mammals	Gray Myotis	*Myotis grisescens*	E	E	1,2,3	I	G4	S1B			x
Mammals	Little Brown Myotis	*Myotis lucifugus*			4	II	G3	S3			x
Mammals	Northern Long-eared Bat	*Myotis septentrionalis*	T	SINC	2,3	I	G1	S3		x	x
Mammals	Pallid Bat	*Antrozous pallidus*		SINC	2	II	G4	S1		x	
Mammals	Southern Bog Lemming	*Synaptomys cooperi*		SINC	2	II	G5	S4	x	x	x
Mammals	Southern Flying Squirrel	*Glaucomys volans*		SINC	2	II	G5	S3			x
Mammals	Spotted Ground Squirrel	*Xerospermophilus spilosoma*			4	II	G5	S3	x		
Mammals	Swamp Rabbit	*Sylvilagus aquaticus*			4	II	G5	SH			x
Mammals	Swift Fox	*Vulpes velox*			3	II	G3	S3	x	x	
Mammals	Texas Deermouse	*Peromyscus attwateri*		SINC	2,5	II	G5	S2			x
Mammals	Townsend's Big-eared Bat	*Corynorhinus townsendii*		SINC	2,3	II	G3	S2		x	
Mammals	Tricolored Bat	*Perimyotis subflavus*			3	I	G2	S4		x	x
Mammals	Western Small-footed Myotis	*Myotis ciliolabrum*			4	II	G5	S2S3B	x		
Mammals	Yellow-faced Pocket Gopher	*Cratogeomys castanops*			4,5	II	G5	S3	x		

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Species of Greatest Conservation Need

Group	Common Name	Scientific Name	Federal Status	State Status	Selection Criteria	Tier	G Rank (Rounded)	S Rank	Conservation Region		
									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Mussels	Bleufer	*Potamilus purpuratus*			4	II	G5	S3			x
Mussels	Butterfly	*Ellipsaria lineolata*		T	2	I	G4	S1			x
Mussels	Creeper	*Strophitus undulatus*		SINC	2,4	II	G5	S2		x	x
Mussels	Cylindrical Papershell	*Anodontoides ferussacianus*		E	2	I	G5	S1?	x	x	
Mussels	Deertoe	*Truncilla truncata*		SINC	2	II	G5	S1S2			x
Mussels	Elktoe	*Alasmidonta marginata*		E	2	I	G4	S1			x
Mussels	Ellipse	*Venustaconcha ellipsiformis*		E	2	I	G4	S1			x
Mussels	Fatmucket	*Lampsilis siliquoidea*		SINC	2	II	G5	S1S2			x
Mussels	Fawnsfoot	*Truncilla donaciformis*		SINC	2	II	G5	S2		x	x
Mussels	Flat Floater	*Utterbackiana suborbiculata*		E	2	I	G5	S1			x
Mussels	Flutedshell	*Lasmigona costata*		T	2	I	G5	S1		x	x
Mussels	Lilliput	*Toxoplasma parvum*			4	II	G5	S2S3			x
Mussels	Mucket	*Actinonaias ligamentina*		E	2,4	I	G5	S1			x
Mussels	Neosho Mucket	*Lampsilis rafinesqueana*	E	E	1,2,3,4,5	I	G1	S1			x
Mussels	Ouachita Kidneyshell	*Ptychobranchus occidentalis*		T	2,3,4,5	I	G3	S1			x
Mussels	Pink Heelsplitter	*Potamilus alatus*			4	II	G5	S2S3			x
Mussels	Plain Pocketbook	*Lampsilis cardium*			4	II	G5	S3			x
Mussels	Pondhorn	*Uniomerus tetralasmus*			4	II	G5	S3S4	x	x	
Mussels	Purple Wartyback	*Cyclonaias tuberculata*			4	II	G5	S1			x
Mussels	Rabbitsfoot	*Theliderma cylindrica*	T	E	1,2,3,4	I	G3	S1			x
Mussels	Rock-Pocketbook	*Arcidens confragosus*		T	2	I	G4	S1			x
Mussels	Round Pigtoe	*Pleurobema sintoxia*		SINC	2	II	G4	S2			x
Mussels	Snuffbox	*Epioblasma triquetra*	E	SINC	1,2,3,4	I	G3	SX			x
Mussels	Spike	*Eurynia dilatata*		SINC	2	II	G5	S2S3			x
Mussels	Spectaclecase	*Cumberlandia monodonta*	E		1	I	G3	SX			
Mussels	Wabash Pigtoe	*Fusconaia flava*			2	II	G5	S3		x	x
Mussels	Wartyback	*Quadrula nodulata*		SINC	2	II	G4	S2			x
Mussels	Washboard	*Megalonaias nervosa*		SINC	2	II	G5	S2			x
Mussels	Western Fanshell	*Cyprogenia aberti*	C	E	1,2,3,4	I	G2	S1			x
Mussels	Yellow Sandshell	*Lampsilis teres*		SINC	2	II	G5	S2S3		x	x
Planarians	Kansas Planarian	*Sphalloplana kansensis*			3,5	I	G1	S1S2			x
Plants	American Ginseng	*Panax quinquefolius*			3	II	G3	S1			x
Plants	Buffalo Clover	*Trifolium reflexum*			3	II	G3	S2			x
Plants	Bush’s Poppy-mallow	*Callirhoe bushii*			3,5	II	G3	S1			x
Plants	Deceptive Leatherwood	*Dirca decipiens*			3	I	G1	S1			x

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Species of Greatest Conservation Need

Group	Common Name	Scientific Name	Federal Status	State Status	Selection Criteria	Tier	G Rank (Rounded)	S Rank	Conservation Region		
									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Plants	Delta Bulrush	*Schoenoplectus deltarum*			3	II	G3	S1			x
Plants	Earleaf False Foxglove	*Agalinis auriculata*			3	II	G3	S2			x
Plants	Engelmann's Goldenweed	*Oonopsis engelmannii*			3	II	G3	S1	x	x	
Plants	Goldenseal	*Hydrastis canadensis*			3	II	G3	S1			x
Plants	Great Plains Ladies'-tresses	*Spiranthes magnicamporum*			3	II	G3	S2		x	x
Plants	Hall's Bulrush	*Schoenoplectiella hallii*			3	II	G3	S1	x		
Plants	Hancin's Dewberry	*Rubus hancinianus*			3,5	II	G3	S2		x	x
Plants	Howard's Evening-primrose	*Oenothera howardii*			3	II	G3	S1	x		
Plants	Kansas Arrowhead	*Sagittaria ambigua*			3	I	G2	S2		x	x
Plants	Mead's Milkweed	*Asclepias meadii*	T		1,3	I	G2	S2			x
Plants	Missouri Mud-plantain	*Heteranthera missouriensis*			3	II	G3	S2		x	x
Plants	Narrowleaf Morning-glory	*Ipomoea shumardiana*			3,5	I	G2	S1			x
Plants	Oklahoma Grass-pink	*Calopogon oklahomensis*			3	I	G2	S1			x
Plants	Oklahoma Phlox	*Phlox oklahomensis*			3,5	II	G3	S2		x	x
Plants	Osage Plains False Foxglove	*Agalinis densiflora*			3,5	II	G3	S2			x
Plants	Pale False Foxglove	*Agalinis skinneriana*			3	II	G3	S1			x
Plants	Prairie Fameflower	*Talinum rugospermum*			3	II	G3	S2		x	
Plants	Royal Catchfly	*Silene regia*			3	II	G3	SH			x
Plants	Running Buffalo Clover	*Trifolium stoloniferum*	E		1,3	I	G3	SH			x
Plants	Sand-dune Broomspurge	*Chamaesyce carunculate*			3,5	II	G3	S1		x	
Plants	Sandhill Goosefoot	*Chenopodium cycloides*			3,5	II	G3	S2	x		
Plants	Sandsage Prairie-clover	*Delea cylindriceps*			3,5	II	G3	S2	x		
Plants	Smooth Goosefoot	*Chenopodium subglabrum*			3	II	G3	SH	x	x	
Plants	Taper-tip Dodder	*Cuscuta attenuate*			3,5	I	G2	SH			x
Plants	Texas Fescue	*Festuca versuta*			3,5	II	G3	S1			x
Plants	Topeka Purple-coneflower	*Echinacea atrorubens*			3,5	II	G3	SNR			x
Plants	Western Prairie White-fringed Orchid	*Platanthera praeclara*	T		1,3	I	G3	S1			x
Reptiles	Broad-headed Skink	*Plestiodon laticeps*		T	2	I	G5	S2			x
Reptiles	Checkered Garter-snake	*Thamnophis marcianus*		T	2,5	I	G5	S2	x	x	
Reptiles	Chihuahuan Night-snake	*Hypsiglena jani*		SINC	2,5	II	G5	S2		x	
Reptiles	Coal Skink	*Plestiodon anthracinus*			4	II	G5	S3			x
Reptiles	Eastern Hog-nosed Snake	*Heterodon platirhinos*		SINC	2	II	G5	S4	x	x	x
Reptiles	Glossy Snake	*Arizona elegans*		SINC	2	II	G5	S4	x	x	
Reptiles	Ground-snake	*Sonora semiannulata*			4	II	G5	S3	x	x	
Reptiles	Lesser Earless Lizard	*Holbrookia maculata*			4	II	G5	S3	x	x	

Appendix 2
Species of Greatest Conservation Need

Group	Common Name	Scientific Name	Federal Status	State Status	Selection Criteria	Tier	G Rank (Rounded)	S Rank	Conservation Region		
									Shortgrass Prairie	Central MixedGrass Prairie	Eastern Tallgrass Prairie
Reptiles	Long-nosed Snake	*Rhinocheilus lecontei*		SINC	2	II	G5	S3	x	x	
Reptiles	Western Massasauga	*Sistrurus tergeminus*			3,4	II	G3	S3S4	x	x	x
Reptiles	New Mexico Threadsnake	*Rena dissecta*		T	2,5	I	G4	S3	x	x	
Reptiles	Plains Hog-nosed Snake	*Heterodon nasicus*		SINC	2	II	G5	S5	x	x	x
Reptiles	Prairie Rattlesnake	*Crotalus viridis*			4	II	G5	S5	x	x	
Reptiles	Red-bellied Snake	*Storeria occipitomaculata*		SINC	2	II	G5	S2			x
Reptiles	Rough Earthsnake	*Haldea striatula*		SINC	2	II	G5	S2			x
Reptiles	Smooth Earthsnake	*Virginia valeriae*		SINC	2	II	G5	S3			x
Reptiles	Smooth Greensnake	*Opheodrys vernalis*			4	II	G5	S1		x	x
Reptiles	Texas Horned Lizard	*Phrynosoma cornutum*			4	II	G4	S4	x	x	x
Reptiles	Timber Rattlesnake	*Crotalus horridus*			2	II	G4	S3			x
Turtles	Alligator Snapping Turtle	*Macrochelys temminckii*		SINC	2,3	II	G3	-		x	x
Turtles	Northern Map Turtle	*Graptemys geographica*		T	2	I	G5	S2			x
Turtles	Smooth Softshell	*Apalone mutica*			4	II	G5	S4	x	x	x

Appendix 3
Definitions of Natural Heritage conservation status ranks

Global Ranks (GRANK)

GRANKs are numeric ranks (G1 through G5) indicating the conservation status or relative endangerment globally of species or ecological communities. Primary factors used in determining rank for species are population size, number of occurrences, viability of occurrences, population trend, and threats. Secondary factors are geographic distribution, environmental specificity, protection and management, and intrinsic vulnerability.

G1 = **Critically imperiled –** At very high risk of extinction or elimination due to very restricted range, very few populations or occurrence, very steep declines, very severe threats, or other factors.

G2 = **Imperiled** – At high risk of extinctions or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

G3 = **Vulnerable** – At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

G4 = **Apparently Secure** – At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats or other factors.

G5 = **Secure** – At very low rick or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.

GU = **Unrankable –** Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

GNR = **Unranked** – Global rank not yet assessed.

State Ranks (SRANKS)

SRANKs are numeric ranks (S1 through S5) indicating the conservation status or relative endangerment within the state of species or ecological communities. Primary factors used in determining rank for species are population size, number of occurrences, viability of occurrences, population trend, and threats. Secondary factors are geographic distribution, environmental specificity, protection and management, and intrinsic vulnerability.

S1 = **Critically imperiled** – At very high risk of extirpation in the state due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors. Typically 5 or fewer occurrences or very few remaining individuals in the state.

S2 = **Imperiled** – At high risk of extirpation in the state due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors. Typically 6-20 occurrences or few remaining individuals in the state.

Appendix 3
Definitions of Natural Heritage conservation status ranks

S3 = **Vulnerable** – At moderate risk of extirpation in the state due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors. Typically 21 to 80 occurrences in the state.

S4 = **Apparently Secure** – At a fairly low risk of extirpation in the state due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors. Typically 81 to 300 occurrences in the state.

S5 = **Secure** – At very low or no risk of extirpation in the state due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats. More than 300 occurrences in the state.

S#S# = **Range Rank** – A numeric range rank (e.g. S2S3 or S1S3) is used to indicate any range of uncertainty about the status of the species.

SU = **Unrankable** – Currently unrankable due to lack or information or due to substantially conflicting information about status or trends.

SNR = **Unranked** – Subnational conservation status not yet assessed.

SNA = **Not Applicable** – A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

SX = **Presumed Extirpated** – Species or ecosystem is believed to be extirpated from the state.

SH = **Historical** – Species possibly extirpated from the state. Known from only historical records but still some hope of rediscovery.

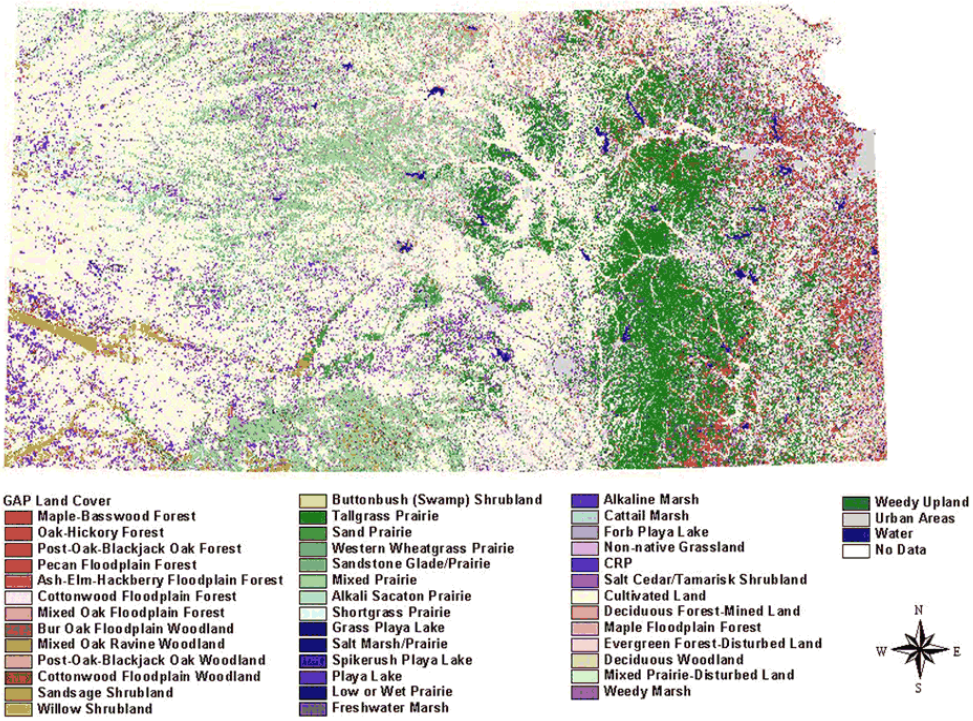
B = **Breeding** – Conservation status refers to the breeding population of the species in state.

N = **Non-breeding** – Conservation status refers to the non-breeding population of the species in the state.

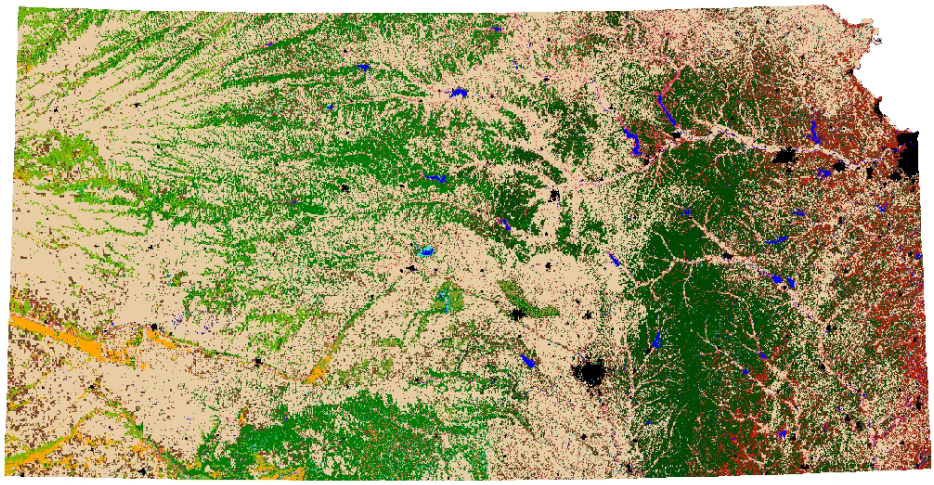
M = **Migrant** – Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient populations of the species in the state.

Appendix 4
Habitats and Descriptions

The original land cover categories of the Kansas Landcover Map from the Kansas GAP Analysis Project provided by the Kansas Applied Remote Sensing Program. 2002. Kansas Biological Survey, University of Kansas, Lawrence.



The collapsed broader categories of habitat types used for the Kansas Wildlife Action Plan.



Appendix 4
Habitats and Descriptions

Habitat Descriptions

The Kansas Wildlife Action Plan habitats are described below. These habitats are based on the land cover types in the Final Report of the Kansas GAP Analysis Project. Further information can be found in Appendix 2.2 of the GAP Final Report.

Deciduous Forest	The Deciduous Forest habitat is made up of the Maple – Basswood Forest, Oak- Hickory Forest, Deciduous Forest-Mined Land, Mixed Oak Ravine, Oak Savanna and Deciduous Woodland habitats. Together, they comprise two percent of Kansas' lands.
Bur Oak Woodland	The Bur Oak Woodland habitat is dominated by Bur Oak, Big Bluestem and Porcupine Needlegrass, mostly in small or linear patches, located in floodplains or adjacent to rivers and streams, in the Shortgrass and Central Mixed-grass Prairie Regions.
Deciduous Floodplain	The Deciduous Floodplain habitat is comprised of Pecan Floodplain Forest, Mixed Oak Floodplain Forest, Ash-Elm-Hackberry Floodplain Forest, Cottonwood Floodplain Forest, Maple Floodplain Forest, and the Cottonwood Floodplain Woodlands. These are temporarily flooded habitats. They comprise four percent of Kansas' lands.
Evergreen (cedar)	The Evergreen (cedar) habitat is Kansas GAP Forest Alliance habitat of Evergreen Forest – Disturbed Land. It consists of abandoned or neglected cropland upland sites in eastern and central KS that have been invaded by Eastern red cedar (*Juniperus virginiana*).
Sandsage Shrubland	Sand Sage, *Artemisia filifolia* is a primary species of the Sandsage Shrubland habitat. It comprises one percent of Kansas' lands.
Riparian Shrubland	The Riparian Shrubland habitat is a combination of Willow Shrubland (temporarily flooded), the (invasive) Salt Cedar or Tamarisk Shrubland of western KS, and Buttonbush Swamp (semi-permanently flooded).
Tallgrass Prairie	The Tallgrass Prairie habitat is comprised of the Tallgrass Prairieand Sandstone Glade/Prairie habitats located primarily in eastern Kansas. They comprise 13 percent of Kansas' lands.
Sand Prairie	The Sand Prairie habitat is located primarily in the central portion of Kansas. Sand Bluestem, *Andropogon hallii*, is a primary species.
Mixed Prairie	The Mixed Prairie habitat is a combination of the Western Wheatgrass Prairie, Mixed Prairie and the Mixed Prairie – Disturbed. Located primarily in the Smoky Hill and High Plains regions of Kansas, this habitat type comprises 12 percent of Kansas' lands.
Shortgrass Prairie	The Shortgrass Prairie habitat is made up of the Shortgrass Prairie and Alkali Sacaton Prairie. Located in the High Plains region of Kansas, they comprise three percent of Kansas' lands.

Appendix 4
Habitats and Descriptions

CRP Native Upland	The CRP Native Upland habitat is the former cultivated areas re-seeded with (usually) native tall and mid-tall grasses. The dominant plants are: *Andropogon gerardii, Schizachyrium scoparium, Sorghastrum nutans,* and *Panicum virgatum.* This habitat is found statewide, but is primarily in southwestern Kansas.
CRP Introduced Grass	The CRP/Introduced Grass habitat is made up of the Non-Native Grassland and CRP (Conservation Reserve Program). This habitat type covers 10 percent of Kansas' lands.
Herbaceous Wetland	The Herbaceous Wetland habitat is comprised of the KS-GAP Wetland Alliances of Grass Playa Lake, Salt Marsh/Prairie, Spikerush Playa Lake, Playa Lake, Low or Wet Prairie, Freshwater marsh, Cattail Marsh, Forb Playa Lake, Cordgrass and Weedy Marsh.
Cropland	The Cropland habitat includes all lands in active agricultural production, including row crops and hay. Cropland covers 48 percent of Kansas' lands.
Urban Areas	The Urban Areas habitat includes city, town and subdivisions. It also includes man-made features, such as road cuts, abandoned structures, bridges, storm sewers, mining operations, oil fields, farm buildings, strip pits, landfills, airports, and railroad and road Right of Ways. They comprise one percent of Kansas' lands.
Cave	Subterranean caverns, including Karst formations in Lower Permian limestone, located primarily in the southern part of Kansas, and gypsum caves in the Flint Hills.
Aquatic-Western Lotic (flowing waters)	Rivers, streams, and their tributaries in the Arkansas, Smoky Hill, Saline, Solomon and Republican River Basins in Western Kansas.
Aquatic-Western Lentic (still waters)	Ponds, lakes, oxbows, and reservoirs in the Arkansas, Smoky Hill, Saline, Solomon and Republican River Basins in western Kansas.
Aquatic-Eastern Streams/Small Rivers	Small rivers, streams, and their tributaries in the Neosho, Missouri, Verdigris, Eastern Walnut, Kansas, and Marais des Cygnes River Basins in eastern Kansas.
Aquatic-Eastern Lentic (still waters)	Ponds, lakes, oxbows, and reservoirs in the Missouri, Neosho, Verdigris, eastern Walnut, Kansas, and Marais des Cygnes River Basins in eastern Kansas.
Aquatic-Eastern Large Rivers	Large rivers such as the Missouri, Arkansas and Kansas Rivers.
Seeps and Springs	Sources of water that come from the ground. Seeps usually ooze slowly from between rock strata. They are found throughout Kansas.

Vulnerability to climate change has three principle components; sensitivity (innate characteristics of a species or system, considers tolerance to changes temp, precip, fire etc), exposure (extrinsic factors, magnitude and rate of change species/system experiences), and adaptive capacity (ability to accommodate with climate change impacts with minimal disruption).

Climate change vulnerability assessments provide two essential contributions to adaptation planning. Specifically, they help in: identifying *which* species or systems are likely to be more strongly affected by projected changes; and understanding *why* these resources are likely to be vulnerable, including the interaction between climate shifts and existing stressors. Determining which resources are most vulnerable enable managers to better set priority for conservation action, while understanding why they are vulnerable provides a basis for developing appropriate management and conservation responses. Climate change vulnerability assessments are intended to support decision-making. Possible adaptation approaches exists ranging from 1) building resistance to climate-related stressors 2) enhancing resilience in order to better change for accommodating change, and 3) anticipating and facilitating ecological transitions that reflect the changing environmental conditions.

NatureServe Climate Change Vulnerability Index (CCVI)

An assessment of the relative vulnerability, and the relative importance of factors contributing to that vulnerability was conducted for a number of the Species of Greatest Conservation Need (SGCN) using the NatureServe Climate Change Vulnerability Index (CCVI). This Microsoft Excel-based tool was chosen for this vulnerability assessment because it is time efficient, cost effective, easy to use, and the results are presented in a way that allows grouping of taxa or sensitivity factors. The Index uses a scoring system that integrates a species' predicted exposure to climate change within an assessment area and three sets of factors associated with climate change sensitivity, each supported by published studies: 1) indirect exposure to climate change, 2) species-specific factors (including dispersal ability, temperature and precipitation sensitivity, physical habitat specificity, interspecific interactions and genetic factors), and 3) documented response to climate change. The tool weighs each sensitivity score depending on the magnitude of projected climate change and calculates a final vulnerability index score (i.e., Extremely Vulnerable, Highly Vulnerable, Moderately Vulnerable, Not Vulnerable/Presumed Stable, or Not Vulnerable/Increase Likely), and a measure of confidence of the score (Very High, High, Moderate, Low). This confidence relates specifically to the level of uncertainty indicated by the assessor based on the range of values given for each factor.

The CCVI does not include factors that are already considered in existing conservation status assessments. Factors such as population size, range size, and demographic factors influence both conservation status and vulnerability to climate change. To avoid duplicating these factors, the NatureServe CCVI does not consider them. Conservation status ranks should therefore be used in concert with the Index output to aid in the interpretation of the results.

Complex interactions such as shifts in competitive, predator-prey, or host-parasite interaction are likely to be important as well, but they are not included in this rapid assessment because of the difficulty and unpredictability inherent in the simultaneous evaluation of climate change on interacting species.

Applying the CCVI to SGCN

Assessments were completed for at least 30% of species in each taxonomic group, choosing species with a variation in geographic location and habitat uses. A total of 83 of the SWAP second edition 285 SGCN were assessed using the CCVI. A detailed table of CCVI results, including the scores for each factor, the overall vulnerability score, and confidence for each species, is included in Table 2.

Species' range maps and natural history information were obtained from a number of sources including the Catalogue of American Amphibians and Reptiles (SSAR), Kansas Herpetofaunal Atlas, Kansas Mammal Atlas, KDWP Stream Survey and Assessment Database, Kansas Fishes (Kansas Fishes Committee 2014), FishMap.org, NatureServe Explorer, USGS GAP Species Maps, published articles and expert input.

Of the SGCN analyzed, many of the species that received a vulnerable index score (extreme, highly or moderately) were fish and mussels (Table 1.). The most common factors that influenced those fish species' vulnerability to climate change were; the distribution relative to barriers (anthropogenic and natural), impact of land use changes resulting from climate change mitigation, physiological hydrological niche, dependence on specific disturbance regime, and restriction to uncommon geological features. The vulnerable mussel species were influenced by the same factors as the fish, but their vulnerability to climate change was also influenced by their dependence on other species for propagule dispersal. In general species most vulnerable to climate change are typically considered specialist. They are dependent on certain habitats, climate conditions, and interactions with other species. A species mobility or ability to disperse also can greatly influence its vulnerability to climate change.

Climate Change Adaptation Strategies

Since it is difficult to make detailed recommendations given the uncertainties of; magnitude, rate, and nature of future climate change, uncertainties about how climate change will interact with other species/ecosystem stressors and the limited understanding of how species and ecosystems will respond to changes, the initial adaptation strategies listed here are fairly broad. As climate predictions become more developed and knowledge of species' responses to climate change increase, more detailed strategies can be developed.

(from the NFWP Climate Adaptation Strategy 2012)

1. Conserve habitat to support healthy fish, wildlife, and plant populations and ecosystem functions in a changing climate.
2. Manage species and habitats to protect ecosystem functions and provide sustainable cultural, subsistence, recreational, and commercial use in a changing climate.
3. Enhance capacity for effective management in a changing climate.
4. Support adaptive management in a changing climate through integrated observation and monitoring and use of decision support tools

5. Increase knowledge and information on impacts and responses of fish, wildlife, and plants to a changing climate
6. Increase awareness and motivate action to safeguard fish, wildlife, and plants in a changing climate.
7. Reduce non-climate stressors to help fish, wildlife, plants and ecosystems adapt to a changing climate.

Table 1. Species of Greatest Conservation Need with a vulnerable (extreme, highly or moderately) NatureServe Climate Change Vulnerability Index score.

TAXA	COMMON NAME	SCIENTIFIC NAME
Extremely Vulnerable		
Fish	Hornyhead Chub	*Nocomis biguttatus*
Invert-Insect	Scott Riffle Beetle	*Optioservus phaeus*
Invert-Mollusk	Sharp Hornsnail	*Pleurocera acuta*
Invert-Other	Butterfly	*Ellipsaria lineolata*
Invert-Other	Cylindrical Papershell	*Anodontoides ferussacianus*
Invert-Other	Flat Floater	*Utterbackiana suborbiculata*
Invert-Other	Lilliput	*Toxolasma parvus*
Invert-Other	Mucket	*Actinonaias ligamentina*
Invert-Other	Neosho Mucket	*Lampsilis rafinesqueana*
Invert-Other	Pink Heelsplitter	*Potamilus alatus*
Invert-Other	Washboard	*Megalonaias nervosa*
Invert-Other	Western Fanshell	*Cyprogenia aberti*
Invert-Other	Yellow Sandshell	*Lampsilis teres*
Highly Vulnerable		
Bird	Bobolink	*Dolichonyx oryzivorus*
Fish	Brindled Madtom	*Noturus miurus*
Fish	Silver Chub	*Macrhybopsis storeriana*
Fish	Southern Redbelly Dace	*Chrosomus erythrogaster*
Fish	Topeka Shiner	*Notropis topkea*
Fish	Blue Sucker	*Cycleptus elongatus*
Fish	Common Shiner	*Luxilus cornutus*
Fish	Neosho Madtom	*Noturus placidus*
Invert-Mollusk	Delta Hydrobe	*Probythinella emarginata*
Invert-Mollusk	Slender Walker	*Potatiopsis lapidaria*
Mammal	Southern Flying Squirrel	*Glaugomys volans*
Moderately Vulnerable		
Bird	American Avocet	*Recurvirostra americana*
Fish	Northern Hog Sucker	*Hypentelium nigricans*
Fish	Paddlefish	*Polyodon spathula*
Fish	Redfin Darter	*Etheostoma whipplei*

Fish	Shovelnose Sturgeon	*Scaphirhynchus platorynchus*
Fish	Brassy Minnow	*Hybognathus hankinsoni*
Fish	Plains Minnow	*Hybognathus placitus*
Fish	Spotted Gar	*Lepisosteus oculatus*
Fish	Spotted Sucker	*Minytrema melanops*
Fish	Orangethroat Darter	*Ethoestoma spectabile*
Fish	Stonecat	*Noturus flavus*
Invert-Insect	American Burying Beetle	*Nicrophorus americanus*
Invert-Insect	Arogos Skipper	*Atrytone arogos*
Invert-Insect	Gray Petaltail	*Tachopteryx thoreyi*
Mammal	Yellowfaced Pocket Gopher	*Cratogeomys castanops*

The following articles are good sources of additional information on potential impacts of climate change on species and ecosystems, and possible conservation strategies.

- AFWA (Association of Fish and Wildlife Agencies). 2009. Voluntary guidance for state to incorporate climate change into state wildlife action plans and other management plans. 42 pp.
- Glick, P., B.A. Stein, and N.A. Edelson, editors. 2011. Scanning the conservation horizon: a guide to climate change vulnerability assessment. National Wildlife Federation, Washington D.C.
- Melillo, J.M., T.C. Richmon, and G.W. Yohe, Eds. 2014. Climate change impacts in the United States: The third national climate assessment. U.S. Global Change Research Program. 841pp.
- National Fish, Wildlife and Plants Climate Adaptation Partnership. 2012. National Fish, Wildlife and Plants Climate Adaptation Strategy.
- Parmeson, C. 2006. Ecological and evolutionary repsonses to recent climate change. Annual Review of Ecology, Evolution, and Systematics 37: 637-669.
- Parra, N., C. Horin, M. Ruth, K. Ross, and D. Irani. 2008. Economic impacts of climate change on KS. A review and assessment conducted by the Center for Integrative Environmental Research. University of Maryland. 18pp.
- Staudinger, M.D., N.B. Grimm, A. Staudt, S.L. Carter, F. Suart Chapin III, P. Kareiva, M. Ruckelshaus, B.A. Stein. 2012. Impacts of climate change on biodiversity, ecosystems and ecosystem services; technical input to the 2013 National Climate Assessment. Cooperative Report to the 2013 National Climate Assessment. 269pp.
- Stein, B.A, P. Glick, N. Edelson, and A. Staudt. Eds. 2014. Climate smart conservation: putting adaptation principles into practice. National Wildlife Federation. Washington, D.C.

Appendix 5
NatureServe Climate Change Vulnerability Index
Assessment Results for the Species of Greatest Conservation Need

Table 2. The results of NatureServe Climate Change Vulnerability Index on the selection of Species of Greatest Conservation Need including the scores for each factor, the overall vulnerability score, and confidence for each species

					Natl barriers	Anth barriers	CC mitigation	Dispersal/Movement	historical thermal niche	physiological thermal niche	historical hydrological niche	physiological hydrological niche	Disturbance	Ice/snow	Phys habitat	Other spp for hab	Diet	Pollinators	Other spp disp	Other spp interaction	Genetic var	Gen bottleneck	Phenol response	Doc response	Modeled change	Modeled overlap	Protected Areas		
Group	**Species**	**English Name**	**GRank**	**SRank**	**B2a**	**B2b**	**B3**	**C1**	**C2ai**	**C2aii**	**C2bi**	**C2bii**	**C2c**	**C2d**	**C3**	**C4a**	**C4b**	**C4c**	**C4d**	**C4e**	**C5a**	**C5b**	**C6**	**D1**	**D2**	**D3**	**D4**	**Index**	**Conf.**
Amphibian	*Ambystoma tigrinum*	Tiger Salamander	G5	G5	N	N	SD	N	N	N	N	SI-N	N	N	SD	N	N	N/A	N	N	SI-N	N/A	U	N	U	U	U	PS	Mod
Amphibian	*Pseudacris streckeri*	Strecker's Chorus Frog	G5	S2	N	N	SD	N	N	N-SD	N	SI-N	N	N	N	N	N-SD	N/A	N	N	SI-N	N/A	N	N	U	U	U	IL	Low
Bird	*Centronyx henslowii*	Henslow's Sparrow	G4	S3B	N	N	N	Dec	N	SI	N	SI	SI-N	N	SD	N	N	N/A	N	N	N	N/A	U	U	SI-N	U	U	PS	VH
Bird	*Ammodramus savannarum*	Grasshopper Sparrow	G5	S5B	N	N	N	Dec	N	SI	SI-N	SI	N	N	SD	N	N	N/A	N	N	U	N	U	U	SI	U	U	PS	VH
Bird	*Anas acuta*	Northern Pintail	G5	S1BS5N	N	N	N	Dec	N	N	SI-N	Inc	N	N	SD	N	N	N/A	N	N	SD	N/A	N	SI	U	U	U	IL	VH
Bird	*Antrostomus vociferous*	Eastern Whip-poor-will	G5	S3B	N	N	N	Dec	N	N	N-SD	SI	N	N	SD	N	N	N/A	N	N	U	N	U	U	N	U	U	IL	VH
Bird	*Athene cunicularia*	Burrowing Owl	G4	S3B	N	N	N	Dec	N	N	SI-N	SD	N	N	SD	SI	N	N/A	N	N	N	N/A	N	U	U	U	Inc	PS	VH
Bird	*Bartramia longicauda*	Upland Sandpiper	G5	S4B	N	N	SI	Dec	N	SI	SI-N	U	U	N	SD	N	N	N/A	N	N	U	U	U	U	U	U	U	PS	VH
Bird	*Botaurus lentiginosus*	American Bittern	G4	S1B	N	N	N	Dec	N	N	SI-N	Inc-SI	N	N	N	N	N	N/A	N	N	U	N	N	U	U	U	U	PS	VH
Bird	*Buteo regalis*	Ferruginous Hawk	G4	S2BS4N	N	N	SI	Dec	N	SI	SI-N	SD	N	N	SI-N	N	SI	N/A	N	N	U	N	U	U	U	U	U	PS	VH
Bird	*Calamospiza melanocorys*	Lark Bunting	G5	S5B	N	N	SI	Dec	N	SI	SI-N	N	N	N	SD	N	N	N/A	N	N	U	N	U	U	U	U	U	PS	VH
Bird	*Calidris fuscicollis*	White-rumped Sandpiper	G5	S4N	N	N	N	Dec	N	N	SI-N	U	N	N	SD	N	N	N/A	N	N	U	U	U	U	U	U	U	IL	VH
Bird	*Charadrius nivosus*	Snowy Plover	G3	S1B	N	N	N	Dec	N	N	N	SI-SD	SI-SD	N	SI-N	N	N	N/A	N	N	U	N	N	U	U	U	U	IL	Low
Bird	*Dolichonyx oryzivorus*	Bobolink	G5	S1B	N	N	N	Dec	N	SI	SI-N	SI	N	N	SD	N	N	N/A	N	N	U	N	U	U	GI	GI	Inc	HV	VH

Appendix 5
NatureServe Climate Change Vulnerability Index
Assessment Results for the Species of Greatest Conservation Need

Bird	*Geothlypis formosa*	Kentucky Warbler	G5	S3B	N	N	N	Dec	N	N	N-SD	SI-N	N	N	SD	N	N	N/A	N	N	U	N	U	U	N	N	U	IL	VH
Bird	*Haliaeetus leucocephalus*	Bald Eagle	G5	S2BS4N	N	N	N	Dec	N	SI-N	SI-N	SI	N	SI	SD	N	N	N/A	N	N	U	N	N	U	U	U	U	PS	VH
Bird	*Icterus galbula*	Baltimore Oriole	G5	S5B	N	N	N	Dec	N	SI	SI-N	N	N	N	Dec	N	N	N/A	N	N	U	N	U	U	U	U	U	IL	VH
Bird	*Laterallus jamaicensis*	Black Rail	G3	S1BS1N	N	N	N	Dec	N	N	N	GI	SI	N	SI-N	N	SD	N/A	N	N	U	U	N	U	U	U	U	PS	VH
Bird	*Limosa haemastica*	Hudsonian Godwit	G4	S3N	N	N	SI	Dec	N	N	N	Inc-SI	N	N	SI	N	N	N/A	N	N	U	N	N	U	U	U	U	PS	VH
Bird	*Melanerpes erythrocephalus*	Red-headed Woodpecker	G5	S5B	N	N	N	Dec	N	N	SI-N	SI	N	N	SD	N	N	N/A	N	N	U	N	U	U	SI	U	U	IL	Low
Bird	*Numenius americanus*	Long-billed Curlew	G5	S1BS2N	N	N	SI-N	Dec	N-SD	N	SI	SI	N	N	SD	N	N	N/A	N	N	U	N	U	U	U	U	U	PS	Mod
Bird	*Passerina ciris*	Painted Bunting	G5	S4B	N	N	N	Dec	N	SD	N	N	N	N	SD	N	SD	N/A	N	N	U	N	U	U	SD-Dec	SI	U	IL	VH
Bird	*Recurvirostra americana*	American Avocet	G5	S2BS3N	N	N	N	Dec	N	N	SI-N	GI	SI-N	N	SI	N	N	N/A	N	N	U	N	N	U	U	U	U	MV	Mod
Bird	*Sternella magna*	Eastern Meadowlark	G5	S5	N	N	SI-N	Dec	N	N	N	SI	N	N	SD	N	SD	N/A	N	N	U	N	U	U	SI	N	U	IL	VH
Bird	*Sternula antillarum*	Least Tern	G4	S1B	N	N	N	Dec	N	SI-N	N	SI	SI	N	N	N	N	N/A	N	N	U	U	N	U	U	U	U	PS	VH
Bird	*Tymhanuchus cupido*	Greater Prairie-chicken	G4	S4	N	N	Inc-SI	Dec	N-SD	N	N	SI-N	SI-N-	N	SD	N	SD	N/A	N	N	N	N/A	N	U	N	N	U	IL	Mod
Bird	*Tyrannus forficatus*	Scissor-tailed Flycatcher	G5	S4B	N	N	N	Dec	N	SD	N	N	N	N	SD	N	N	N/A	N	N	U	N	U	U	N	N	Inc	PS	VH
Bird	*Tyrannus verticalis*	Western Kingbird	G5	S5B	N	N	N	Dec	N	SI-N	SI-N	SD	N	N	SD	N	N	N/A	N	N	N	N/A	U	U	U	U	U	IL	VH
Bird	*Vireo bellii*	Bell's Vireo	G5	S4B	N	N	N	Dec	N	N	SI-N	N	N	N	SD	N	N	N/A	N	N	U	N	U	U	SD	N	U	IL	VH
Bird	*Zonotrichia querula*	Harris's Sparrow	G5	S4N	N	N	N	Dec	N	SI	SI-N	SI-N	N	N	SD	N	N	N/A	N	N	U	N	U	U	U	U	U	PS	Mod
Fish	*Chrosomus erythrogaster*	Southern Redbelly Dace	G5	S2S3	GI-Inc	GI-Inc	SI-N	N	N	SI	N	SI-N-SD	SI-N	N	SI-N	SI-N	SD	N/A	N	N	U	N	N	N	U	U	U	HV	Mod
Fish	*Cycleptus elongatus*	Blue Sucker	G3	S3	GI-Inc	GI-Inc	SI-N	SD-Dec	N	N-SD	N	Inc-SI	SI-N	N	N	N	N	N/A	N	N	U	N	U	U	U	U	U	HV	Low
Fish	*Etheostoma cragini*	Arkansas Darter	G3	S2	Inc	Inc	SD	N-SD	N	SI	N	SI	N	N	N	N	N	N/A	N	N	U	U	N	SI	U	U	U	PS	VH
Fish	*Etheostoma whipplei*	Redfin Darter	G4	S3	Inc	Inc	SI-N	N-SD	N	N	N-SD	SI-N	SI-N	N	SI	N	N	N/A	N	N	U	N	U	N	U	U	U	MV	Mod
Fish	*Ethoestoma spectabile*	Orangethroat Darter	G5	S5	SI	SI	N	N	N	N	N	SI	SI-N	N	N	N	N	N/A	N	U	N	N/A	N	N	U	U	U	MV	VH
Fish	*Fundulus kansae*	Northern Plains Killifish	G5	S3	SI	SI	SI	SD	N	N-SD	SI-N	N	SI	N	SD	N	N	N/A	N	N	U	N	N	SI	U	U	U	PS	Mod
Fish	*Hybognathus hankinsoni*	Brassy Minnow	G5	S1	Inc	Inc	N	N	N	N	SI-N	N	SI-N	N	SD	N	N	N/A	N	N	U	N	U	N	U	U	U	MV	VH
Fish	*Hybognathus placitus*	Plains Minnow	G4	S2S3	Inc	Inc	N-SD	SD-Dec	N	N	SI-N	Inc	Inc	N	SD	N	N	N/A	N	N	N	N/A	SD	U	U	U	U	MV	Low

Appendix 5
NatureServe Climate Change Vulnerability Index
Assessment Results for the Species of Greatest Conservation Need

Fish	*Hypentelium nigricans*	Northern Hog Sucker	G5	S1	Inc	Inc	SI-N	SD	N	N	N-SD	SI-N	SI-N	N	SI	N	N	N/A	N	N	U	N	U	N	U	U	U	MV	Mod
Fish	*Lepisosteus oculatus*	Spotted Gar	G5	S1S2	Inc-SI	Inc-SI	SI-N	SD-Dec	N	N	N-SD	SI-N	SI-N	N	N-SD	SI-N	N	N/A	N	N	U	N	U	N	U	U	U	MV	Low
Fish	*Luxilus cornutus*	Common Shiner	G5	S4	Inc	Inc	N	N-SD	N	N	N	SI-N	SI	N	SI	SI-N	N	N/A	N	N	U	SI	N	SI	U	U	U	HV	High
Fish	*Macrhybopsis storeriana*	Silver Chub	G5	S3S4	Inc	Inc	SI-SD	SD-Dec	N	N	U	GI-Inc-SI	Inc-SI	N	N-SD	N	N	N/A	N	N	U	SI	SI	Inc	U	U	U	HV	VH
Fish	*Minytrema melanops*	Spotted Sucker	G5	S3	Inc	Inc	SI-N	SD-Dec	N	N	N	SI-N	SI-N	N	N-SD	N	SD	N/A	N	N	U	N	U	N	U	U	U	MV	Low
Fish	*Moxostoma erythrurum*	Golden Redhorse	G5	S5	Inc	Inc	SI-N	SD-Dec	N	N	N	SI-N	SI-N	N	SD-Dec	N	N	N/A	N	N	U	N	U	N	U	U	U	PS	Low
Fish	*Nocomis biguttatus*	Hornyhead Chub	G5	S1	Inc	Inc	SI-N	N	N	SI-N	N	SI	SI-N	N	SI-N	N	N-SD	N/A	N	SI-N	U	N	U	U	U	U	U	EV	Mod
Fish	*Notropis topkea*	Topeka Shiner	G3	S2	GI	GI	SI-SD	SI-N	N	SI	N	SI	SI	N	SI	SI	N	N/A	N	N	U	SI	U	SI	U	U	U	HV	VH
Fish	*Noturus flavus*	Stonecat	G5	S5	SI	SI	N	SI-N	N	N	N	SI	SI-N	N	SI-N	N	N	N/A	N	N	U	N	N	SI-N	U	U	U	MV	VH
Fish	*Noturus miurus*	Brindled Madtom	G5	S2	Inc	Inc	SI-N	N	N	N	N	SI-N	SI-N	N	SI-N	N	N	N/A	N	N	U	SI-N	U	SI-N	U	U	U	HV	High
Fish	*Noturus placidus*	Neosho Madtom	G2	S2	GI	GI	N	SI-N	N	N	N	Inc	SI	N	SI	N	N	N/A	N	N	U	N	N	N	U	U	U	HV	VH
Fish	*Polyodon spathula*	Paddlefish	G4	S3	Inc	Inc	SI-SD	Dec	N	N	N	Inc	SI-SD	N	N-SD	N	SI	N/A	N	N	U	N	U	N	U	U	U	MV	High
Fish	*Scaphirhynchus platorynchus*	Shovelnose Sturgeon	G4	S3	Inc	Inc	SI-N	SD-Dec	N	N	N	SI	N	N	N	N	N	N/A	N	N	U	SI	U	N	U	U	U	MV	VH
Invert-Insect	*Atrytone arogos*	Arogos Skipper	G3	S3S4	N	N	N	SD	N	N	SI-N	SI-N	SI-N	N	N-SD	Inc	SI	N/A	N	N	U	SI	U	U	U	U	Inc	MV	Mod
Invert-Insect	*Danaus plexippus*	Monarch	G5	S5B	N	N	N	Dec	N	N	SI-N	SI	N	N	SD	SI	SI	N/A	N	N	SD	N/A	N	U	U	U	U	PS	VH
Invert-Insect	*Gryllotalpa major*	Prairie Mole Cricket	G3	S3	N	N	SI	SD	N	N	N	SI	N	N	SI	N	N	N/A	N	N	U	N	N	U	U	U	U	PS	VH
Invert-Insect	*Hesperia ottoe*	Ottoe Skipper	G3	S2S3	N	N	N	SD	N	SI-N	SI-N	SI-N	N	N	SD	N	SI-N	N/A	N	N	U	N	U	U	U	U	U	PS	VH
Invert-Insect	*Nicrophorus americanus*	American Burying Beetle	G2	S1	N	N	N	SD	N	N	N-SD	SI	N	N	SI	N	SI-N	N/A	N	N	U	Inc	N	U	U	U	Inc	MV	VH
Invert-Insect	*Optioservus phaeus*	Scott Riffle Beetle	G1	S1	N	N	N	N	SD	GI	SI	SI	N	N	Inc	N	SI	N/A	N	N	U	Inc	N	U	U	U	U	EV	VH
Invert-Insect	*Somatochlora ozarkensis*	Ozark Emerald Dragonfly	G3	S1	N	N	N	SD	N	N	N	SI	SI-N	N	SI	N	N	N/A	N	N	U	N	N	U	U	U	U	PS	VH
Invert-Insect	*Speyeria idalia*	Regal Fritillary	G3	S4	N	N	N	SD	N	Inc	N	SI	N	N	SD	N	SI	N/A	N	N	N	N/A	U	U	U	U	U	PS	VH
Invert-Insect	*Tachopteryx thoreyi*	Gray Petaltail	G4	S1	N	N	N	SD	N	N	N	GI	N	N	Inc	N	N	N/A	N	N	U	SI	N	U	U	U	U	MV	VH
Invert-Mollusk	*Pleurocera acuta*	Sharp Hornsnail	G5	S1	Inc	Inc	N	Inc	N	SI	N	Inc	N	N	SI	N	N	N/A	N	N	U	U	U	U	U	U	U	EV	VH
Invert-Mollusk	*Potatiopsis lapidaria*	Slender Walker	G5	S1	GI	GI	N	GI	N	GI	N	GI	N	N	Inc	Inc	SI	N/A	N	N	U	U	U	U	U	U	U	HV	VH

Appendix 5
NatureServe Climate Change Vulnerability Index
Assessment Results for the Species of Greatest Conservation Need

Invert-Mollusk	*Probythinella emarginata*	Delta Hydrobe	G5	SNR	GI	GI	N	GI	N	GI	N	GI	N	N	Inc	Inc	SI	N/A	N	N	U	U	U	U	U	U	U	HV	VH
Invert-Other	*Actinonaias ligamentina*	Mucket	G5	S1	GI	GI	N	N	N	SI	N	Inc	SI	N	N	N	N	N/A	SI	N	U	N	N	U	U	U	U	EV	VH
Invert-Other	*Utterbackiana suborbiculata*	Flat Floater	G5	S1	Inc	Inc	N	N	N	N	N	GI	SI	N	SI	N	N	N/A	N	N	U	N	N	U	U	U	U	EV	VH
Invert-Other	*Anodontoides ferussacianus*	Cylindrical Papershell	G5	S1?	GI	GI	N	Inc	N	Inc	N	Inc	SI	N	N	N	N	N/A	SI	N	U	N	N	U	U	U	U	EV	VH
Invert-Other	*Cyprogenia aberti*	Western Fanshell	G2	S1	GI	GI	N	N	N	N	N	Inc	SI	N	N	N	N	N/A	Inc	N	U	N	N	U	U	U	U	EV	VH
Invert-Other	*Ellipsaria lineolata*	Butterfly	G4	S1	Inc	Inc	N	N	N	N	N-SD	Inc	SI	N	N	N	N	N/A	Inc	N	U	N	N	U	U	U	U	EV	VH
Invert-Other	*Lampsilis rafinesqueana*	Neosho Mucket	G2	GS1	GI	GI	N	N	N	N	N	Inc	SI	N	N	N	N	N/A	Inc	N	U	N	N	U	U	U	U	EV	VH
Invert-Other	*Lampsilis teres*	Yellow Sandshell	G5	S2S3	Inc	Inc	N	N	N	N	N	Inc	SI	N	N	N	N	N/A	SI	N	U	N	N	U	U	U	U	EV	VH
Invert-Other	*Megalonaias nervosa*	Washboard	G5	S2	Inc	Inc	N	N	N	N	N	Inc	SI	N	N	N	N	N/A	SI	N	U	N	N	U	U	U	U	EV	VH
Invert-Other	*Potamilus alatus*	Pink Heelsplitter	G5	S2S3	GI	GI	N	N	N	N	N	Inc	SI	N	N	N	N	N/A	Inc	N	U	N	N	U	U	U	U	EV	VH
Invert-Other	*Toxolasma parvus*	Lilliput	G5	S2S3	Inc	Inc	N	N	N	N	N	Inc	SI	N	N	N	N	N/A	SI	N	U	N	N	U	U	U	U	EV	VH
Mammal	*Corynorhinus townsendii*	Townsends Bigeared Bat	G3	S2	SI	SI	Inc	SD	N	Inc	N	SI-N	SI-N	N	Inc	N	N	N/A	N	N	SI	N/A	U	U	U	U	U	PS	Mod
Mammal	*Cratogeomys castanops*	Yellowfaced Pocket Gopher	G5	S3	Inc	Inc	SI-SD	SI-N	N-SD	SD	SI-N	SD	N	N	N	N	N	N/A	N	N	N	N/A	U	U	U	U	U	MV	Mod
Mammal	*Glaugomys volans*	Southern Flying Squirrel	G5	S3	SI	SI	SI-N	SI	N	N	N	N	Inc-SI	N	SD	SI	N-SD	N/A	N	N	SI	N/A	U	U	U	U	U	HV	Low
Mammal	*Myotis grisescens*	Gray Myotis	G3	S1B	N	N	Inc-SI	Dec	N	SI-N	SD	SI-N	SI-N	N	Inc	N	SI-N	N/A	U	N	U	U	U	U	U	U	U	PS	VH
Mammal	*Spilogale putorius*	Eastern Spotted Skunk	G4	S1	N	N	N	SD	N	N	SI-N	N	N	N	Dec	N	N-SD	N/A	N	N	U	U	U	U	U	U	U	IL	VH
Reptile	*Apalone mutica*	Smooth Softshell	G5	S3	N	N	N	N-SD	N	N-SD	N	SI-N	SI-N	N	SI-N	N	N-SD	N/A	N	N	SD	N/A	U	N	U	U	U	PS	Mod
Reptile	*Phrynosoma cornutum*	Texas Horned Lizard	G4	S3S4	N	N	N-SD	N	N	SD	N	N-SD	N	N	SD	N	SI	N/A	N	N	SD	N/A	U	N	U	U	U	IL	VH
Reptile	*Plestiodon laticeps*	Broad-headed Skink	G5	S2	Inc-SI	Inc-SI	SI-SD	SI-N	N	SD	N-SD	SD	SI-N	N	SI-N	N	N	N/A	N	N	U	U	U	N	U	U	U	PS	Low
Reptile	*Rhinocheilus lecontei*	Long-nosed Snake	G5	G3	N	N	SD	N	N	N-SD	SI-N	N	SI-N-	N	SD	N	SI-N	N/A	N	N	U	U	U	N	U	U	U	IL	Low
Reptile	*Sistrurus catenatus*	Massasuaga	G3	S3S4	N	N	SD	N-SD	N	N-SD	N	SI-N-SD	SI-SD	N	SD	N	N	N/A	N	N	SD	N/A	U	N	U	U	U	IL	VH

Appendix 5
NatureServe Climate Change Vulnerability Index
Assessment Results for the Species of Greatest Conservation Need

Factor Scores:
GI – Greatly Increase Vulnerability
Inc – Increase Vulnerability
SI – Somewhat Increase Vulnerability
N – Neutral
SD – Somewhat Decrease Vulnerability
Dec – Decrease Vulnerability
U – Unknown

Index Scores:
EV – Extremely Vulnerable: Abundance and/or range extent within geographical area assessed extremely likely to substantially decrease or disappear by 2050.
HV – Highly Vulnerable: Abundance and/or range extent within geographical area assessed likely to decrease significantly by 2050.
MV – Moderately Vulnerable: Abundance and/or range extent within geographical area assessed likely to decrease by 2050.
PS – Not Vulnerable/Presumed Stable: Available evidence does not suggest that abundance and/or range extent within the geographical area assessed will change (increase/decrease) substantially by 2050. Actual range boundaries may change.
IL – Not Vulnerable/Increase Likely: Available evidence suggests that abundance and/or range extent within geographical area assessed is likely to increase by 2050.
Confidence (in species information):
VH – Very High confidence
High – High confidence
Mod – Moderate confidence
Low – Low confidence

Color coding highlights factors that influence climate change vulnerability:
Red – Greatest influence in increasing vulnerability
Yellow – Moderate influence in increasing vulnerability
Green – Contributes to decrease in vulnerability

Success Story – Arkansas Darter

The Arkansas Darter is a stout-bodies member of the perch family. They prefer shallow, clear, spring-fed tributary and headwater streams having sand or sandy-gravel substrates. The Arkansas Darter was added to the USFWS candidate list in 1989 because of concern over its diminishing range. In 2016 USFWS concluded that listing the species was not warranted and removed it from candidate status. The work done by Kansas Department of Wildlife and Parks contributed greatly to that decision. KDWP's Stream Survey Program have been tracking the occurrences of the Arkansas Darter for 25 years. The removal of invasive red cedar trees in riparian and upland areas where Arkansas Darters habitat occurs has resulted in increased stream flow, with some perennial streams flowing for the first time in years. Once flow was restored to these prairie streams, the Arkansas Darter was typically one of the first species to reappear. Additionally, funding was provided for fish passage for dam replacement on the Arkansas River, allowing for connection of up- and downstream populations of Arkansas Darters.

Success Story – Lincoln Street Dam – Fish Passage Construction

Riverine habitat in Kansas has been highly fragmented in part because of barriers such as low-head dams. This fragmentation has led to the decline of several native fish species and very dissimilar fish assemblages about and below impoundments. A fishway was contructed as part of the renovation of the Lincoln Street Dam on the Arkansas River in the City of Wichita, with consultation from Kansas Department of Wildlife and Parks. The fishway was the first of its kind, built for passage of smaller-bodied fishes including multiple Species of Greatest Conservation Need recognized in the SWAP. Species benefitting from the contruction of the dam include the Plains Minnow, Silver Chub, Pepered Chub, Arkansas River Shiner, and the Arkansas Darter. Emerald Shiners were found upstream of the dam for the first time in 20 years. Post-construction monitoring of the fish community in the Arkansas River adjacent to the fish passage has documented 27 species of the fish using the passageway. The upstream fish assemblage more resembled the downstream assemblage not long after competition of the passageway

Engineers were able to incorporate aesthetic improvements and canoe and kayak passage as well. A project of this scope required considerable funding, as well as permits and zoning across multiple jurisdictions. Post construction monitoring was funded throught the State Wildlife Grants Program. Project partners included City of Wichita, U.S. Fish and Wildlife Service, MKEC Engineering, Federal Highway Administration, Kansas Department of Transporation, U.S. Coast Guard, University of Illinois – Ven Te Chow Hydrosystems Laboratory, and Kansas State University.

Success Story – Bald Eagles in Kansas

KDWP and a group of interested partners started a three-year study to collect information that will give wildlife managers and energy developers the data to make scientifically based decisions to address potential conflict between Bald Eagles and energy development infrastructure. The primary way to aquare these vital data is to telemeter Bald Eagles in Kansas to produce highly detailed data on where they fly and how they use airspace. The data will subsequently be analyzed in the context of topography, weather, land cover, and energy infrastructure, to gain an understanding of what environmental conditions and eagle responses to those conditions that may put them at risk from wind turbines, powerlines, and associated features.

In early May 2021, project partners came together to band and affix GPS transmitters on thirteen Bald Eagle nestlings in five different counties. The seven to nine-week nestlings were captured in the nest, lowered to the ground in bags, and fitted with both identification leg bands and GPS transmitters. These units will provide data on the bird's location, including altitiude at intervals of 3-5 seconds in flight and 15 minutes at roost. The data collected will provide intimate details of eagle travel and flight response to topography, land cover, and weather.

Success Story – Restoring Kansas River Connectivity

Stream fragmentation from in-stream barriers has been implicated as a primarty cause in the decline of many aquatic species. These effects are particularly impactful to fishes with pelagic spawning reproductive strategies. The Kansas River is formed by the confluence of the Smoky Hill and Republican rivers and is home to 19 Species of Greatest Conservation Need, several of which are pelagic spawning minnows like the Shoal Club, Silver Chub, and Plains Minnow. The Kansas River contains 3 barriers: the Topeka Weir (Topeka, KS), Bowersock Dam (Lawrence, KS), and WaterOne Weir (Kansas City, KS). To improve riverine habitat connectivity in the Kansas-Lower Republican Ecological Focus Area, Kansas Department of Wildlife and Parks partnered with the City of Topeka to alter their water supply weir to include fish passage. This effort was in conjunction with safety improvements to the low-head dam, as the Kansas River continues to see increased recreational use. Providing passage at the Topeka Weir combines 2 fragments (86 and 35 miles) of the Kansas River to form a larger fragment of 121 connected river miles. Such restoration efforts should improve reproduction and recruitment of SGCN species in the river and are necessary to make recovery possible for pelagic spawning species.

Success Story – Neosho Madtom in the Spring River

The Neosho Madtom is a small catfish listed as Threatened under the Endangered Species Act and under the Kansas Nongame and Endangered Species Conservation Act. In Kansas, the species is native to the Neosho River Basin (located in the Neosho River Ecological Focus Area) but has experience range reductions due to dam construction, gravel harvesting, and water quality impacts. Historically, the Neosho Madtom has been less abundanct in the Sping River mainstem compared to the Cottonwood and Neosho rivers. Reasons for lower density in the Spring River include different physiochemical conditions compated to the Neosho-Cottonwood system. Specifically, segments of the Spring River drain the Tri-State mining district, where lead (Pb), zinc (Zn), and coal mining were common practive during ~1850-1970. Drainage from previously mined areas results in elevated cadmium (Cd), Pb, and Zn concentrations in the Sping River and its tributaries and is hypothesized to be a primary reason why Neosho Madtoms are less numerous in the Spring River compared to the Neosho-Cottonwood River system. The Neosho-Cottonwood system maintained higher Neosho Madtom densities than the Sping River despite having greater fragmentation and flow regime modification resulting from three large reservoirs (i.e., Marion Reservoir, Council Grove Reservoir, and John Redmond Reservoir) and numerous lowhead dams. In contrast, the Sping river retains a natural flow regime and has a lower degree of fragmentation (i.e., no large reservoirs).

Recently, KDWP partnered with Pittsburg State University to complete a research project comparing Neosho Madtom densities between the Cottonwood-Neosho River system and the Spring River above and below sources of mining pollution. Results to date indicate that there is no significant difference in Neosho Madtom abundance between the Cottonwood-Neosho River system and the Sping River has allowed Neosho Madtom populations to improve considerably compared to studies completed in the 1990s. This is encouraging news, not just for the Neosho Madtom, but also for the dozens of other Species of Greatest Conservation Need in the Spring River. Improved water quality may allow for natural re-colonization or improved recruitment, and also paves the way for conservation propagation if necessary.

Appendix 7
Definitions

Aggressive – species are those that spread rapidly and can outcompete other species. They can be native or nonnative and may be aggressive in some situations, but not others. Eastern red cedar is an example of a native tree that can spread aggressively in open areas

Biodiversity – a contraction of "biological diversity", generally refers to the variety and variability of life on Earth. This can refer to genetic variation, ecosystem variation, or species variation with a specified region

Channelization – Mechanical redirecting a streambed in more or less a straight line

CRP – Conservation Reserve Program. A federal program that pays a yearly rental payment in exchange for farmers removing environmentally sensitive land from agricultural production and planting species that will improve environmental health and quality

Ecosystem – a biological community plus all of the abiotic factos influencing that community

Endangered species – species of plants or animals of concern that have the potential of becoming extinct

Endemic – native to or confined to a certain region. For this document, the term specifically refers to taxa that are limited to Kansas

Ephemeral – Channel or basin which carries water only during and immediately after periods of rainfall or snowmelt

Habitat – An ecological area inhabited by a particular organism, where the organism can find food, shelter, and reproductive opportunities

Invasive – species are aggressive, nonnative species whose presence causes or is likely to cause harm to the environment, economy, and/or human health. These species often grow, reproduce, and spread rapidly.

Issues – "Conservation issues" in this Plan is used in place of the term "conservation problems" whish was used by Congress in the legislation that authorized this program

Marsh – a type of wetland, featuring grasses, rushes, reeds, typhas, sedges, and other herbaceous plants in a context of shallow water

Native species – species occur within a region as the result of natural processes and are adapted to local environmental conditions. They have co-evolved with other native species and are critical to ecosystem functions

Nonnative species – species are those introduced to new place or new type of habitat. Historically, most of these introductions have resulted from human activities. Their presence can often have negative impacts on ecosystems. The words "exotic," "alien," and "introduced" are synonyms for "nonnative."

Nuisance – species are native to the local landscape but still can cause problems. For instance, raccoon are a native species but may become a problem when they repeatedly knock over your trash can or get into your chicken coop.

Appendix 7
Definitions

Playa – a desert basin with no outlet which periodically fills with water to form a temporary lake

Prescribed burning – planned burning by land management agencies under specific weather conditions to remove excess plant material and replicate natural fire regimes

Rare – species that occurs in very small numbers or at a very low density even within its primary habitat. These species are unlikely to be found in their habitat without extensive searching

Recruitment – reinforcement of a population of a species with new members through reproduction or immigration

Riparian habitat – transitional semiterrestrial areas regulary influenced by fresh water, usually extending from the edges of water bodies to the edges of upland communities

Seep – a generally small area where water percolates slowly to the ground surface, typically without a well-defined point of origin

Spring – the location where an underground source of water emerges from the ground, generally from a single point of origin

Strategy – strategies are termed “conservation actions” in this document

Theatened species – species of plants or animals of concern that have the potential of becoming endangered

Uncommon – species that occurs at a low to moderate density within its primary habitat. Often, these species require several hours of search time to locate within their occupied habitat

Watershed – also known as a catchment or basin, is a topographically delineated area drained by a stream system; that is, the total land area about some point on a stream or river than drains past the point

Wildlife – animals as a broad, all-inclusive group that live in the water or on land. They include arthropods, fish, reptiles, amphibians, freshwater mussels, birds, and mammals

Appendix 8
Road Map to 8 Required Elements

The following comments and passages describe how each required element was addressed in the revision of the State Wildlife Action Plan. Please refer to the following chapters and page numbers to examine how each required element was addressed.

Element 1	Chapter and Appendix	Tables and Figures	Comments
Information on the distribution and abundance of species of wildlife, including low and declining populations as the state deems appropriate, which are indicative of the diversity and health of the state's wildlife	Chapter 3 – Statewide Perspective Chapter 4 – Shortgrass Prairie Chapter 5 – Mixed Grass Prairie Chapter 6 – Tallgrass Prairie Appendix 2 – SGCN	Appendix 2 Table	Ch 4 provides a general distribution and abundance description of KS wildlife. Species distributions are specified in eacn ecoregion chapter (4-6) with species listed in each EFA they occur. Appendix 2 table provides species Natural Heritage conservation ranks which incorporate distribution and abundance factors

Element 2	Chapter and Appendix	Tables and Figures	Comments
Description of locations and relative conditions of key habitats and community types essential to conservation of species identified in (1).	Chapter 2-Methods Chapter 4-Shortgrass Prairie Chapter 5-Mixed Grass Prairie Chapter 6-Tallgrass Prairie Appendix 4	Figure 2. Figure 3. Figure 4. Figure 5. Figure 6. Figure 7. Figure 8.	Maps of all habitat types are in Ch 2 and Appendix 4. Maps, descriptions and relative condition of indivudal priority habitat types are in each ecoregion chapter (4-6). EFA map (figures 3-8) are considered priority landscapes for efficiently conserving KS biodiversity

Element 3	Chapter and Appendix	Tables and Figures	Comments
Description of problems which may adversely affect species identified in (1) or their habitats, and **priority research and survey efforts** needed to identify factors which may assist in restoration and improved conservation of these species and habitats.	Chapter 3-Statewide Perspective Chapter 4-Shortgrass Prairie Chapter 5-Mixed Grass Prairie Chapter 6-Tallgrass Prairie		Ch 3 lists conservation issues occurring statewide that directly threat biodiversity. It also lists issues that are not direct threats to biodiversity but hinder conservation efforts. The ecoregion chapters list more detailed issues considered priority for each EFA.

Appendix 8
Road Map to 8 Required Elements

Element 4	Chapter and Appendix	Tables and Figures	Comments
Description of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions.	Chapter 4-Shortgrass Prairie Chapter 5-Mixed Grass Prairie Chapter 6-Tallgrass Prairie		Conservation actions proposed to address conservation issues are found in the ecoregion chapter with each EFA section

Element 5	Chapter and Appendix	Tables and Figures	Comments
Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions.	Chapter 2-Methods Chapter 4- Shortgrass Prairie Chapter 5- Mixed Grass Prairie Chapter 6 – Tallgrass Prairie		Ch 2 provides general approaches for monitoring and adaptive management. The ecoregion chapters (4-6) provide details on monitoring species and habitats as conservation actions

Element 6	Chapter and Appendix	Tables and Figures	Comments
Description of procedures to review the strategy at intervals not to exceed ten years.	Chapter 7		Plan to review plan in 5 year intervals to address emerging issues, new information on changes in abundance, distribution, population trends, listing status of species, and habitat conditions

Appendix 8
Road Map to 8 Required Elements

Element 7	Chapter and Appendix	Tables and Figures	Comments
Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats.	Chapter 2-Methods Chapter 4- Shortgrass Prairie Chapter 5- Mixed Grass Prairie Chapter 6 – Tallgrass Prairie		Ongoing collaboration with our SWAP partners occurred through out the revision process. The ecoregion chapters (4-6) list current and potential conservation partners with which to collaborate.

Element 8	Chapter and Appendix	Tables and Figures	Comments
Provisions to ensure public participation in the development, revision, and implementation of projects and programs.	Chapter 2-Methods		Public participation was invited through news releases, exposure through Commission meetings, presentations at society meetings, and access to the plan on the Internet. Public review comments were evaluated by the technical committee with changes made by majority agreement. KDWP has and will maintain an open policy on submittal of projects for implementation