The Nature Conservancy

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Conserving the Biological Diversity of the Central Mixed-Grass Prairie

A PORTFOLIO DESIGNED FOR CONSERVATION ACTION

Al Steuter • Jennifer S. Hall • Mary Lammert Khoury

CONSERVING THE BIOLOGICAL DIVERSITY OF THE CENTRAL MIXED-GRASS PRAIRIE

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Front cover photograph:

- Nebraska Sandhills along the Niobrara River, Matt Bradley

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EXECUTIVE SUMMARY

The Central Mixed-Grass Prairie (CM-GP) region has long been known as a transition between the mesic tallgrass prairies to the east, and the arid shortgrass prairies to the west. The culture and land-use of the Central Mixed-Grass Prairie also has transitional qualities. A satellite view of the CM-GP reveals relatively large and distinct native landscapes remaining within a cropland matrix. In contrast, native grasslands become the landscape matrix to the west, while to the east a matrix of cropland is nearly exclusive. This Plan's priorities, strategies, and actions associated with conserving biological diversity reflect the current human and ecological underpinnings of the CM-GP landscape. **Importantly, we make any loss of size or increase in fragmentation of the most significant native landscapes unacceptable relative to achieving our conservation goals.**

The CM-GP region has three high quality native landscapes with compatible land-use histories distributed one each in the north, central, and south. These landscapes are regionally known as the Nebraska Sandhills, Kansas/Oklahoma Red Hills, and Oklahoma Granite Hills/Wichita Mountains, respectively. Numerous smaller and or lesser quality landscapes dominated with native vegetation occur throughout the region. These are the places where the primary ecological forces of climate, soils, weather, grazing, and fire still have the opportunity to interact to yield the dynamic spatial and temporal patterns required by the vast array of native plants, animals, and natural communities. They form the heart of the terrestrial conservation portfolio. Even in these areas, however, sound management by the predominately private landowners will need to recognize, and be fully vested in, the value of biological diversity. We know far less about the conservation needs of the aquatic ecological systems, aquatic communities, and aquatic species of the region. Their long-term conservation relies on a portfolio of sites which is much less intact, and much more threatened by the water demands and pollutants associated with modern socio-economic forces.

The CM-GP biological assessment describes conservation targets, and goals for each, at multiple scales. Nine terrestrial ecological systems were identified as targets within which the species common to the CM-GP are assumed to be conserved. All 69 native plant communities within the region were selected as targets. Of these, only one is consider endemic to the CM-GP, while two are uncommon and found mainly in other regions. Most of the native plant communities are either widespread (34) in the CM-GP and common in other regions as well, or have a distribution mainly limited (32) to the CM-GP though occurring in several adjacent regions. At the fine-scale, all terrestrial species listed as endangered or threatened under the Endangered Species Act, as well as all species ranked critically imperiled, imperiled, or vulnerable by NatureServe and the Natural Heritage Program Network, are considered conservation targets within the region. Additional bird species targets were identified using a combination of established lists and expert knowledge. The resulting list of terrestrial species targets includes 6 mammals, 19 birds, 3 reptiles, 6 insects, and 13 plants.

Conservation goals and viability assessment for terrestrial targets followed the guidelines set forth in Groves *et. al.* 2000a. The CM-GP was stratified into three planning units in order to consider the full range of ecological variation during the goal setting process. The large-scale and intense natural disturbance regimes, the generalized nature of the dominant native communities, and the resilience of the dominant native species argued for making size the over-riding consideration when assessing the viability ecological system targets. The goal for ecological systems was two per planning unit, while goals for natural communities and species were informed by guidelines established by other planning teams and modified based on expert knowledge of regional distribution, abundance, vulnerability, and threats. The judgement of an expert panel that there was a high likelihood that an

occurrence would persist for 100 years under current conditions was used as a viability threshold. Strict viability assessment for most target occurrences was not possible during this planning effort due to a lack of scientific understanding of how to assess viability for a particular target and/or a lack of resources to apply viability assessment criteria when they existed. We hope this planning effort will initiate research into the development of viability criteria for the targets and will prompt inventory efforts in which to apply the criteria.

Similar to the terrestrial targets, a coarse-filter approach was used to classify aquatic diversity at zoogeographic (3) and ecological drainage unit (9) levels based on lithology and landform. Smaller than the ecological drainage units, we recognized distinct aquatic assemblages of macrohabitats and species at a stream network scale as the aquatic ecological system. These systems are stream segments and small to medium sized lakes that are defined by unique combinations of co-occurring physical features, including size, elevation, gradient, connectivity, and upstream geology. Five size classes were defined *a priori* to distinguish headwater and creek systems, and small, medium, large, and extra large rivers.

We used a Geographic Information System (GIS) and assigned a value for size, geology, gradient, and position in the drainage network to all streams in the region. Then, a multivariate clustering analysis (PC-ORD) was used to evaluate the patterns of stream and lake macro-habitat within these catchments. The clustering algorithm grouped catchments with similar macro-habitat components. These clusters of unique aquatic system types were used as surrogates of biological diversity, and each catchment as a system occurrence.

The native fishes of the CM-GP region are relatively well known and not very distinct from nearby regions. In contrast, little is known about the conservation needs of the macro-invertebrate and smaller levels of biological diversity. An expert workshop identified 13 fish, five aquatic insects, and two herptiles that rely on aquatic habitats as conservation targets. In addition, seven natural assemblages of mussels, snails, and fishes were included in the selection of priority aquatic conservation areas.

Conservation goals were established and viability was assessed for aquatic conservation targets. We set a generalized goal for the number of viable occurrences desired in the final portfolio equal to 30% of known occurrences for size 1 through size 4 system types. Our goal for size 5 system types (large rivers) was one viable occurrence. GIS data were used to develop a multi-metric index of aquatic stressors. Maps of system-level indicators and index scores were developed for conservation planning purposes. Experts compared these maps with species and system occurrences to assess the likelihood that a target occurrence would persist for 100 years under current conditions.

The conservation portfolio for the CM-GP is focused on the significant untilled landscapes that occur in the region. In some cases terrestrial and aquatic areas are embedded within larger areas to reflect conservation targets with different scales. Given that these natural landscapes survived the development onslaught of the 20th century, we can assume they are places where the ecological, economic, and social forces are acting to re-enforce the viability of conservation targets. **We feel that this leverage cannot be lost if we are to achieve our conservation goal for the Central Mixed-Grass Prairie.**

The CM-GP portfolio is intended to represents all coarse-scale targets. In addition, the portfolio is intended to include multiple viable examples of other conservation targets across the range of major environmental gradients in the region in order to meet the conservation goals. Thus portfolio sites

should be thought of as *areas of biodiversity significance*. The terrestrial portfolio consists of 57 areas ranging in size from 34 acres to over 12 million acres. Total area of these sites is 24,483,088 acres or 41% of the region. The aquatic portfolio consists of watershed sites, and stream or river reaches. There are a total of 67 aquatic conservation areas in the CM-GP portfolio, with a total of total area 7,674,436 acres of watershed sites and 5,264 stream and river miles. The total area of all watershed and stream/river sites is 12,235,833 acres or 21% of the ecoregion.

At least one viable example of 47% of the CM-GP conservation targets is captured in the portfolio. Conservation goals were met or exceeded for 23% of the targets. This is clearly an underestimate of the number of targets captured and goals met by the portfolio, and is a direct result of the limited amount of target occurrence information available in the region. However, it was also agreed that due to the level of fragmentation in the region, there is little hope of meeting all conservation goals without extensive restoration efforts.

Conservation action in the CM-GP should be dedicated to building onto, rather than minimizing the loss of, the areas of biodiversity significance identified in this plan. As with the conservation portfolio, conservation action is envisioned as a nested set of activities at various scales. The critical large-scale conservation activities will need to be supported by local communities through non-governmental organizations such as the Sandhills Task Force, the Commanche Pool in the Red Hills, the Platte River Corridor Initiative, and the Loess Canyons Rangeland Alliance. These private-land, public agency partnerships are best suited for the long-term conservation required in the region. It will take the broad-based support engendered in these local groups to define and implement conservation appropriate development and agricultural practices. These groups will also be in the best position to work with private conservation groups to leverage their funds for maximum impact.

In the near-term, conserving the most unique and threatened elements of biological diversity will continue to be driven by conservation agencies – public and private. Restoring ecological systems and habitat for the most threatened conservation targets, as well as conducting the inventory and research needed to assure their viability will also need to be supported by the conservation community. However, in the Central Mixed-Grass Prairie region even these efforts must shortly gain the acceptance and support of the local human communities.

TABLE OF CONTENTS

FIGURES AND TABLES

FIGURES

TABLES

I. INTRODUCTION TO CONSERVATION BY DESIGN

Several years ago, The Nature Conservancy developed an overarching strategy for achieving its conservation mission. *Conservation by Design: A Framework for Mission Success*, defines our enterprise as "the long-term survival of all viable native species and community types through the design and conservation of portfolios of sites within ecoregions" (The Nature Conservancy 1996). More recently, the Conservancy has committed to achieving lasting, tangible results, at scale, with leverage, by conserving 2,500 sites identified through our conservation planning efforts, with special emphasis on 500 landscape scale sites. Inherent in this goal is the Conservancy's commitment toward the four-part **conservation approach**: setting priorities, developing strategies, taking action, and measuring success (Figure 1).

Figure 1. The Nature Conservancy's conservation approach.

SETTING PRIORITIES

Conservation planners at The Nature Conservancy set priorities through the selection and design of "portfolios of conservation areas within and across ecologically similar regions" (The Nature Conservancy 2000a). This process called **ecoregional planning** is complex and iterative. The end result is the identification of areas that comprehensively conserve the biological diversity of the region. These areas make up a "portfolio" of sites – and integrate the actions of the Conservancy with those of our partners.

The process starts with the identification of the important elements of biological diversity that will be used to select the final portfolio of conservation areas. These important elements, or **conservation targets**, represent critical biological resources at many scales. They include:

- terrestrial ecological systems,
- aquatic ecological systems,
- plant community associations, and
- rare plant and animal species.

After the conservation targets are selected, numeric **conservation goals** are established for each target. The goal represents the number of viable occurrences, *and* the spatial distribution of a target across the region, that is needed to maintain the population or system over the next 100 years.

Areas of biodiversity significance are drawn around the most viable examples of the conservation targets. Selection of these areas starts with the largest scale targets (ecological systems) for efficiency of target capture. The final **portfolio** includes all areas that most effectively meet the conservation goals. The highest priority areas in the portfolio are selected as the most important places for the Conservancy to work in the near-term.

After ecoregional planning establishes the regional conservation priorities, the next phases of the conservation approach begin – developing strategies and conservation area plans for high priority

areas, taking conservation action at these areas, and measuring the success of those actions. These three phases focus on a much smaller scale than this ecoregional planning effort – either on a single or sets of similar conservation areas. Conservation targets and ecosystem threats can be addressed in a more comprehensive and detailed manner at individual conservation areas. These next phases are vitally important to the conservation enterprise. It is through the finer-scale, more detailed conservation area planning that the data gaps and short falls in the first iteration of this plan can be resolved. Conservation planners then use the new information to review and revise the conservation priorities and process.

CENTRAL MIXED-GRASS PRAIRIE CONSERVATION PLAN

This plan will serve as a basis for immediate conservation action by The Nature Conservancy and its partners in the Central Mixed-Grass Prairie. In addition to a conservation action plan, this document serves as a list of survey and research needs in the region. It is intended that this first iteration of the Central Mixed-Grass Prairie conservation plan will guide The Nature Conservancy, state Natural Heritage Programs, State and Federal agencies and private partners in taking effective conservation action over the next five to ten years. By planning for and taking action at the site level, and by measuring success of those actions, it will then be possible to evaluate and improve our efforts to conserve the biological resources of the region.

Project Organization

The Central Mixed-Grass Prairie conservation effort started in November of 1999. Three Conservancy staff played a large role in the entire Central Mixed-Grass Prairie effort:

- Vince Shay, Vice President and State Director, Nebraska Field Office, Omaha NE served as the *project sponsor;*
- Al Steuter, Director of Conservation Programs, Nebraska Field Office, Ainsworth NE served as the *project leader; and*
- Jennifer Hall, Conservation Planner, Great Plains Division, Ann Arbor MI served as the *project coordinator.*

The project sponsor was responsible for developing institutional support for the effort, raising the necessary funds to complete the project, and will oversee the eventual implementation of the final results. The project leader was responsible for ensuring the effectiveness of the conservation plan by adapting Conservancy guidelines to the region, and for overseeing the successful completion of the Central Mixed-Grass Prairie plan. He initiated each step in the planning process, worked with members of the various planning teams to assemble the target list, set conservation goals, and lead the selection of a portfolio of conservation sites. He also was responsible for co-authoring this final report. The project coordinator communicated with the project leader and technical team members about established Conservancy planning guidelines and methods. She worked with various planning teams to evaluate target viability and select a portfolio of conservation sites. She also organized expert meetings and co-authored the final report. Any questions or comments about this planning effort can be directed to the project leader or project coordinator.

Jon Haferman, former staff member of The Nature Conservancy's Midwest Conservation Science Center in Minneapolis MN, aided in a large part of the initial project organization. Amongst many other tasks, he created a database with target information and assembled most of the spatial data for the ecoregion.

CORE MANAGEMENT TEAM. The core management team is composed of Conservancy staff that were responsible for ensuring that the resources and organizational support for the planning process were available. The Team also forms the bridge between the planning process and implementation by connecting the conservation targets identified in portfolio sites with the appropriate conservation strategies and partners. The team consists of:

- Vince Shay, Vice President and State Director, Nebraska Field Office, Omaha NE
- Greg Wingfield, Conservation Programs Specialist, Kansas Field Office, Topeka KS
- Chris Hise, Western Oklahoma Program Manager, Oklahoma Field Office, Oklahoma City OK
- Steve Chaplin, (former) Director, Midwest Conservation Science Center, Minneapolis MN

TECHNICAL TEAMS. The technical teams were responsible for developing, analyzing, and/or managing the biological and ecological information that resulted in the list of conservation targets. The team consists of:

- Bill Busby, Natural Heritage Inventory, Kansas Biological Survey, Lawrence KS (*non-avian vertebrate and invertebrate species)*
- Craig Freeman, Natural Heritage Inventory, Kansas Biological Survey, Lawrence KS (*plant species)*
- Mary Harkness, Great Plains Division, The Nature Conservancy, Minneapolis MN (*terrestrial ecological systems)*
- Chris Helzer, Central Platte/Rainwater Basin Project Office, The Nature Conservancy, Aurora NE (*avian species)*
- Mary Lammert Khoury and Jonathan Higgins, Freshwater Initiative, The Nature Conservancy, Chicago IL (*aquatic ecological systems)*
- Kelly Kindscher, Natural Heritage Inventory, Kansas Biological Survey, Lawrence KS (*untilled landscapes, natural communities)*
- Brian Schreurs, Great Plains Division, The Nature Conservancy, Minneapolis MN (*GIS data and cartography)*

A special thanks to Gerry Steinauer (Nebraska Game and Parks), Chris Hise (The Nature Conservancy, Oklahoma Field Office) and Chris Lauver (formerly of the Kansas Biological Survey) – these individuals contributed significantly at technical team meetings.

The results generated by this team of specialists were reviewed by a group of peer scientists, recruited by the specialists, who were actively working on corresponding species and native communities within the Central Mixed-Grass Prairie. The conservation targets identified by the technical teams form the basis for the work of the portfolio design working-group.

PORTFOLIO DESIGN WORKING-GROUP. This group of Conservancy staff was responsible for identifying the most efficient array of sites that conserve the conservation targets identified by the technical team. The portfolio design working-group consists of:

- Chris Hise, Western Oklahoma Program Manager, Oklahoma Field Office, Oklahoma City OK
- Greg Wingfield, Conservation Programs Specialist, Kansas Field Office, Topeka KS
- Doug Whisenhunt, Project Director, Western Projects Office, North Platte NE
- Jennifer Hall, Conservation Planner, Great Plains Division, Ann Arbor MI
- Al Steuter, Director of Conservation Programs, Nebraska Field Office, Ainsworth NE

Goal, Strategy and Objectives

CONSERVATION GOAL. The conservation goal for the Central Mixed-Grass Prairie is to ensure the continued existence of all viable native plant communities and all viable native species within landscapes that retain fundamental ecological processes.

CONSERVATION STRATEGY. Our strategy for achieving this goal is to implement **Conservation by Design** with widespread support for a dispersed and redundant array of core conservation areas buffered by a system of public incentives which foster compatible private land uses.

CONSERVATION OBJECTIVES. Our objectives are: 1) to maintain and improve the integrity of the large native landscapes that survived the 20th century; 2) to identify the core conservation areas which will be critical to maintaining the most sensitive conservation targets; 3) to reinforce sound management of the ecological processes that maintain native landscapes; and 4) to enhance the ecological functions of wetland complexes, riparian zones, and freshwater ecosystems which are critical for long-term health of human populations, migratory water birds and sensitive aquatic species.

BACKGROUND ON THE CENTRAL MIXED-GRASS PRAIRIE

The Central Mixed-Grass Prairie is one of 64 terrestrial ecoregions in the continental United States. It occupies roughly 59 million acres in the central portions of Nebraska, Kansas, and Oklahoma. Very small parts of the region are in South Dakota and Texas. Figure 2 shows the counties, larger towns, major roads, and large rivers that occur within the region.

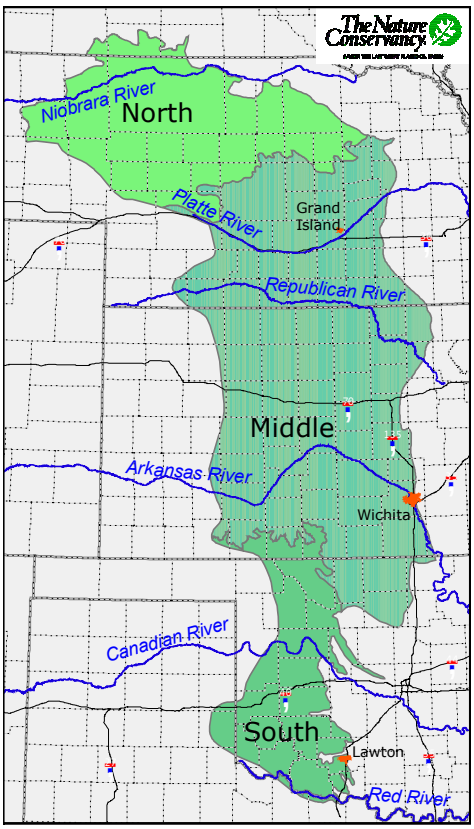

Figure 2. Major features and planning units of the Central Mixed-Grass prairie.

NATURAL HISTORY OF THE CENTRAL MIXED-GRASS PRAIRIE

The Nature Conservancy's US ecoregions are based in part on subunits of the US Forest Service's provinces (Bailey 1995). The Central Mixed-Grass Prairie is found predominantly within the Great Plains Steppe Province (332). At the time the Conservancy adopted their regional planning units, the US Forest Service had not completed the finer level of classification in the central and

western US. As a result, the US Forest Service section lines do not match the Central Mixed-Grass Prairie boundary. Our ecoregion boundary is roughly comprised of three sections: Nebraska Sand Hills (332C), South-Central Great Plains (332E), and Redbed Plains (311A). Other sections that partially overlap The Nature Conservancy's Central Mixed-Grass Prairie ecoregion boundary include: Northwestern Great Plains (331F), North-Central Glaciated Plains (251B), and Central Loess Plains (251G). For more information on the USFS hierarchy of ecological map units, see Bailey 1995.

Geology

Natural communities of the Central Mixed-Grass Prairie reflect the influence of soils as well as climate. The three dominant soil parent materials are loess, alluvial sands, and Permian Shale. Soils may be young and poorly developed due to low fertility and regular re-working by the wind (sand), or due to low infiltration rates and severe erosion (shale). In contrast, deep fertile soils occur on gently sloping loess plains, and in mixed alluvial deposits within the large river valleys. Isolated scarps, bed rock outcrops, and peat lands provided unique substrates for plants and animals from distant regions to colonize, thus adding to the biological diversity of a region with few endemic species.

Climate

A harsh continental climate characterizes the Central Mixed-Grass Prairie (see England 1987, Wilhite and Hubbard 1989). Blizzards and days of 100°F or higher are the norm within a 12-month period, and swings of 60°F can occur within a 12-hour period. Given these wide fluctuations, the annual and seasonal average conditions would seem to have little meaning. However, average annual precipitation and growing season precipitation ranges from 17 and 13 inches, respectively, in the northwest portion of the ecoregion to 31 and 21 inches, respectively, in the southeast portion of the ecoregion. Average annual freeze-free days range from 120 to 222 days along the same gradient. July average maximum temperature ranges from 88°F to 98°F, and January average minimum temperature ranges from 8°F to 27°F at the same northwest and southeast extremes, respectively.

Vegetation

The Central Mixed-Grass Prairie is home to a transitional grassland ecosystem, between the tallgrass prairie ecosystem to the east and the shortgrass prairie ecosystem to the west. Depending on soils, topographic position, grazing, fire, and weather, the composition of the mixed-grass prairie ecosystem can favor the tall or short grasses. Robust plant communities developed on the broad inter-fluvial surfaces of the Great Plains following the introduction of an intensive fire regime imposed by early humans arriving at the close of the Pleistocene. Prior to this time the landscape was a more heterogeneous combination of woodland, savanna and grassland. The intensified fire regime during the Holocene resulted almost exclusively in herbaceous communities on both uplands and lowlands. Woodlands and savannas were isolated on buttes, and along scarps and the most protected riparian zones. Relatively few perennial grasses (tens of species) dominate the biomass within these generalized communities, while forbs (hundreds of species) are largely responsible for community diversity.

Embedded within the generalized communities are smaller, specialized communities usually associated with unique and localized soil-moisture conditions. Combinations may range from shallow, infertile and excessively drained soils, to deep, fertile and saturated soils. In contrast to predominant communities, these smaller communities are composed of species with relatively

narrow habitat requirements. These communities may be isolated within an otherwise hostile landscape. For example, blowout penstemon (*Penstemon haydenii*), an endemic plant to the Central Mixed-Grass Prairie, is narrowly adapted to actively eroding habitats (blowouts) in the Nebraska Sandhills. These blowouts are currently small isolated communities. However, at various times during the Holocene they occupied extensive landscape-scale areas. Wetland, scarp, and riparian communities would be other examples of specialized communities in the Central Mixed-Grass Prairie.

In order to maintain a viable matrix of communities, land uses that support the required ecological processes will need to be maintained. For the Central Mixed-Grass Prairie this will probably take landscapes of 250,000 acres that are less than 20% fragmented by developed lands. These estimates are based on a crude ecological assessment of the historic area affected by large-scale disturbance events such as fire; and a qualitative assessment of the requirements for a local ranching industry to remain viable (20 to 30 individual 400-cow operations). Two assumptions underlie this latter assessment: 1) land management practices can maintain the ecological processes associated with the generalized matrix; and 2) without a relatively large number of viable ranch operations, the social infrastructure will not exist to support the appropriate land use.

Freshwater Ecosystems

As one moves from north to south in this region, one finds a great diversity of stream characteristics. In the Sandhills, streams are typically cold (less than 77°F), low in alkalinity, have constant but relatively low flow, and unstable banks. These streams vary in slope from the gently sloping Calamus and highly sinuous North Loup, to the streams that steeply downcut to meet the mainstem Niobrara (Bleed and Flowerday 1989)

With a few notable exceptions, human land uses have dramatically altered streams in Kansas, especially in the Smoky Hills region. Historically, two types of plains streams were dominant. Large rivers, such as the Kansas and Arkansas River mainstems, were typically shallow with fluctuating channels and shifting sand beds. In the headwaters of the Republican, Solomon, Saline, and Smoky Hill Rivers, springs and seeps originated in the Ogallala Formation to form clear brooks, ponds, and marshes. Streams had both lentic habitats with significant macrophytes, and low gradient stretches of moderate flow over sand and gravel substrates (Cross and Moss 1986). Many of these headwaters are now intermittent or simply dry because of groundwater pumping. Impoundments and diversions on the large rivers have dramatically altered their characteristics. The flow and turbidity have dropped significantly and the channels have been stabilized, creating habitats that favor non-native fishes that prefer clear water.

Streams in the Red Hills region of southwestern Kansas and Red Bed Plains of northern Oklahoma resemble those to the north in that they drain sedimentary rocks and thus are typically sand-bottomed, wide, and often flow intermittently. However, these streams have a greater mineral content due to the gypsum layered into the geological formations. Dams and groundwater pumping have also altered these streams.

Landscape-scale Ecological Processes

Large-scale ecological processes such as grazing, fire, and severe weather events interact to form complex spatial and temporal mosaics that represent the many seral states of natural communities super-imposed on various topo-edaphic combinations. It is difficult to imagine an individual grazing, fire, or weather event occurring today that would be novel to the Holocene experience.

What is different, however, is the profound reduction in spatial and temporal dynamism in the contemporary landscape that results from native land cover fragmented by ownership and use patterns. Since the topography of the Central Mixed-Grass Prairie is less dissected and the climate more arid than the Tallgrass Prairie, the scale of the major ecological processes is even larger in the Central Mixed-Grass Prairie than in the Tallgrass Prairie (Central Tallgrass Prairie Ecoregional Planning Team 2000; The Nature Conservancy, Osage Plains/Flint Hills Prairie Ecoregional Planning Team 2000).

As with most of the continent, the structure, function and composition of the Central Mixed-Grass Prairie changed dramatically with the arrival of the first people. An increase in the frequency and size of fire events, and a shift from a diverse grazing and browsing mega-fauna to a few large-herd species occurred following human colonization about 12,000 to 14,000 years ago. The intense disturbance regime combined with a harsh mid-continent climate to produce very resilient ecological systems. Although semi-arid, the Central Mixed-Grass Prairie has landscape scale wetland complexes and a network of large river systems. Understandably, these portions of the landscape provided critical habitat for aquatic and terrestrial species with both local and migratory populations. The water resources of the Central Mixed-Grass Prairie have always constrained the ecological and economic possibilities of the region (Bragg and Steuter 1996).

CURRENT SOCIAL AND ECONOMIC SETTING

The landscape of the Central Mixed-Grass Prairie has certainly changed drastically since the time of human settlement. The largest cities within the ecoregion are Wichita, KS (pop. 310,200), Grand Island, NE (pop. 39,500), and Lawton, OK (pop. 84,100). These and other relatively large population centers have diversified manufacturing, recreation, and service economies, and continue to experience population growth. In contrast, the vast majority of rural counties have experienced consistent population declines during the last 70 years. Populations are expected to continue declining throughout most of the rural counties within the region (Figure 3).

Nearly all (98.2%) of the landscape remains privately owned and managed. The rest of the region, which is publicly owned, consists of 1.2% federal, 0.4% state, and less than 0.5% county and reservation owned land. Production agriculture continues to be the dominant economic force on privately owned land within the region. The major crops consist of dry land wheat and sorghum, and irrigated corn, soybeans and alfalfa. Beef cattle have historically been the primary livestock, but recently large-scale pork and dairy operations have been attracted to the region. A trend towards less enterprise diversity within individual operations has occurred during the last five decades. This trend has been accompanied by a nearly five-fold increase in the average size of individual operations, and a nearly annual reliance on federal farm program subsidies to create farm profits. Recently, there has been a renewed interest in diversifying farm and ranch income by producing alternative crops, livestock, and value added niche products; and by offering various recreation and leisure opportunities for a fee. For example, the number of bison producers, specialty wood products, and fee hunting have steadily increased during the last 20 years.

The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) maintains technical expertise in communities throughout the Central Mixed-Grass Prairie to assist land owners with management planning and cost-share incentives for land, water, and wildlife conservation. This system of incentives for conservation is intended to compliment the public policy incentives for agricultural production. The production and conservation functions of agriculture are associated

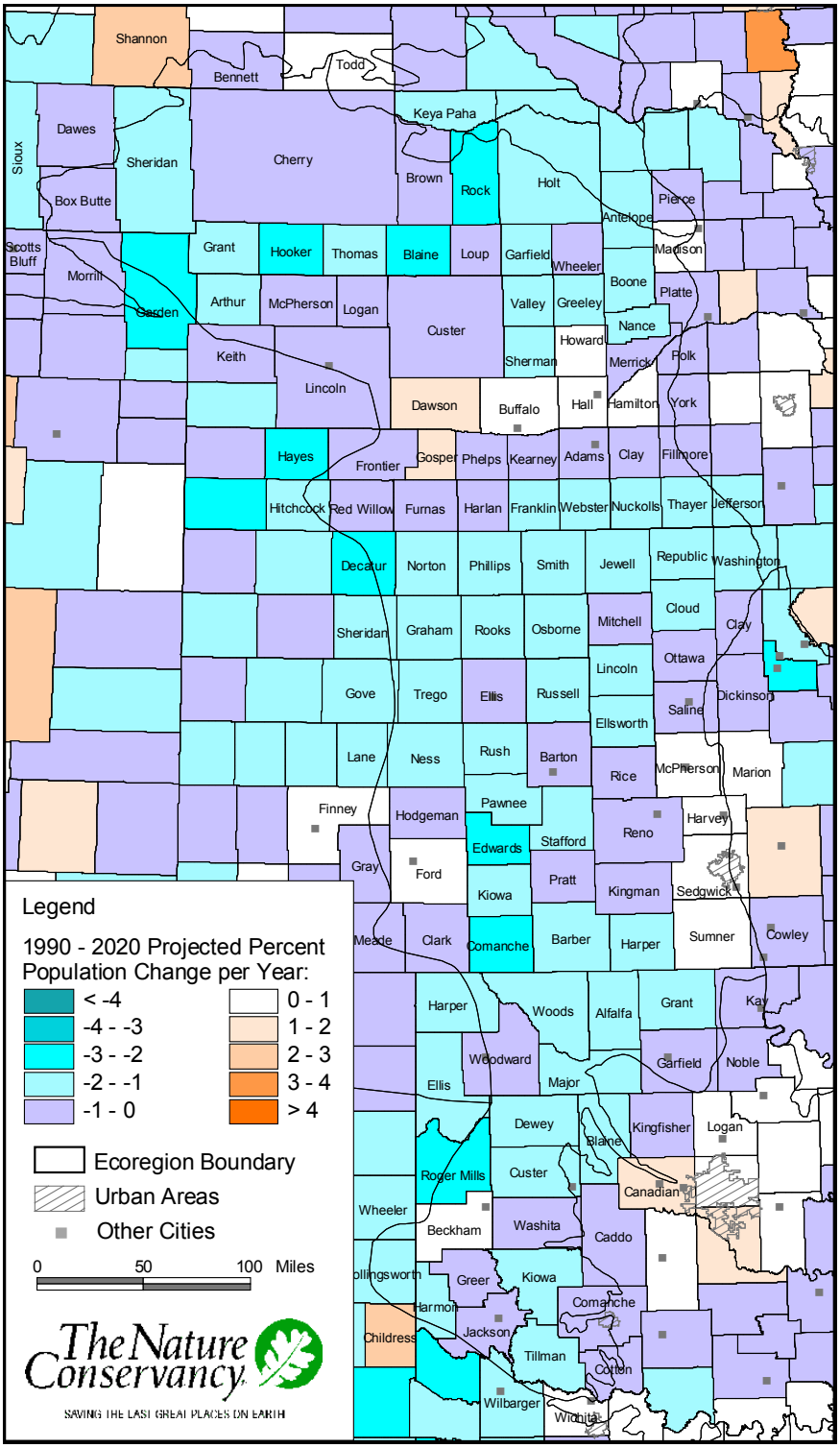

Figure 3. Population change by county for Central Mixed-Grass Prairie ecoregion. Population projections prepared by The Nature Conservancy, based on rate of change from 1990-1999.

with short- and long-term strategic needs, respectively, for food and fiber. The Nature Conservancy is a private, non-profit conservation organization dedicated to preserving the plants, animals, and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive. There are many other industries, agencies and organizations vital to the Central Mixed-Grass Prairie region. Although the Conservancy has initiated this region-wide conservation effort, **it will not succeed without a widespread conviction that biological diversity enhances our ecosystem's health in the same way that enterprise diversity enhances the health of our economy.**

A Need for Conservation Action

Conservation is a uniquely human form of altruism intended to benefit future generations through a complex set of resource management actions taken today. The social, economic, and ecological setting of the Central Mixed-Grass Prairie will determine what types of conservation strategies will receive public support. Thus, our best intentions are constrained by the real-time environment in which countless individual decisions lead to actions that will affect the quality of life for future generations.

This assessment has determined that there is indeed a need for immediate conservation action in the Central Mixed-Grass Prairie. Many of the targets are of insufficient quality or in too short supply to meet their conservation goals. There are also a number of urgent threats affecting the region. The need for conservation action is detailed by two independent, but interrelated assessments – a terrestrial assessment (Section III) and an aquatic assessment (Section IV). Section V describes the areas in which we propose to conserve these targeted elements of biological diversity and Sections VI and VII provide recommendations for conservation action and next steps.

III. TERRESTRIAL ECOREGIONAL ASSESSMENT

As discussed in the introduction, we began the terrestrial assessment with the selection of conservation targets. Conservation goals were set for each target and the viability of each target occurrence was assessed. All of this information is used to identify the areas of biological significance (also known as the portfolio of conservation areas) in the region.

RAPID ECOLOGICAL ASSESSMENTS

In order to better understand the current condition of the Central Mixed-Grass Prairie region, surveys were conducted during the spring and summer of 1999 and 2000. These surveys, called **Rapid Ecological Assessments (REAs)**, are quick and cursory assessments used to identify natural communities and systems in the region, describe their location and extent, note their condition, and record current and potential sources and scope of disturbances. Areas within the region identified as untilled landscapes (Ostlie *et. al. in press*) were visited and assessed for quality. Select large ranches and properties within those intact landscape features were visited and interviews of owners or managers of those properties were coupled with a survey of the vegetation. Assessments of quality were based on species composition, continuity of ground cover, observations of livestock impact, and viability of the community types present. Size and landscape context were also considered. This information greatly aided the terrestrial ecoregional assessment. A detailed report of the REA work is provided by Loring *et. al.* 2000.

SPATIAL STRATIFICATION

To better encompass ecological variation in habitat, to represent the range of variability of targets, and to protect targets from disturbance events, the Central Mixed-Grass Prairie ecoregion was divided into three **planning units** and conservation goals assigned by planning unit where appropriate. This spatial stratification attempts to create units at a scale appropriate for major variations in habitat across the region.

In other regional planning efforts, teams have stratified based on the US Forest Service section or subsection units (Anderson *et. al.* 1999). Due to the discrepancies between the section lines and the Central Mixed-Grass Prairie boundary (see Section II), we created three planning units to use for the purposes of stratification, roughly based on the three major sections that comprise the region. We named these planning units North, Middle and South (Figure 2).

As discussed below, viable occurrences of conservation targets were selected, when possible, from each of these planning units in order to ensure genetic and habitat diversity.

ECOLOGICAL SYSTEM CONSERVATION TARGETS

There are two approaches commonly used in planning for the conservation of biological diversity. The **coarse-filter approach** operates under the assumption that common species will likely be protected through the conservation of large-scale ecological systems and natural plant communities. **Fine-filter** or species-specific conservation focuses on rare species, which due to their rarity and subsequent management needs, may not be adequately addressed through large-scale conservation efforts. This two-tiered approach was used for selecting terrestrial conservation targets and setting conservation goals for the Central Mixed-Grass Prairie.

The coarse-filter approach to conservation has changed over the last several years. When the Conservancy first began regional planning, it was assumed that site selection based on plant communities was an appropriate scale at which to work. The Conservancy has since realized that such an approach often fails to capture the large-scale ecological processes at work in a region. For long term conservation of biological resources, the coarse-filter approach needs to target ecological systems (Poiani *et. al.* 2000, Groves *et. al.* 2000a). **Ecological systems** are defined as:

> dynamic spatial assemblages of ecological communities that: 1) occur together on the landscape; 2) are tied together by similar ecological process (e.g. fire, hydrology), underlying environmental features (e.g. soils, geology), or environmental gradients (e.g. elevation, hydrologic zone); and 3) form a robust, cohesive, and distinguishable unit on the ground (Groves *et. al.* 2000a).

During this planning effort, ecologists at The Nature Conservancy and Association for Biodiversity Information began work on a national ecological system classification that would be consistent with the US National Vegetation Classification (Grossman *et. al.* 1998). The classification is not yet complete and therefore not available to the planning team in the Central Mixed-Grass Prairie. With the help of Heritage Program and academic ecologists, a preliminary list of ecological systems for the ecoregion was drafted by the planning team. In addition to the principles set forth by Groves *et.*

al. (2000a), the planning team established a few additional criteria to aid in the definition of Central Mixed-Grass Prairie ecological systems:

- there must be high confidence that patterns of co-occurrence consistently repeat themselves across the landscape;
- a single plant community association can be found in more than one system;
- ecological systems are fairly large scale;
- for most systems, the dominant plant communities are matrix-forming; and
- community types that do not consistently occur with other types to form ecological systems, will be addressed as community conservation targets.

There are nine ecological systems currently defined for the Central Mixed-Grass Prairie:

- Mixed-Grass Prairie,
- Sand Prairie,
- Dakota Sandstone Tallgrass Prairie,
- Sandsage Shrubland,
- Southern Great Plains Mesquite Shrubland,
- Southern Great Plains Shin Oak Shrubland,
- Sandhills Wetlands,
- Saline Sandhills Wetlands, and
- Large and Medium River Floodplain.

Descriptions of each system type and a list of the plant associations found within each system are found in Appendix 1. Again, it should be noted that some plant community associations occur in more than one system type.

Occurrences of each ecological system target were identified by the planning team, using natural vegetation maps, untilled landscape data (Ostlie *et. al. in press*), information from the REA report (Loring *et. al.* 2000) and expert knowledge. Occurrence information can be found in Appendices 4 and 5.

Target Goals

Conservation goals for targets are set with the hope of ensuring long-term viability, and maintaining genetic and ecological variation. The numeric goal for each target should consider the number and distribution of occurrences needed to conserve the element within the Central Mixed-Grass Prairie. Goals reflect an understanding of a suite of ecological variables, including: life history characteristics, threats to occurrences, key ecological processes, and disturbance regimes (The Nature Conservancy 1997, Groves *et. al.* 2000a). Regional and range-wide conservation is a concern. Goals and sites are chosen to protect the full range of biological diversity. Targets endemic to a single region receive greater emphasis than those that occur in many regions. Thus, the goals for the Central Mixed-Grass Prairie will be informed by the conservation work in other regions within the range of the target.

There is very little information about the composition and functionality of ecological systems in the Central Mixed-Grass Prairie to confidently assign numeric conservation goals. The planning team decided to use a generalized goal of 2 system occurrences per planning unit. These generalized goals were modified for types endemic or limited to the region. As more information is gathered about these targets, conservation goals should be refined to better serve the conservation needs of the ecological systems.

Viability Assessment

Viability refers to the ability of an ecological system, community, population or species to persist over time (The Nature Conservancy 1996, The Nature Conservancy 1997, Groves *et. al.* 2000a). Assessment of viability is a necessary step to identify the conditions under which the target occurrence will persist over time, and ultimately in the identification of areas of biological significance. By selecting areas of biodiversity significance that include viable examples of conservation targets, we can ensure a high probability of conservation success. The standards for viability assessment set forth by Groves *et. al.* (2000a) include:

> To the extent practical, the long-term viability (100 years) of populations and occurrences of conservation targets is assessed with the three criteria of size, condition, and landscape context. No site should be included in the portfolio of sites unless the coarsest-scale target at that site has been assessed as viable with these three criteria or can be feasibly restored to a viable status.

The application of the guidelines established by Groves *et. al.* (2000a) for determining what constitutes a *viable* occurrence of a conservation target is problematic in the Central Mixed-Grass Prairie. Empirical evidence is available to assess population viability for only a few target species. At the ecological system and natural community scale, only broad conceptual guidelines exist, with direct evidence limited to the effects of patch dynamics on viability in forest systems. The structure, function and composition of Great Plains grasslands suggest resilience beyond temperate forest systems. Yet, the ecological processes that give rise to this prairie, operated at large spatial scales (e.g. climate, weather, grazing, fire, flooding, migration, etc). Of these, only grazing and fire can be actively managed in an attempt to scale them down to match remnant native prairie size. Possibly as important to the viability of remaining ecological systems and natural communities is the potential for compatible land uses to become non-viable. The Global Climate Change assessment for the Great Plains suggests that land use change is more important than climate change as a force driving land cover changes (Ojima *et. al.* 2002)

Similar planning efforts (The Nature Conservancy, Osage Plains/Flint Hills Prairie Ecoregional Planning Team 2000, Anderson 1999) have applied a concept called **minimum dynamic area** to the analysis of system viability. Because the viability of conservation targets is tied to the historic scale and frequency of large-scale processes (eg. fire), it is important to consider the geographic area needed to ensure survival or re-colonization following these stochastic events. This concept has been termed minimum dynamic area (Pickett and Thompson 1978).

The scale and frequency with which the primary ecological processes historically occurred and the diversity of the systems with respect to biological diversity are used to assess the minimum dynamic area. Estimates have been made that the area required for the continuation of ecological processes at their historic scale, while maintaining a mosaic of habitat in all structure classes for the full array of species in the region, is four or five times larger than the historic disturbance patch size. An estimate has also been made regarding the amount of area needed by bird and mammals using matrix community patches. This estimate has been made based on 25 times the mean female home range (Anderson 1999), or the area required for 200 individuals (The Nature Conservancy, Osage Plains/Flint Hills Prairie Ecoregional Planning Team 2000).

The Central Mixed-Grass Prairie planning team felt that the resilience of mixed prairie argued for making size an over-riding consideration when assessing the viability of ecological systems. As a result, we used the minimum dynamic area concept coupled with best expert knowledge about the historic size of these major ecosystems to establish a size/fragmentation level above which the best (or "A-ranked") occurrences would be represented, and a second size level (minimum, or "C-ranked") below which they would probably not be viable (see Appendix 1). **Most importantly, we make any loss of size or increase in fragmentation of the most significant native landscapes unacceptable**. Given that these landscapes survived the development onslaught of the 20th century, we can assume they are places where the ecological, economic, and social forces are acting to re-enforce viability of conservation targets. We feel that this leverage cannot be lost if we are to achieve our conservation goal in the Central Mixed-Grass Prairie.

Information on the size and condition criteria used in evaluating the viability of system occurrences can be found in Appendix 1.

PLANT COMMUNITY ASSOCIATION CONSERVATION TARGETS

There are 69 native plant communities defined by the US National Vegetation Classification (Grossman *et. al.* 1998) that are found within the region. All were selected as conservation targets for the Central Mixed-Grass Prairie (Appendix 1). Native plant communities occur in landscapes that are generally the result of soil-moisture-topography combinations that limit farming, historic land use decisions of private land owners, or past purchases by conservation agencies and organizations. These plant communities are remnants of those that developed on the broad inter-fluvial surfaces of the Great Plains following the introduction of an intensive fire regime imposed by early humans arriving at the close of the Pleistocene. The "matrix" plant communities are not only adapted to, but require fire and grazing to persist. These two forces interacting with regional climate and soils, and weather, particularly drought, produce a dynamic spatial and temporal mosaic of communities. Embedded within matrix communities, are "small and large" patch communities usually associated with unique and localized soil-moisture conditions.

Target Goals

Plant association targets were assigned to groups based on ecological and geographical characteristics, i.e. range-wide distribution and patch size (Appendix 1). General guidelines were then developed for setting conservation goals for the resulting categories based in part on the values set by other planning team. Guidelines were modified to better reflect distribution and abundance in the region, ecological importance, expert knowledge of the target, habitat vulnerability, and current and future threats in the region. In the absence of community-specific information, the general guidelines provide consistency across vegetation types, and incorporate known community characteristics. Goals were set generously, hopefully erring on the side of over-protection.

General guidelines used for setting conservation goals are shown in Table 1. Conservation goals for each plant community target are included in Appendix 1.

DISTRIBUTION. Range-wide distribution of plant communities has been used as a criterion in assigning the number and distribution of conservation areas within regions (Anderson *et. al.* 1999). A four-category classification was applied to Central Mixed-Grass Prairie plant communities. Only one (1.5%) of the communities is *endemic* to the Central Mixed-Grass Prairie. Thirty-two (46%) are classified as *limited*, occurring mainly within the region, but also in several adjacent regions. Thirty-

four (49%) are *widespread* communities, common in many other regions and widespread in the Central Mixed-Grass Prairie. Two (3%) are classified as *peripheral*, found mainly in other regions, and uncommon in the Central Mixed-Grass Prairie.

PATCH SIZE. A four-category classification of historical patch size has been used in other regions (Anderson *et. al.* 1999) for setting conservation goals for plant communities. *Matrix* communities generally are widespread, have broader ecological amplitude, and are driven by regional-scale processes. *Large patch* communities may form extensive cover, but community boundaries correlate with a single dominant process or habitat characteristic. *Small patch* communities rarely form extensive cover, and usually have quite narrow ecological requirements. *Linear* communities are those types that occur as long narrow stands (usually riparian communities along streams) with acreage typically within the range of the small patch category.

Of the 69 plant communities currently identified for the ecoregional planning process, 19 (28%) have been classified as matrix types, 12 (17%) as large patch types, 28 (40%) as small patch types and 10 (14%) as linear patch types.

Table 1. General guidelines used in setting conservation goals for plant communities in the Central Mixed-Grass Prairie. Values represent number of viable occurrences desired. Goals are based on historical patch size and range-wide distribution. Goals for individual types may vary from these general guidelines based on habitat vulnerability, threat and expert knowledge of the community type.

	Matrix	Large Patch	Small Patch	Linear
Endemic	n/a	16	n/a	n/a
Limited	4-10	6-10	4-10	6
Widespread	4-6	2-6	2-10	2-4
Peripheral	n/a	4	n/a	n/a

Viability Assessment

The viability assessment is also a critical step in the planning process for community occurrences. Ideally, the Heritage Program element occurrence rank* (EORANK) is used to determine the viability of community occurrences. However, meaningful EORANKs were not available for most of the occurrences. Quality assessment information from the REA report (Loring *et. al.* 2000) was used to assess the viability of many community occurrences. In addition, community occurrences found within viable system occurrences were assumed to be viable. Heritage ecologists in Nebraska and Kansas reviewed this collected information on system and community occurrence viability to make final determinations about the viability of most occurrences. Community occurrences in Oklahoma did not receive this final review from Heritage ecologists.

PLANT AND ANIMAL CONSERVATION TARGETS

For species, conservation targets were chosen based on regional rarity, vulnerability, and existing and potential threats. The general guidelines set forth by The Nature Conservancy for rare species

* Size is a quantitative measure of the area and/or abundance of the occurrence. Condition is the integrated measure of the quality of biotic and abiotic factors, structures, and processes within the occurrence, and the degree to which they affect the continued existence of the element occurrence. Landscape context is an integrated measure of the quality of the biotic and abiotic factors, structures and processes surrounding the occurrence, and degree to which they affect the continued existence of the element occurrence. (The Nature Conservancy and Association for Biodiversity Information 1999).

conservation (Groves *et. al.* 2000a) proved to be an adequate filter for many of the species in the Central Mixed-Grass Prairie. Targets include all species listed Endangered or Threatened by the US Endangered Species Act, all species ranked G1-G3 by NatureServe and the Natural Heritage Network, and all subspecies ranked T1-T3 (NatureServe 2002).

Expertise and knowledge of the Central Mixed-Grass Prairie were used to evaluate the preliminary list of plant and animal species. The target list was refined over the course of the planning process, incorporating new information and expert review. The final target list if found in Appendix 2.

Avian Targets

The standard target selection criteria do not adequately capture the conservation needs of avian targets that breed, migrate through, or winter in the Central Mixed-Grass Prairie. Wintering and migratory habitats are much more complicated to protect and manage because very little is known about critical wintering and migratory habitat components for many species. Migratory habitat, in particular, is difficult to address in conservation planning because little detail is available on the migratory patterns and selection criteria for stopover sites.

In addition to the standard criteria discussed above for the selection of species targets, additional criteria were developed by the planning team for avian targets using guidance from Partners In Flight and The Nature Conservancy's Migratory Bird Program. Bird species important for consideration as conservation targets were initially considered from a list compiled by the Migratory Bird Program. This preliminary species list was based on the Partners in Flight (PIF) physiographic database. All species that overlapped with the Central Mixed-Grass Prairie were considered. Species that were either peripheral or known not to occur in the region were excluded. In addition, the PIF Watch List, *Birds of the Great Plains* (Johnsgard 1979), Breeding Bird Survey data, and expert knowledge were used to develop the avian conservation targets. In the end, targets include those species which:

- have PIF scores of 23 or higher;
- have a PIF score of 19-22 and the CM-GP region is the center of their range;
- are declining significantly; or
- are on the PIF Watch List and are potentially conservable in the region.

Target Goals

The planning team consulted known information on distribution, abundance, habitat and sensitivity for the target species. The results of this literature search and expert consultation indicated that for most species, basic knowledge such as habitat characteristics, distribution within the region, and current and potential threats is lacking. General guidelines were thus developed for setting conservation goals based in part on the relative distribution of the species within the ecoregion and based on values set by other planning teams (Table 2). Guidelines were modified to better reflect distribution and abundance in the region, ecological importance, expert knowledge of the target, habitat vulnerability, and current and future threats in the region. The conservation process is an iterative process, and as more information is gathered about the target species, conservation goals should be refined to better serve the conservation needs of the rare species on the target list. Goals for each species can be found in Appendix 2.

Goals were established for avian targets based on the best research available regarding population viability of each species. For bird targets of particular concern in the ecoregion, goals were reflected in the number of breeding pairs. See Appendix 2 for information on specific bird targets.

Table 2. General guidelines used in setting conservation goals for species targets in the Central Mixed-Grass Prairie. Values represent number of viable occurrences. Goals are based on relative distribution within the ecoregion. Endemic species are those that only occur within this region. Limited species occur mainly within the region, but are also found in several adjacent regions. Widespread species are common in many regions and widespread in this region. Peripheral species are found mainly in other regions and are uncommon in this region.

	General Goal for Species Target
Endemic	10
Limited	7
Widespread	4
Peripheral	2

Viability Assessment

Plant and animal species occurrences were evaluated to determine if they were of sufficient viability to include in conservation areas. Ideally, the Heritage Program element occurrence rank (EORANK) is used for this assessment. However, meaningful EORANKs were missing for most of the occurrences. In some cases, the Heritage Programs know only that the occurrence is extant, but not much else about the quality of the occurrence or about the life history and habitat of a given species. There was not sufficient time and resources during this ecoregional assessment to revisit those occurrences and assign an element occurrence rank.

Therefore, Heritage biologists and Conservancy staff knowledgeable about the conservation targets met in June of 2001 to evaluate target occurrences for viability. If these experts agreed that there was a high likelihood that a given occurrence or population would persist for 100 years under current conditions, the occurrence was determined to be viable. In some cases outside experts were consulted for this evaluation. The viability information is listed for each target occurrence in Appendices 4 and 5.

There was not sufficient time during this assessment to fully evaluate all target occurrences for viability. These species are marked with a "*" in Appendix 5. In future iterations of ecoregional planning, these targets should be adequately reviewed by a group of experts for viability.

IV. AQUATIC ECOREGIONAL ASSESSMENT

Similar to the terrestrial assessment, the aquatic assessment relied heavily on the assumption that common species will likely be protected through the conservation of ecological systems and aquatic communities.

Assessing the ecological patterns within the Central Mixed-Grass Prairie aided in the development of an aquatic conservation plan. The planning units being used by the Conservancy are modifications of the US Forest Service ecoregions (Bailey 1995), and are representative of distinct ecological patterns within broad regions of similar climate, geology and landform. Identifying the suite of priority aquatic conservation sites that will represent a region's aquatic biological diversity requires a comprehensive picture of aquatic ecosystems. However, as with many regions, we have limited or currently unavailable spatially-referenced information about the distribution of aquatic species, and generally lack data on native aquatic assemblages.

Environmental gradients of climate, elevation, and geology shape aquatic ecosystems at several spatial scales, and the influence of the physical habitat on the diversity of aquatic species and communities has been well documented. Based on these relationships, The Freshwater Initiative (FWI) program of the Conservancy developed a method to create an approximate comprehensive picture of *potential* aquatic community diversity across the Central Mixed-Grass Prairie. This method is based on a standard methodology developed by Higgins *et. al.* 1999. Spatial data are used to describe units of aquatic ecosystems in terms of the regional driving factors that influence community distribution and composition. This classification approach has already been used to classify streams and lakes in many other regions. Once the potential diversity and distribution of aquatic communities and systems within the region is determined, it is combined with an expert review of aquatic target species occurrences and a quality assessment to identify the highest quality examples of the different communities and systems. If no high quality communities or systems are remaining, the best areas for restoration are identified.

DEFINING AQUATIC TARGETS

Aquatic Ecological Systems

To capture the variability in stream types across the region, we developed a hierarchical abiotic classification for the Central Mixed Grass Prairie Ecoregion that distinguishes stream types based on zoogeographic history, major physiographic features, local geology, permanence of flow, size, position in the drainage network, and gradient. In total we described 86 aquatic ecological systems (Appendix 3).

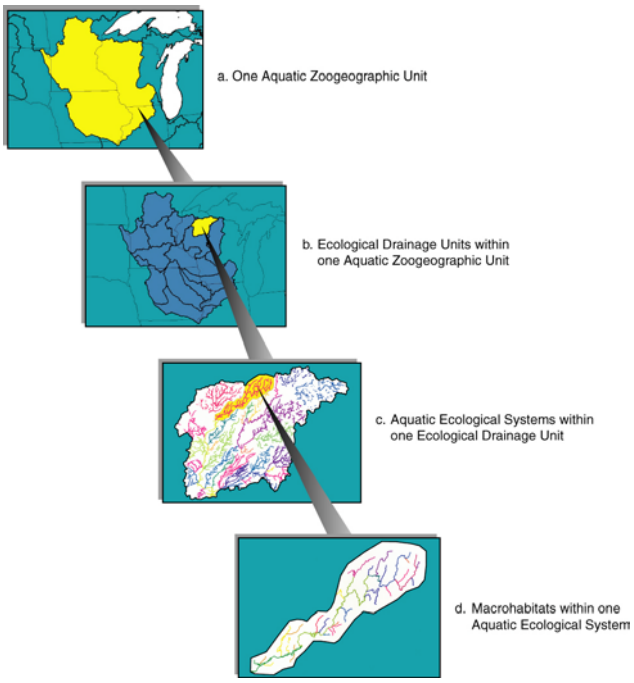

Figure 4. A four-tiered hierarchy classification framework of freshwater ecosystems. Ecosystem units are nested within higher levels. Macrohabitats occur within aquatic ecological systems that are nested within ecological drainage units. Ecological drainage units are watersheds within zoogeographic units.

The first level of the classification is the zoogeographic unit (Figure 4). Cross *et. al.* 1986 name two main zoogeographic divisions in the Central Mixed-Grass Prairie region – those watersheds in the Missouri River drainage that represent the northern plains/central lowland fauna and those in the Arkansas River drainage that represent the fauna of the southern plains.

At the second level of the classification, the ecological drainage unit (EDU) (Figure 4), we further divided the two zoogeographic units based on physiography to identify a total of ten EDUs that intersect the region (Figure 5). The region comprises three ecoregional sections: the Nebraska Sand Hills, South-Central Great Plains, and Redbed Plains (Bailey 1995: see Section II). These sections are distinct in terms of their lithology and landform. The Sand Hills EDU encompasses most of the Nebraska Sandhills section, and includes a few watersheds that

originate to the west in the shale plains of the Northwestern Great Plains, as well as watersheds that also drain the South-Central Great Plains and North Central Great Plains.

The South-Central Great Plains is a gently sloping area with loess-capped ridge tops, rivers with broad flood plains, and smaller streams occurring in narrow bottomlands. This section dominates both the Smoky Hills EDU and the East Arkansas River Basin EDU. The Republican River EDU and the West Arkansas River Basin EDU overlap the extreme western part of the region. These two EDUs originate in higher elevation plains.

On the east side of the ecoregion, the Big Blue Basin EDU slightly overlaps the ecoregion. This EDU mainly drains the Central Loess Plains and Flint Hills.

The third main section is the Redbed Plains. These shale-dominated plains are highly irregular, with a low density of small to medium intermittent streams. This section overlaps the Canadian River EDU, the Red River Basin EDU, and a small portion of the East Arkansas EDU. Most of the Canadian River EDU is outside of the region.

Finally, on the north edge, the region includes a small portion of the White/Cheyenne/Grand EDU of the Dakotas. This EDU drains the dissected shale plains of the Northwestern Great Plains.

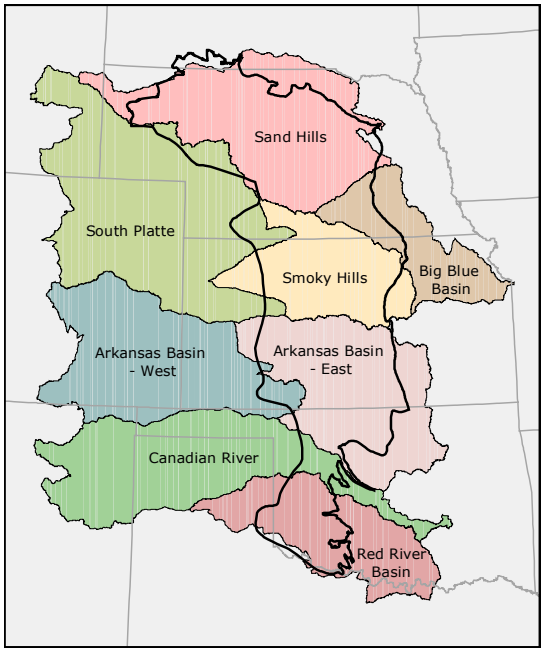

Figure 5. Ecological Drainage Units in the Central Mixed-Grass Prairie Ecoregion (ecoregion boundary represented by thick black line). Note: White/Cheyenne/Grand and Republican River EDUs are not depicted in this figure.

The third level of the classification is the **aquatic ecological system** (Figure 4). They are stream networks that are potentially distinct in the assemblages of biologic community types. Aquatic ecological systems are mapped as catchment polygons, with system types determined by assessing how these catchments vary in terms of their finer-scale features. We defined five size classes of systems a priori to distinguish headwater and creek systems, from small, medium, large and extra-large rivers. This is the level of the classification that yields the most meaningful conservation targets.

We then identified key environmental factors in addition to size that affect the distribution of aquatic fauna. In this region, according to descriptions of the river systems from different sources – fish respond to gradient and changes in water chemistry related to the geology. We mapped these attributes at the fourth level of the classification hierarchy – the macrohabitat (Figure 4). Macrohabitats are stream segments and small to medium sized lakes that are defined by unique

combinations of co-occurring physical features, including size, elevation, gradient, connectivity, and upstream geology. While we did not use macrohabitats as conservation targets, we distinguish among system types by looking at the macrohabitat variability within each system's size classes.

Using a Geographic Information System (GIS), we assigned a value for size, geology, gradient, and position in the drainage network to all streams in the ecoregion. For each stream reach, we were able to use elevational data to determine the extent of land that drains to that stream reach, which we call the contributing area or catchment.

Multivariate clustering analysis (PC-ORD) was then used to evaluate the patterns of stream and lake macrohabitats within these catchments. The clustering algorithm groups catchments with similar macrohabitat components. Each cluster becomes a unique system type (Appendix 3) and each catchment can be used as a system occurrence. We evaluated the clusters visually against the original spatial data layers (e.g. elevation, geology, hydrography) to determine if further lumping or splitting was warranted based on the ecological significance of the landscape features.

For example in the Arkansas River East EDU there are 18 freshwater system types (Appendix 3). Within each of the five size classes there are multiple system types. For the smallest headwaters and creeks, the main distinctions are in the gradient of the streams and the type of geology the headwaters drain.

We use the aquatic systems as a course-filter to capture all the species and natural communities common to the ecoregion. Each aquatic system type is itself a conservation target that we sought to represent in this assessment. As was true of our two-tiered terrestrial assessment, we expect that some species will not be captured by the coarse filter, so we compliment this approach with a fine-filter set of conservation targets, species that are globally rare, endemic, or known to be declining. The following section describes the aquatic species targets in the Central Mixed-Grass Ecoregion.

Species

The fish fauna of the Great Plains is fairly uniform and not very distinct from nearby regions. It has over 77 native species – but nearly all of these species are also found in the central lowlands to the east. Species diversity decreases and the fauna become more ubiquitous between drainages as you move north and west from the mainstem Mississippi River (Cross *et. al.* 1986). There are however, a group of species that are endemic or emblematic of this ecoregion – and all have been greatly reduced by the changes to the flow and sediment patterns in the rivers. Very little is currently known about the conservation needs of macroinvertebrate species of this region.

The planning team held a workshop for aquatic experts in the region in November of 2001 to develop an aquatic species target list and to identify viable occurrences of these targets within the region. The final target list can be found in Appendix 3 and includes 18 fish or fish assemblages; 2 herptiles; 3 insects or insect assemblages; 3 mollusks or mollusk assemblages; and 3 snail or snail assemblages.

SETTING CONSERVATION GOALS

There is very little information about the composition and functionality of aquatic ecological systems in the Central Mixed-Grass Prairie. As a result, we set a generalized goal for the number of *viable* occurrences desired in the final portfolio equal to 30% of *known* occurrences within the ecoregion

for size 1 through size 4 system types. Our goal for size 5 system types (large rivers) was 1 viable example of each type. As more information is gathered about these targets, conservation goals should be refined to better serve the conservation needs of the ecological systems. Goals for each system type can be found in Appendix 3.

The planning team asked experts about the distribution, abundance, habitat and sensitivity for the target species in order to assign conservation goals. Not much information could be gathered on these characteristics, so the general guidelines that were developed for terrestrial species were applied to the aquatic species targets (Table 2). As more information is gathered about the target species, conservation goals should be refined to better serve the conservation needs of the rare species on the target list. Goals for each species can be found in Appendix 3.

ASSESSING VIABILITY

Information on aquatic system stressors was sought from experts and available spatial databases to assess the viability of aquatic system occurrences throughout the region. We used GIS data to develop a multi-metric stressor index that quantified and ranked the intensity of multiple types of stressors (e.g. percent of agriculture land use) on all systems in the region. The index is based on an average of the score for each of the indicators (Table 3) and is standardized to a scale of 0-1 (1 is equal to the least impacted areas).

Table 3: Indicators used in final index.

• Catchment Dam Density
• Catchment Superfund Site (CERCLIS) Density
• Catchment Industrial Facilities (IFD) Density
• Catchment Sand and Gravel Mine Density
• Catchment Toxic Release Density
• Percent Row Crop and Urban Land Cover in Catchment area
• Percent Row Crop and Urban Land Cover in Riparian area
• Catchment Irrigation Well Density

Maps of system-level indicator and index scores were developed for analysis (Figure 6). These maps, combined with expert information and corresponding data generated for every stream reach in the region, allowed us to ascertain the relative intensity of different stressors across the region, and the combined intensity of these stressors on the occurrences of the system targets (highly stressed occurrences are potentially non-viable). The maps also highlighted areas of low stressor intensity not identified by experts. Experts were then asked to review these areas of low stress as possible viable examples of the targets.

With the exception of several fish species, the Heritage Programs did not have data on many of the aquatic species targets. Therefore, we asked experts at a workshop in November of 2001 to identify aquatic species occurrences and to evaluate if they were of sufficient viability to include in conservation areas. If these experts agreed that there was a high likelihood that a given occurrence or population would persist for 100 years under current conditions, the occurrence was determined to be viable. In some cases additional experts were consulted for this evaluation. The viability information is listed for each target occurrence in Appendices 4 and 5.

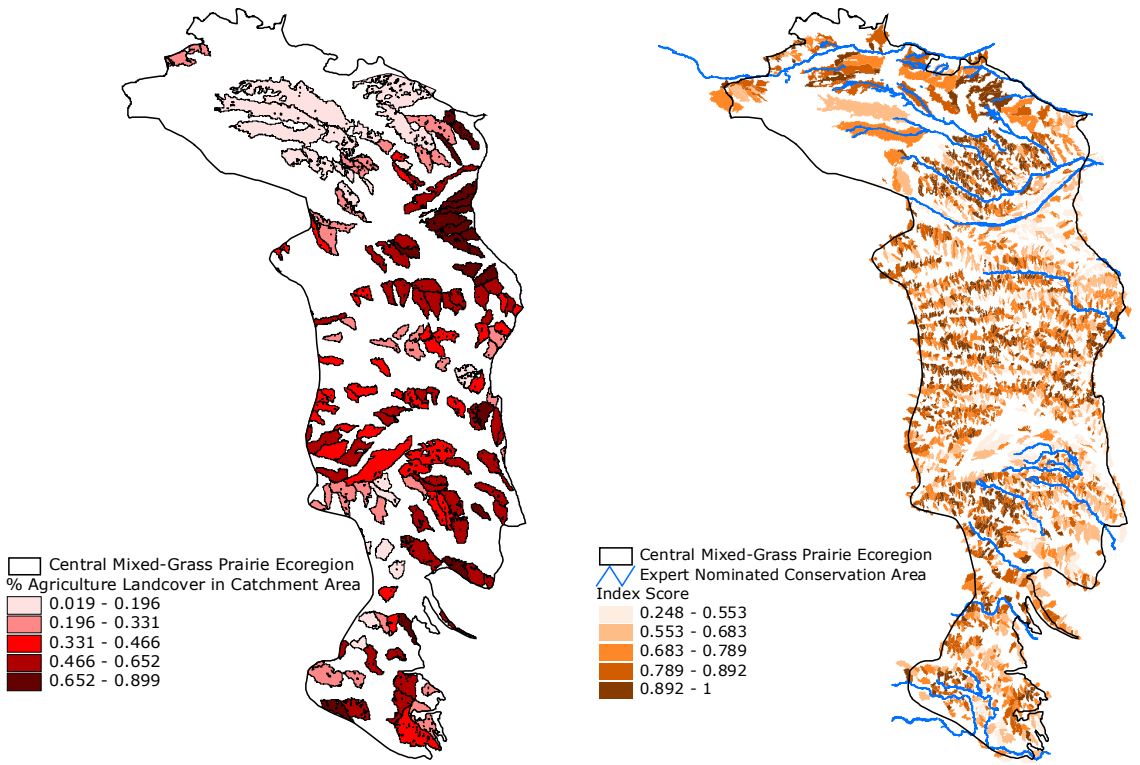

Figure 6. System-level indicator and index scores developed for analysis. These data were reviewed by experts to aid in the aquatic site selection process. The map on the left shows the percent of agricultural land cover in each size 3 watershed (an example of one of the indicators used in the combined stressor index). The map on the right shows the combined index scores for all size 1 watersheds. The index is based on an average of the score for each of the indicators (Table 3) and is standardized to a scale of 0-1 (1 is equal to the least impacted areas).

V. A Central Mixed-Grass Prairie Conservation Portfolio

The ultimate goal of this planning effort is to identify areas of biodiversity significance that are intended to conserve the native species, ecological communities and systems of the region (Groves *et. al.* 2000a). There are a number of principles inherent in the design of this portfolio of conservation areas. The portfolio should represent all coarse-scale targets. Multiple examples of all conservation targets should be represented across the diversity of environmental gradients in the region. Priority should be given to coarse-scale target occurrences during the site selection process as these areas are likely to contain examples of community and species targets. When possible, the areas of biodiversity significance should be functional – in other words, maintain the size, condition and landscape context within the normal range of variability of the conservation targets. All targets should be represented in the portfolios, with as many examples as are needed to meet the conservation goals.

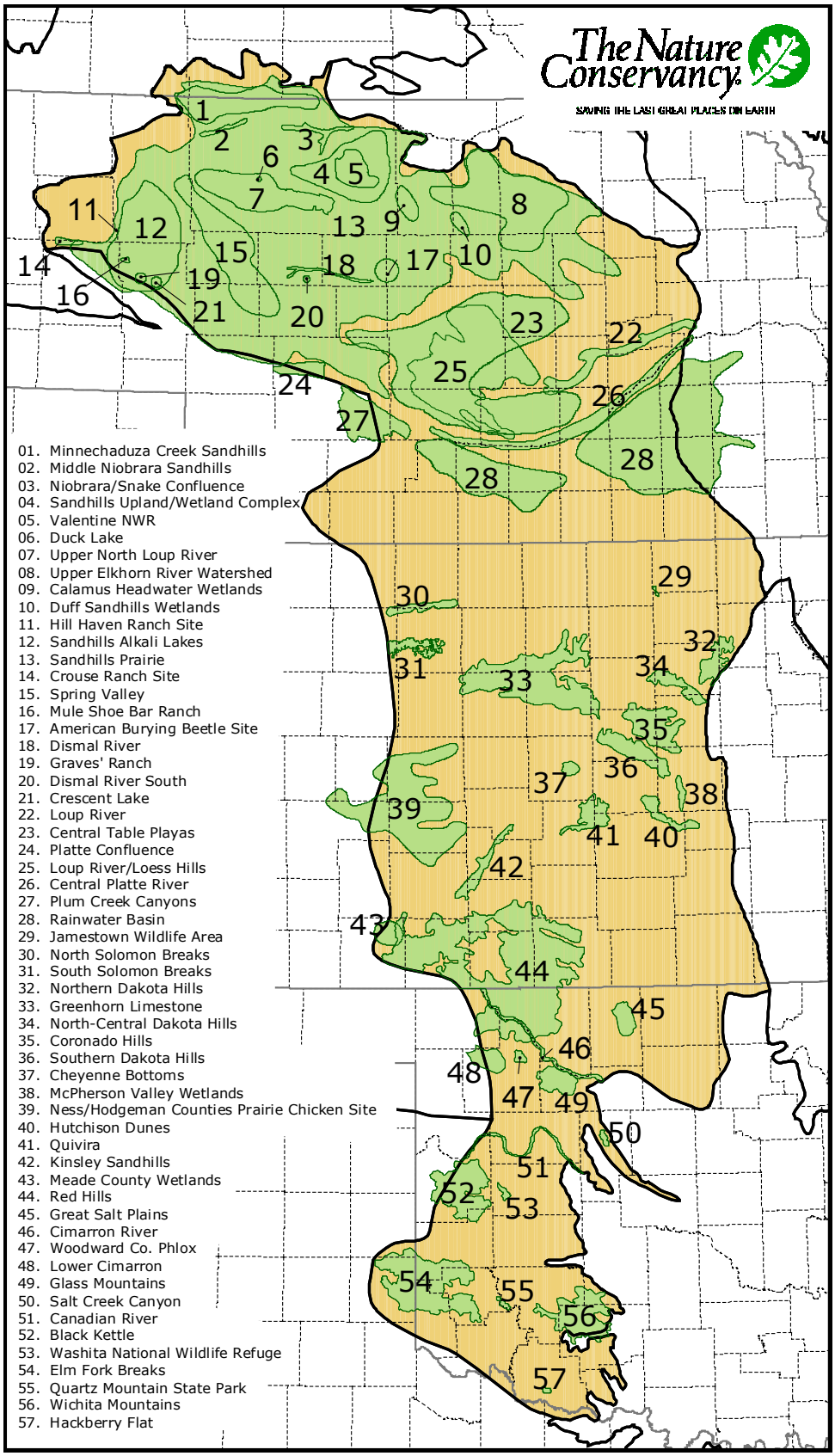

Figure 7. Terrestrial Areas of Biodiversity Significance.

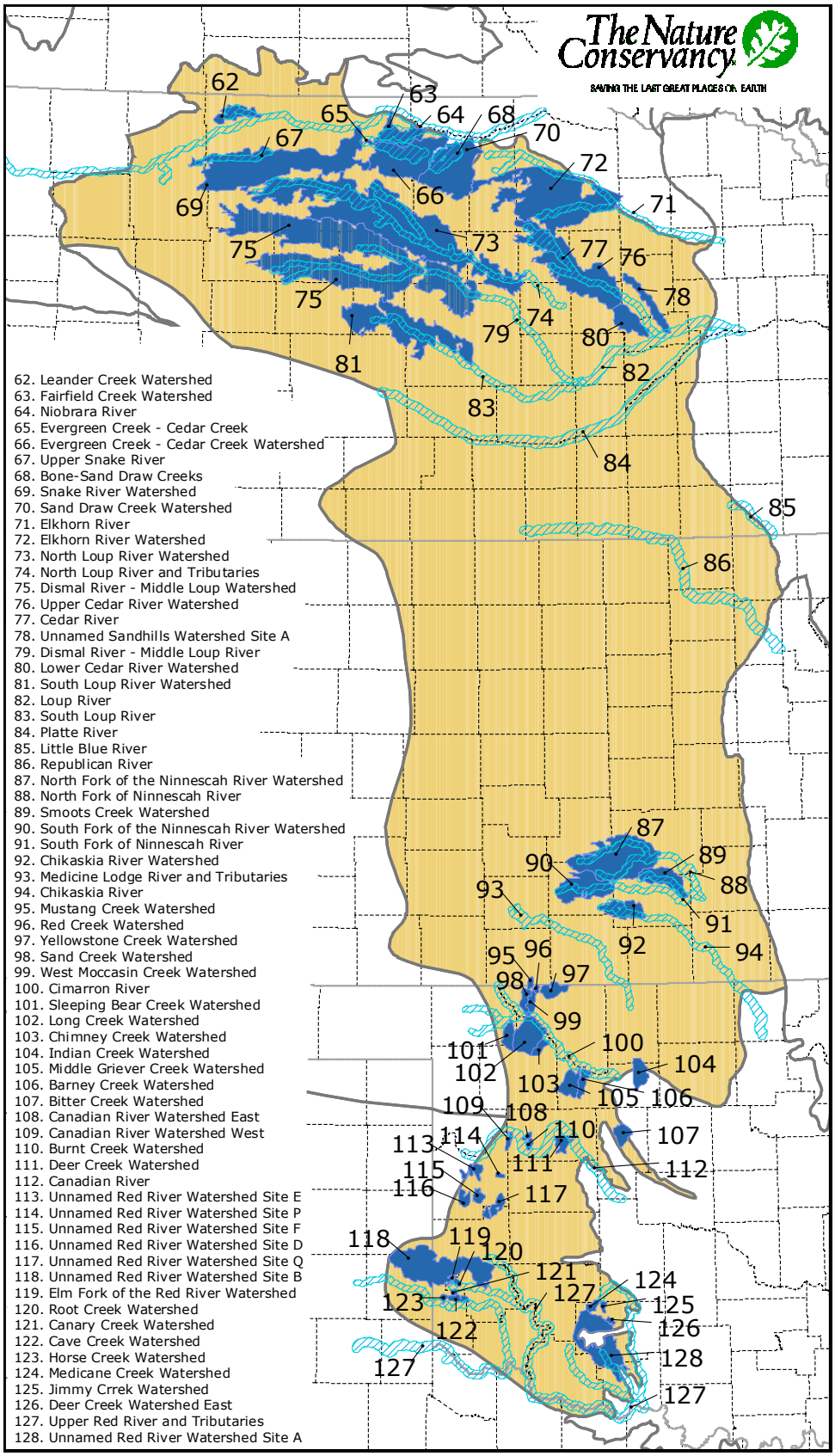

Figure 8. Aquatic Areas of Biodiversity Significance.

The conservation process followed by The Nature Conservancy (discussed in Section I) works at two different scales, the region and the site. The areas delineated during this regional planning assessment should be thought of as areas of biodiversity significance – very simply, areas that contain critical, unique, and high quality elements of the natural biological diversity of the ecoregion. During the next step of the conservation process, conservation area planning, the boundaries of the areas of biodiversity significance will be refined to ensure that the site is a functional site that maintains the targets and their supporting ecological processes within their normal range of variability (The Nature Conservancy 2000b).

In the Central Mixed-Grass Prairie region, areas of biodiversity significance were delineated which represent the most important areas for conservation of biological diversity. These sites were selected regardless of current management status. This portfolio of conservation sites will direct the activities of the Conservancy in the Central Mixed-Grass Prairie, as well as assist partner agencies in meeting their goals.

IDENTIFYING AREAS OF SIGNIFICANT BIOLOGICAL DIVERSITY

Terrestrial Area Identification

As viable occurrences of the conservation targets were identified, the planning team and consulting experts nominated areas of biodiversity significance to include in the portfolio. Areas containing viable examples of the terrestrial ecological systems were identified first. Additional areas were added to the portfolio for community or species targets, when additional areas were needed for the conservation of those targets.

We also identified key areas, such as the Rainwater Basin and the central Platte River of Nebraska, Cheyenne Bottoms in Kansas, and the Great Salt Plain in Oklahoma, where shorebirds and waterfowl concentrate in large numbers.

A number of areas were delineated which "overlap" other areas, especially in the Sandhills region in Nebraska. The targets found within these smaller or "nested" areas have special conservation needs; they are highlighted as distinct conservation areas to emphasize these needs.

All preliminary areas were "ground-truthed" by a contract ecologist during the summer of 2001 to confirm that these areas were of sufficient quality to include in the portfolio. Additional target and site description information was gathered at this time (Appendix 4).

A map showing the terrestrial areas of biodiversity significance is shown in Figure 7. There are a total of 57 areas shown on this map, ranging in size from 34 acres (Hill Haven Ranch) to over 12 million acres (Sandhills Prairie). The total area of all sites is 24,483,088 acres or 41% of the ecoregion (these numbers do not double count overlapped areas). Descriptions of each area and examples of targets found within each area are found in Appendix 4.

Aquatic Area Identification

Our approach for aquatic area identification started with those streams key to the protection of our species targets. In the aquatic expert workshop of November 2001, experts were asked to nominate aquatic areas of biodiversity significance containing viable examples of the species targets.

Watershed areas were then delineated to represent viable occurrences of aquatic system targets by combining information on aquatic system stressors (see Section IV) and expert knowledge to identify viable aquatic system occurrences.

A map showing the aquatic areas of biodiversity significance is shown in Figure 8. There are two different types of areas displayed on this map: watershed areas and stream or river reaches. The watershed areas represent size 1 through size 3 system types. It was felt that the stream or river reaches themselves would better highlight the area necessary for the conservation of targets in size 4 and size 5 system types. In addition, the size 4 and size 5 types capture the majority of the aquatic species targets. The total area of watershed sites is 7,674,436 acres; the total length of all stream or river reaches is 5,264 miles. There are a total of 67 areas shown on this map, ranging in size from 44 acres (Bone-Sand Draw Creeks) to 1,368,804 acres (Dismal River – Middle Loup River Watershed); and from 35 miles (Little Blue River) to 710 miles (Niobrara River). The total area of all watershed and stream/river sites is 12,235,833 acres or 21% of the ecoregion. Descriptions of each area and examples of targets found within each area are found in Appendix 4.

EVALUATING THE CONSERVATION DESIGN

The success of the portfolio is measured by how well it captures viable occurrences of conservation targets and meets the conservation goals. Overall, the portfolio of conservation sites was successful in capturing at least one example of each target for 47% of targets. The portfolio was most successful in capturing terrestrial system targets – conservation goals were met or exceeded for over 50% of terrestrial system targets. Table 4 provides a summary of each category of conservation target and details the success of the portfolio in capturing viable examples of the targets. Appendix 5 presents summary and detail information for each conservation target.

Table 4. Measuring success of areas of biodiversity significance in capturing viable examples of targets.

	total number of targets	at least one example in ecoregion	percent	number targets meet or exceed goal	percent
TERRESTRIAL SYSTEMS	9	5	56%	5	56%
AQUATIC SYSTEMS	86	34	40%	17	20%
COMMUNITIES	69	37	54%	15	22%
PLANTS	13	6	46%	3	23%
TERRESTRIAL ANIMALS	34	14	41%	7	21%
AQUATIC ANIMALS	27	15	56%	7	26%
TOTAL TARGETS	238	111	47%	54	23%

Despite the best efforts of the planning team to gather occurrence information for the conservation targets, there is clearly an underestimation of the number of targets captured by the portfolio. Conservation area planning, future iterations of this regional plan, and research and surveys by other parties should gather additional information about these areas, hopefully gaining a better picture of the targets that occur within each of these areas. However, it was agreed that due to the level of fragmentation of this ecoregion, there is little hope of meeting all conservation goals without extensive restoration efforts.

VI. CONSERVATION ACTION

This plan provides the specifics for **Conservation by Design** as applied to the Central Mixed-Grass Prairie as a whole. The first step in implementing this plan is to begin the process of conservation area planning for the individual components of the portfolio. Although all sites occurring within the portfolio warrant conservation action, it infeasible for us to work at all portfolio sites in the short term given the limited time and financial resources of the Conservancy and our partners. As part of this plan several assessments were completed to prioritize conservation actions in the Central Mixed-Grass Prairie.

ASSESSING AND ABATING THREATS

Successful implementation of this plan will hinge on the ability of the Conservancy and partners to develop strategies to abate existing and future threats to the biological diversity of the region. Depending on the circumstances, strategies for tackling these threats may be area-specific and implemented within individual areas, or may be more regional in scope and require implementation at broader levels. However, as a first step, it was critical that the threats be identified.

Threats Assessment

An assessment of the critical threats facing each conservation area can aid conservation planners in the prioritization of conservation activity. In addition, examining threats at the ecoregional scale can provide information about threats common across the entire planning area.

Other ecoregional planning efforts have lacked a systematic, data driven approach for the assessment of threats. In some cases, teams have relied solely on individual opinion regarding the level of threat within each conservation area. These opinions are often solicited from individuals with only state-specific knowledge. Sites identified as highly threatened using this approach may not be comparable across state lines. The end result, consequently, is the identification of the most highly threatened sites within each state, rather than the most highly threatened sites across the region.

To assess region-wide threats and to objectify the threat assessment across all states in the Central Mixed-Grass Prairie region, we created a systematic approach using available GIS databases. Land use, vegetation cover type, and other indicators of threat were assessed across the entire region to illustrate current threat status. Available GIS data included:

- land uses and land type;
- invasive woody vegetation (as an indicator of fire suppression);
- center pivot irrigation wells;
- superfund sites;
- active mine operations (most gravel);
- oil wells;
- concentrated agricultural feedlot operations; and
- road density.

In this conceptual model, the above mentioned **indicators of threat** are translated into numeric scores that are applied in a GIS to develop a map indicating high, medium, and low threat status across the region. Relative threat status within each conservation area was summarized to indicate the overall **threat rank** of each conservation area (see Appendix 4). The model and results were

reviewed by the planning. Appendix 6 summarizes the methods used for the threats assessment and discusses the results.

There are a number of threats that are not well represented by GIS data sources. For example, we lack comprehensive data on the distribution and abundance of invasive species. The conceptual model described above can help to standardize threat ranks across the region, however, it is still important to combine this information with site-specific knowledge. Planning team members and experts were asked for their qualitative assessment of the threats to each conservation area. This information is summarized by site in Appendix 4.

Multi-site Threats and Abatement Strategies

Threats to biological diversity occur at multiple scales and frequencies. Some threats may act over large geographic scales and others may occur at a local scale, yet be pervasive across a large number of conservation sites. In the former, site-specific threat abatement activities will not be successful and coordinated regional or national activities are therefore a necessity. In the latter, site-specific activities may be successful, but a regional approach may prove more efficient. Each of these are examples of multi-site strategies for the abatement of threats that might be effective.

We used the combined results of the GIS-based threat assessment and the qualitative threat assessment to identify possible multi-site strategies in the Central Mixed-Grass Prairie. Several primary threats were identified across many sites, and therefore might lend themselves to multi-site abatement strategies (Appendix 4 and Appendix 6). These included:

- conversion of remaining native grasslands to row crops;
- fragmentation of remaining native grasslands by ownership subdivision;
- altered hydrology from groundwater pumping, water diversions, and impoundments;
- encroachment of woody vegetation;
- exotic/invasive species;
- inappropriate grazing;
- broad cast pesticide application;
- inappropriate fire regimes;
- inappropriate sand and gravel extraction; and
- inappropriate haying regimes.

Based on these threats, two overarching themes were identified: abating development-based threats and abating agriculture-based threats.

ABATING DEVELOPMENT-BASED THREATS. Current and future reduction in the ranching industry within the region is a likely scenario given the increase in demand for rangeland for recreation and ex-urban development. This growing pressure for subdivision of ranches into "ranchettes" is particularly acute since it is often focused on riparian corridors. The Implementation and Strategies Team suggested a number of strategies to maintain the current extent of native range in the region:

- support tax and easement scenarios that incorporate public support for native grasslands;
- foster development of new livestock industry-/producer-driven partner land trusts;
- maintain dialogue with livestock associations to identify areas of common interest;

- garner the support of prominent ranchers to demonstrate best management practices; and
- work with counties, municipalities, NRCS Resource Conservation and Development program, etc. to develop appreciation for protection.

ABATING AGRICULTURE-BASED THREATS. Many of the threats to biological diversity in the region can be alleviated by re-enforcing conservation incentives in federal farm policy. Federal farm policy must ensure a reliable and safe food supply; while at the same time making certain that long-term resource health is maintained and has widespread public support. Partnerships between conservation and producer groups can have major positive impacts on biological diversity at scales that would be difficult to match through a site-by-site approach. We suggested a number of approaches to improve the cross-cultural understanding and progress on this important issue:

- better inform Conservancy's staff at all organizational levels on operational aspects of managing for biological diversity within agricultural landscapes;
- identify and communicate critical management constraints in the conservation/production environment (by Conservancy science and stewardship staff at the project level);
- focus on re-building the dual responsibility and authority of agriculture for both short-term production and long-term conservation;
- build effective partnerships to insure that incentives supporting biological diversity values are fundamental to Federal Farm Bill legislation;
- increase the funding available for innovative research into conservation sensitive production systems; and
- bring agriculture support industries into the efforts to develop conservation friendly production systems.

In summary, working with the agricultural interests that affect the vast majority of the region will be critical to achieving conservation success in the Central Mixed-Grass Prairie. There are rich opportunities for bold partnerships to address issues that are of concerns to both agriculture and conservation.

THE NESTED APPROACH TO CONSERVATION ACTION

Our approach to conserving biological diversity within the Central Mixed-Grass Prairie recognizes that although the majority of native land cover has been transformed by agriculture and infra-structure development, there are significant native grasslands that have survived into the 21st Century. This plan is dedicated to ensuring that we build onto, rather than minimize the loss of, these significant biological resources. There are a number of inter-related, or nested, approaches that are needed to ensure the conservation of the Central Mixed-grass Prairie region.

Conservation of Core Areas for Biological Diversity

The distribution of conservation targets across the spectrum of land types, land uses, and threats results in uniquely high biological diversity values in local areas of the Central Mixed-Grass Prairie. The most effective way to ensure that these areas are protected will be to designate them as core conservation areas. The primary management paradigm will need to support these unique values. Although most of the core conservation areas will have a strong government or private conservation organization presence, it will be necessary that they receive the support of the local community in order to be viable in the long term. It is unlikely that these areas will be large enough to include

effective buffers if they are embedded in a hostile landscape. Indeed, many core conservation areas in the portfolio are already embedded in functional landscapes.

Conservation of Functional Landscapes

A **functional landscape** is capable of conserving a large number of ecological systems, communities, and species representing all spatial scales – from local to regional. It has a high degree of ecological intactness and retains (or can have restored) most or all of its key components, patterns and processes (Poiani *et al.* 2000). These landscapes tend to be on the order of 1 million acres or larger in size. In comparison, a **functional site** is capable of supporting a small number of ecological systems, communities, or species representing only several spatial scales – from local to coarse (regional scale species generally can not be conserved by functional sites). Functional sites are typically on the order of 20,000 acres to 1 million acres in size. Most of the sites in the Central Mixed-grass Prairie portfolio are considered functional sites.

There are only two functional landscapes found in the Central Mixed-grass Prairie region – the Sandhills Prairie (site 13) and the Red Hills (site 44). These two landscapes account for 56% of the total terrestrial portfolio area and capture a significant portion of the region's biological diversity. Furthermore, they offer conservation targets the best opportunity for long-term viability. As such, conservation action designed to focus on these areas must be a priority.

The predominance of the private, ranching land use dictates that conservation strategies be designed to fully engage the range livestock and its support industries in the conservation of these functional landscapes. We recognize that conservation area planning must involve these key stakeholders, early on and throughout the planning process. Developing tools that maintain conservation targets over the long term, and ensure the economic viability of the ranching industry, will be a prerequisite to conservation success. Additionally, a public commitment must develop which translates into private incentives to maintain the existing land use. Examples of tools already available include conservation easements, green-belting to control property taxes, local zoning, and cost-share programs for improved range management practices.

Conservation through Local Land Trusts

Local land trusts that are rancher-driven such as the Sandhills Task Force in Nebraska and the Commanche Pool in the Red Hills of Kansas, offer excellent opportunities for local partnerships with public and private conservation organizations. In spite of 20^{+} years of community-based conservation by several Conservancy projects it appears that we still are perceived as outsiders on some of the more difficult yet important conservation issues. This is understandable given the nature of local politics, and the obvious connection of our local staff to a global organization. Strong working relationships with local land trusts may be the most realistic approach to community-based conservation for several or more generations. The development of a local land trust for each of the functional landscapes within the Central Mixed-Grass Prairie would be one way to provide leverage at scale and provide an effective buffer to core preserves embedded within the landscapes.

Restoration of Fragmented Landscapes

One of the overriding messages that should be drawn from this conservation plan is that even if all of the proposed portfolio sites are conserved, we will still fall far short of meeting our conservation goals. Even with additional inventory in the region and follow-up conservation actions, we would

only be likely to fully conserve about half of the ecological systems and native plant communities. This fact is of great concern to conservationists.

Restoration has the potential to improve the biological diversity of the region. We have defined **restoration** as an enhancement of the viability of a conservation target by modifying its size, condition or landscape context. Although some believe that restoration means simply "letting nature takes its course", we believe that the culture of the region suggests a more "hands-on" course of action. As such, the discussion here will focus on proactive strategies designed to expand the functional size of native plant communities, reintroduce ecological processes, remove ecosystem threats, and/or link isolated landscape fragments together with native vegetation.

Restoration in the Central Mixed-Grass Prairie is viewed as a necessary effort to: 1) maintain and enhance the ecological integrity of ecological system targets in portfolio areas with significant fragmentation; 2) buffer core protected areas in otherwise tilled landscapes; and 3) expand the habitat size of community or species targets; and 4) provide important habitat for grassland birds affected by fragmentation. This plan recognizes that without long-term restoration in selected areas, the conservation goals for the region cannot be achieved and additional conservation targets occurring within small prairie remnants will be lost.

IDENTIFYING RESTORATION AREAS. Landscape restoration is a discussion topic of merit for each conservation target. However, the primary emphasis within this iteration of the plan will be on ecological systems and communities, focusing principally on matrix types. These systems and communities form the predominant natural character of the region, providing habitat for an array of species that would not otherwise be able to survive. They also form the medium through which the major ecological processes of fire and grazing operate. This concept was independently pioneered and first applied towards prairie conservation in the Osage Plains/Flint Hills region by The Nature Conservancy and the Missouri Department of Conservation with the designation of Landscape Conservation Areas (The Nature Conservancy, Osage Plains/Flint Hills Prairie Ecoregional Planning Team 2000). The concept was first tested in the Central Tallgrass Prairie (Central Tallgrass Prairie Ecoregion Planning Team 2000). Through increased connectivity, improved landscape context, and greater management flexibility to restore natural disturbance processes like fire at or near the scale they historically occurred, it is assumed that these areas will be more functional, and consequently, target occurrences within them will be more viable over the long term. Equally important, there will be a higher likelihood that land uses based on native grasslands will remain viable.

Potential landscape restoration areas are those identified in Appendices 4 and 5 of this report and in Loring *et. al.* 2000 as having questionable or non-viable occurrences of ecological systems and native plant communities.

ESTABLISHING PRIORITIES FOR RESTORATION. The current contribution of restoration, while significant, will have to be dramatically increased to have a substantial impact on reaching the conservation goals outlined in this plan. However, restoration activities are expensive, an estimated 2-3 times more so than conserving intact and viable examples of natural communities outright. The task at hand is how to prioritize restoration efforts, given the scarcity of resources for conservation action. A primary conservation strategy should be to prioritize conservation action toward the native systems and communities, then focus on restoring the matrix community types on the

marginal tilled lands in moderately fragmented portfolio sites. Several of the conservation practices and programs of the Natural Resource Conservation Service (NRCS) can be used to accomplish these restorations.

Significant resources will need to be generated to support restoration at the scale envisioned by this plan. We do not yet know if the combined energy of natural resource agencies, conservation organizations, and private landowners can be focused to carry out large-scale, long-term, and expensive restoration efforts necessary to improve the condition of the region's soil, water, and grassland diversity. Opportunities for public-private partnerships might include identification of restoration priorities for the NRCS EQUIP cost-share funds, and the identification of significant conservation areas as "grassland reserves" supported by farm bill programs.

Research and Inventory

As discussed above, restoration will be one critical step towards the conservation of the biological diversity of this region. In addition, this assessment provides a detailed analysis of the biological research and inventory needs in the region. Specifically, Appendix 5 can be used as a list of inventory needs, with priority given to those targets for which no or few examples were located within the portfolio.

Major research needs for the region include:

- a better understanding of conservation targets so that goals and viability can be better addressed;
- consultation with state prairie dog working groups, especially in Nebraska and Oklahoma, to better understand locations and extent of towns in the region;
- an extensive survey of bat caves in Kansas and Oklahoma;
- more review of *Plantanthera praeclara* occurrences in Nebraska;
- better data pertaining to aquatic macroinvertebrates; and
- an assessment of lakes for conservation purposes.

VI. THE NEXT ITERATION

MAINTENANCE OF THIS CONSERVATION PLAN

We recommend two ways of ensuring that this document will remain a useful conservation guide for the Central Mixed-Grass Prairie. First, a Site Selection Advisory Team will be established to review modifications to the portfolio which may be proposed in the future by state or project offices. This team will draft guidelines and protocols for modifying the existing portfolio. Second, an Assessment and Design Team will be established to review the changes adopted by the Site Selection Advisory Team and determine the implications of these changes for the entire portfolio.

Site Selection Advisory Team

Over time, species global ranks may change, resulting in a gain or loss of conservation targets; new inventories may suggest a new prioritization of conservation areas; or research may lead to improved conservation methods. The Site Selection Advisory Team will be able to adapt the plan in a disciplined way to accommodate the new realities. The Team will be responsible for documenting these changes in a form that is readily usable for future iterations of the plan.

A Site Selection Advisory Team was created and includes the project leader (Al Steuter), project coordinator (Jennifer Hall), and one science representative from each state: Chris Helzer (NE), Kelly Kindscher (KS), and Chris Hise (OK). Project Directors advocating change to the portfolio of sites will provide the project leader and project coordinator with the information needed to evaluate their proposal. The Advisory Team will utilize an established protocol in their review. Changes approved by the Team will be sent to the affected project directors and science staff. In addition, they will be appended to databases and file archives of this plan and maintained by the Great Plains Division office of The Nature Conservancy.

Assessment and Design Team

The Assessment and Design Team will meet every two years, or as needed based on the number of changes made by the Site Selection Advisory Team. Members of the Assessment and Design Team will include the project leader (Al Steuter), a senior Great Plains Division science staff member (Jennifer Hall), and Kansas (Greg Wingfield), Oklahoma (Chris Hise) and Nebraska (Doug Whisenhunt) Field Office representatives. They will evaluate the actions of the Site Selection Advisory Team and overall progress in meeting the goals of the Central Mixed-Grass Prairie Plan. This team will recommend operational changes in the Central Mixed-Grass Prairie Plan to State Program directors prior to the official second iteration of the plan. These recommendations will be appended to databases and file archives of this plan and maintained by the Great Plains Division office of The Nature Conservancy.

SECOND ITERATION OF THIS PLAN

Ecoregional planning, as defined by the conservation approach (Figure 1), is an iterative process. We understand this to mean that as new data become available, it will be incorporated into the framework of this assessment, and conservation priorities will be updated as necessary. However, there is great value in producing a status report of these collected biological information, such as this report. We therefore recommend that a complete second iteration report be produced for the Central Mixed-Grass Prairie within 10 years.

Data gaps that constrained our thinking should be the focus of research and inventory efforts supported by the Conservancy. The results of these efforts as well as approved changes of the Site Selection Advisory Team and recommendations of the Assessment and Design Team will form the basis for this second iteration.

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Appendix 1. Terrestrial Ecological System and Community Target Information for the Central Mixed-Grass Prairie Ecoregion.

A total of 9 terrestrial ecological system targets and 69 different community association targets are defined for the Central Mixed-Grass Prairie ecoregion. Community association targets are consistent with the US National Vegetation Classification (Grossman et al. 1998).

Section A lists the terrestrial ecological system targets, organized by spatial scale - from largest to smallest. Description and viability information was compiled by Mary Harkness, Great Plains Division, The Nature Conservancy. Description and viability information includes: a detailed description of each system type, information on how to assess the integrity of each system, a conservation goal, and the community types which occur in each system.

Community types are listed in the Section B of this report, ordered numerically by their global element code to allow users to easily look up community types referenced in the system report. Each community type has been assigned a Pattern and Distribution category. Matrix communities form extensive cover, are the most widespread landform types, have broad ecological amplitutde, and are driven by regional-scale processes; large patch communities may form extensive cover over some of the area, but usually their boundaries correlate with a single dominant process; small patch communities rarely form extensive cover, they have very specific ecological amplitudes and occur where a number of local conditions come together in a precise way; and linear communities occur as long narrow strands with acreage typically within the range of the small patch category. Communities with endemic distribution occur primarily or entirely with the region; widespread communities are common in many other regions and widespread in this region; limited community types occur within the region, but also in a few adjacent regions; and peripheral communities occur rarely in the region, with the core of their distribution in a different region. Conservation goals are listed for each type.

Section A: Ecological System Targets

Mixed-grass Prairie System

The loess regions in west-central Kansas and central Nebraska, the Red Hills Region of south-central Kansas, and northern Oklahoma are home to the mixed-grass prairie system. Because of its proximity to other ecoregions, the mixed-grass prairie contains elements from both the shortgrass and tallgrass prairies, which combine to form the mixed-grass prairie ecological system on mid- to upper slopes throughout its range (Tomanek and Albertson 1957, Weaver and Bruner 1948, Albertson and Tomanek 1965, Hopkins 1951, Barnes et al. 1983). Topography and soil moisture determine the distribution of the dominant species. Little bluestem, blue grama, and side-oats grama are among the dominant species in this system.

There are several smaller communities that typically co-occur with the mixed-grass prairie as large or small patches embedded within the system. Riparian areas embedded in this system may contain a variety of communities that co-occur with each other throughout the mixed-grass prairie system. Streams and rivers in the region may be gently or noticeably terraced, and the soil texture and height above the river determine which plant communities are present. Immediately along a stream or river are sand flats or strands, often with sandbar willow shrublands growing on them. Although the soil appears dry, the water table is within a few feet of the surface. In stretches with well-drained soils, cottonwood-dominated floodplain woodland or forest may be found on the next terrace, approximately three to five feet above the level of the river. If the soil is siltier and allows water to collect, open or emergent marshes may grow; even further from the streambed, the marshes grade into wet prairies with predominantly tallgrass elements. (These riparian tallgrass prairies have largely been eliminated from this system through agricultural practices.) Wooded riparian vegetation may sometimes be found immediately above marshes, rather than wet prairies. An occasional component in riparian areas is a river scour woodland. In isolated areas, localized flooding due to ice jams may occur and create small scoured areas, but this is rare in all but the largest rivers in this part of the Great Plains. The wooded riparian vegetation alternates with marsh complexes along streams and rivers in the mixed-grass prairie system, according to soil texture and depth to water.

Groundwater-driven marshes and other wetlands occur independently of streams or rivers in mixed-grass prairie systems. Open and emergent marshes may be found together with wet prairies, wet meadows, and seeps. These wetlands co-occur with each other throughout the range of the mixed-grass prairie system. The groundwater-supplied wetlands may be either fresh or saline; saline wetlands derive their salts from the substrate and/or evaporation.

Some of the best examples of the ecological system are found in the Loup River's Loess Hills in Nebraska, the Red Hills of Kansas, and the Granite Hills of Oklahoma.

Community Association Types found in this sytem:

Matrix Community Associations	Heritage Code
Blue Grama - Hairy Grama Shortgrass Prairie	CEGL001755
Blue Grama - Buffalograss Shortgrass Prairie	CEGL001756
Eastern Great Plains Big Bluestem Loess Prairie	CEGL002025
Little Bluestem Loess Mixedgrass Prairie	CEGL002036
Needle-and-thread - Blue Grama Mixedgrass Prairie	CEGL002037
Central Great Plains Little Bluestem Prairie	CEGL002246
Red Hills Little Bluestem Mixedgrass Prairie	CEGL002248
Western Gypsum And Redbed Clay Prairie	CEGL002252

Large Patch Community Associations	Heritage Code
Broad-leaved Cattail Marsh	CEGL002010
Central Wet-mesic Tallgrass Prairie	CEGL002024
Northern Cordgrass Wet Prairie	CEGL002027
Western Tallgrass Bur Oak Woodland	CEGL002053
Southern Great Plains Cordgrass Wet Prairie	CEGL002223
Little Bluestem Chalkflat Mixedgrass Prairie	CEGL002247
Honey Mesquite - Lotebush Shrubland	CEGL004939

Small Patch Community Associations	Heritage Code
Southern Great Plains Cattail - Bulrush Marsh	CEGL002032
Great Plains Neutral Seep	CEGL002033
Western Great Plains Alkaline Marsh	CEGL002040
Southern Great Plains Saline Meadow	CEGL002042
Great Plains Pondweed Submerged Aquatic Wetland	CEGL002044
Alkali Bulrush Marsh	CEGL002226
Chairmaker's Bulrush - Sedge species Herbaceous Vegetation	CEGL004144
Oklahoma Arrowhead Marsh	CEGL004525
Smartweed - Water-pepper Pond	CEGL004699

Linear Community Associations	Heritage Code
Cottonwood - Green Ash Floodplain Forest	CEGL000658
Cottonwood - Peach-leaf Willow Floodplain Woodland	CEGL000659
Sandbar Willow Shrubland	CEGL001197
Riverine Sand Flats	CEGL002049
Cottonwood - Sycamore Forest	CEGL002095
Eastern Cottonwood / Black Willow Woodland	CEGL004919

Conservation Goal:

6 examples in the ecoregion (2 in each ecoregional planning unit)

Criteria for evaluating ecological integrity: size of occurrence

The most important viability factor for the mixed-grass prairie system is size. The mixed-grass prairie system forms the matrix vegetation in parts of the Central Mixed-grass Prairie ecoregion. The size criteria take into consideration the large scale ecological processes that once shaped this matrix-forming system: fire and bison grazing. A viable example of this system should be large enough that fire and grazing can occur at spatial and temporal scales approaching those at which they naturally occurred. Given current fire suppression practices, loss of bison from the landscape, and the economics of cattle grazing, fire and grazing regimes will usually (if not always) have to be approximated by prescribed burns and carefully managed cattle grazing. It should also be large enough to represent the smaller scale communities that are associated with it, such as various wetland communities. It should be capable of supporting prairie dog colonies and other native fauna.

"Best" (A rank) size: 100,000 acres
Minimum threshold for viable example: 5,000 acres

A report of an 1885 fire noted that it burned 175 miles from western Kansas, across the Cimarron River, and on across the north plains of Texas (Haley 1929 in Joern and Keeler 1995). A cursory literature review does not provide additional information on the actual patch size of prairie fires in the Central Mixed-Grass Prairie or surrounding ecoregions, but such historical accounts and other anecdotal information indicate a single fire could be extremely large, spanning millions of acres. Joern and Keeler (1995) also note that historical fire frequency in southern mixed-grass prairie systems may have been every five to ten years, due to slow litter accumulation. That fire frequency translates to an annual average of 10-20% of a mixed-grass prairie ecosystem burned. Using Pickett and Thompson's (1978) "minimum dynamic area" concept suggests that a viable example of a mixed-grass prairie ecological system should be on the order of millions of acres in size. The historical fire frequency translates to hundreds of thousands or millions of acres burning annually. In today's fragmented and multiple-use landscape, this does not provide a practical size criterion. Since the dominant ecological processes in this system, fire and grazing, can be managed and controlled, it is necessary to scale down the size criteria to reflect these practical considerations.

Criteria for evaluating ecological integrity: condition of occurrence

The condition of a mixed-grass prairie system occurrence is secondary to its size, although still important. One of the most important components of condition in this matrix-forming ecological system is the level of fragmentation within an occurrence. Less than 20% of the occurrence should be fragmented by non-native grasslands, row crops, or other cover types not dominated by native mixed-grass prairie species. It should also be easy to prevent the spread of non-natives into the 80% (or more) unfragmented portion of the occurrence. Another important aspect of condition is the presence of the small patch communities that are typically embedded within this ecological system.

Since the small patch communities are not addressed individually in this effort, all or most of those communities must be present within an individual occurrence for it to be considered viable.

A-rank threshold:
* The processes of fire and bison grazing are functioning within their natural range of variation, or are mimicked by various management techniques
* Little or no invasion by non-native or invasive or increaser species; if present, such species are easily controlled or eliminated
* Appropriate diversity of individual plant communities are represented within the occurrence
* Plant communities are appropriately interspersed and connected
* Plant communities have representative composition and structure
* Surface and groundwater hydrologic regimes are not altered, or altered very little (applies to wetland communities embedded in prairie matrix)
* High forb diversity

Minimum (C-rank) threshold:
* The processes of fire and bison grazing are functioning well outside their natural range of variation, or are poorly mimicked by various management techniques; however, there is potential to restore these ecological processes (or their surrogates) to a natural range of variability
* Non-native or invasive or increaser species are widely present; however, there is still potential to control or eliminate these species with appropriate management or restoration over a twenty-year time horizon
* Low diversity of plant communities present
* Plant communities are lacking much of their representative composition and structure
* Surface and groundwater hydrologic regimes are highly altered, but still have the potential to be fully restored over a twenty-year time horizon
* Low forb diversity

Criteria for evaluating ecological integrity: landscape context of occurrence

A-rank threshold:
Surrounding landscape is relatively unfragmented and provides some connectivity for species dispersal, migration, or recolonization.

Minimum (C-rank) threshold:
Surrounding landscape is fragmented and provides little connectivity for species dispersal, migration, or recolonization.

Sand Prairie System

The matrix community of this system is sand prairie in most areas, and a mix of sand prairie and xeric shrubland in the southern part of the ecoregion. The Sandhills of Nebraska are dominated by the Sandhills Wet-mesic Prairie. In central Kansas and western Oklahoma, the drier sand prairies such as Sand Bluestem - Prairie Sandreed Sand Prairie and Prairie Sandreed - Needle-and-thread Prairie are dominant, but there is a noticeable component of sand sagebrush intermingled. The xeric shrubland in the southern part of the ecoregion is a sand sagebrush-little bluestem community, and it is dominant in the sand prairie around the Cimarron River. True sand prairies are intermingled with the sand sagebrush community. The sand prairie system gradually shifts toward sand sagebrush shrubland as you go from north to south in the ecoregion. The sand prairie system was naturally found in the southern part of the ecoregion prior to Euro-American settlement; woody or shrubby species such as Artemisia filifolia have invaded or greatly increased in density in southern arid grasslands since then.

There are several smaller communities that co-occur with the sand prairies and are embedded in the sand prairie matrix. Riparian areas may contain a variety of communities that co-occur with each other throughout the sand prairie system. Streams and rivers in the region may be gently or noticeably terraced, and the soil texture and height above the river determine which communities are present. Immediately along a stream or river are sand flats or strands, often with sandbar willow shrublands growing on them. Although the soil appears dry, the water table is within a few feet of the surface. In stretches with better-drained soils, cottonwood-dominated floodplain woodland or forest may be found on the next terrace, approximately three to five feet above the level of the river. If the soil is siltier and allows water to collect, open or emergent marshes may grow; even further from the streambed, the marshes grade into wet prairies with predominantly tallgrass elements. (These riparian tallgrass prairies have largely been eliminated from this system through agricultural practices.) Wooded riparian vegetation may sometimes be found immediately above marshes, rather than wet prairies. An occasional component in riparian areas is a river scour woodland. In isolated areas, localized flooding due to ice jams may occur and create small scoured areas, but this is rare in all but the largest rivers in this part of the Great Plains. The wooded riparian vegetation alternates with marsh complexes along streams and rivers in the sand prairie system, according to soil texture and depth to water.

Marsh wetland complexes also occur independently of streams or rivers in sand prairie systems. They are groundwater-driven, and occur in the highest density in Nebraska's Sandhills. Open and emergent marshes may be found together with wet prairies, wet meadows, and seeps. These wetlands co-occur with each other throughout the range of the sand prairie system.

Saline wetlands are found primarily in the sand prairies in the western part of the Nebraska Sandhills, and do not co-occur with the open (freshwater) wetlands described above. Groundwater in such areas arises from deep sediments with a relatively high salt content. Drainage and evaporation of water has allowed those salts to build up in surface soils over time. Saline wetlands are also found in the Great Salt Plain of Oklahoma, and in central Kansas sand prairie systems.

Other components of the sand prairie system are not as widely distributed within that system. Western xeric shrublands are likely a component of the sand prairies around the Cimarron River, and may also be found in the southwest portion of the Nebraska Sandhills. (They are dominant in southwestern Nebraska, outside the Central Mixed-grass Prairie ecoregion.)

The sand prairie system appears in several areas across the Central Mixed-grass Prairie ecoregion. It is intermingled with another major prairie system, the upland mixed-grass prairie. By far the largest and most intact example of the sand prairie system lies within the Sandhills of Nebraska. Central Kansas, south of Cheyenne Bottoms, has another area of sand prairie that is much smaller and more fragmented than the Sandhills. These sand prairies tend to be associated with the Arkansas River. Western and west central Oklahoma also contain a smaller and more fragmented area of sand prairie. The Cimarron River area, south of Kansas' Red Hills is another region of sand prairie. Most of the sand prairie is on the east side of the river, but there are also examples on the west side. Some sand prairies also occur south of the Platte River, and east of Grand Island; they are also fragmented. These sand prairies are associated with alluvial sands from ancient river systems that once drained the parts of the Rocky Mountains immediately to the west.

Community Association Types found in this sytem:

Matrix Community Associations	Heritage Code
Sand Bluestem - Prairie Sandreed Sand Prairie	CEGL001467
Prairie Sandreed - Needle-and-thread Prairie	CEGL001473

Sandhills Wet-mesic Prairie	CEGL002023
Sand Sagebrush / Little Bluestem Shrubland	CEGL002178
Sand Sage / Sand Dropseed Shrubland	CEGL002179

Large Patch Community Associations	Heritage Code
Broad-leaved Cattail Marsh	CEGL002010
Central Wet-mesic Tallgrass Prairie	CEGL002024
Northern Cordgrass Wet Prairie	CEGL002027
Southern Great Plains Cordgrass Wet Prairie	CEGL002223

Small Patch Community Associations	Heritage Code
Sandhills Wet Prairie	CEGL002028
Sandhills Bulrush Marsh	CEGL002030
Southern Great Plains Cattail - Bulrush Marsh	CEGL002032
Great Plains Neutral Seep	CEGL002033
Western Great Plains Alkaline Marsh	CEGL002040
Southern Great Plains Saline Meadow	CEGL002042
Great Plains Pondweed Submerged Aquatic Wetland	CEGL002044
Alkali Bulrush Marsh	CEGL002226
Sandhills Fen	CEGL002390
Chairmaker's Bulrush - Sedge species Herbaceous Vegetation	CEGL004144
Oklahoma Arrowhead Marsh	CEGL004525

Linear Community Associations	Heritage Code
Cottonwood - Green Ash Floodplain Forest	CEGL000658
Cottonwood - Peach-leaf Willow Floodplain Woodland	CEGL000659
Sandbar Willow Shrubland	CEGL001197
Riverine Sand Flats	CEGL002049
Cottonwood - Sycamore Forest	CEGL002095
Eastern Cottonwood / Black Willow Woodland	CEGL004919

Conservation Goal:

6 examples in the ecoregion (2 in each ecoregional planning unit)

Criteria for evaluating ecological integrity: size of occurrence

The most important viability factor for the sand prairie system is size. The sand prairie system forms the matrix vegetation in parts of the Central Mixed-grass Prairie ecoregion. The size criteria take into consideration the large scale ecological processes that once shaped this matrix-forming system: fire and bison grazing. A viable example of this system should be large enough that fire and grazing can occur at spatial and temporal scales approaching those at which they naturally occurred. Given current fire suppression practices, loss of bison from the landscape, and the economics of cattle grazing, fire and grazing regimes will usually (if not always) have to be approximated by prescribed burns and carefully managed cattle grazing. It should also be large enough to represent the smaller scale communities that are associated with it, such as various wetland communities. It should be capable of supporting prairie dog colonies and other native fauna.

"Best" (A rank) size: 100,000 acres
Minimum threshold for viable example: 5,000 acres

A report of an 1885 fire noted that it burned 175 miles from western Kansas, across the Cimarron River, and on across the north plains of Texas (Haley 1929 in Joern and Keeler 1995). A cursory literature review does not provide additional information on the actual patch size of prairie fires in the Central Mixed-Grass Prairie or surrounding ecoregions, but such historical accounts and other anecdotal information indicate a single fire could be extremely large, spanning millions of acres. Fire frequency in the sand prairie may have been every five years (Bragg 1986 in Joern and Keeler 1995), but Bragg notes that figure may be off because bison had already been nearly eliminated by the time period from which the frequency estimate is drawn, and their grazing patterns impact the areas of sand

prairie that get burned (see Knapp et. al. 1999 and articles referenced there). Using Pickett and Thompson's (1978) "minimum dynamic area" concept suggests that a viable example of a sand prairie ecological system should be on the order of millions of acres in size. Despite the caveats associated with the historical fire frequency estimate, it likely translates to hundreds of thousands or millions of acres burning annually. In today's fragmented and multiple-use landscape, this does not provide a practical size criterion. Since the dominant ecological processes in this system, fire and grazing, can be managed and controlled, it is necessary to scale down the size criteria to reflect these practical considerations.

Criteria for evaluating ecological integrity: condition of occurrence

The condition of a sand prairie system occurrence is secondary to its size, although still important. One of the most important components of condition in this matrix-forming ecological system is the level of fragmentation within an occurrence. Less than 20% of the occurrence should be fragmented by non-native grasslands, row crops, or other cover types not dominated by native sand prairie species. It should also be easy to prevent the spread of non-natives into the 80% (or more) unfragmented portion of the occurrence. Another important aspect of condition is the presence of the small patch communities that are typically embedded within this ecological system. Since the small patch communities are not addressed individually in this effort, all or most of those communities must be present within an individual occurrence for it to be considered viable.

A-rank threshold:
* The processes of fire and bison grazing are functioning within their natural range of variation, or are mimicked by various management techniques
* Little or no invasion by non-native or invasive or increaser species; if present, such species are easily controlled or eliminated
* Appropriate diversity of individual plant communities are represented within the occurrence
* Plant communities are appropriately interspersed and connected
* Plant communities have representative composition and structure
* Surface and groundwater hydrologic regimes are not altered, or altered very little (applies to wetland communities embedded in prairie matrix)
* High forb diversity

Minimum (C-rank) threshold:
* The processes of fire and bison grazing are functioning well outside their natural range of variation, or are poorly mimicked by various management techniques; however, there is potential to restore these ecological processes (or their surrogates) to a natural range of variability
* Non-native or invasive or increaser species are widely present; however, there is still potential to control or eliminate these species with appropriate management or restoration over a twenty-year time horizon
* Low diversity of plant communities present
* Plant communities are lacking much of their representative composition and structure
* Surface and groundwater hydrologic regimes are highly altered, but still have the potential to be fully restored over a twenty-year time horizon
* Low forb diversity

Criteria for evaluating ecological integrity: landscape context of occurrence

A-rank threshold:
Surrounding landscape is relatively unfragmented and provides some connectivity for species dispersal, migration, or recolonization.

Minimum (C-rank) threshold:
Surrounding landscape is fragmented and provides little connectivity for species dispersal, migration, or recolonization.

Dakota Sandstone Tallgrass Prairie System

Kuchler (1974) describes this system as a transition between the big bluestem-dominated tallgrass prairie just to the east, and the mixed-grass prairie to the west. This tallgrass-dominated system is found on loamy soils in the Dakota Sandstone region of north-central Kansas and adjacent Nebraska. Its range lies entirely within the Central Mixed-grass Prairie ecoregion. Abundant species include big bluestem, switchgrass, little bluestem, side oats grama and Indian grass.

The Dakota Sandstone tallgrass prairie association is typical of this system, but other tallgrass and mixed-grass prairie associations are typically intermingled with that particular association. As with the other prairie systems, various wetland communities are also embedded within this system.

Community Association Types found in this sytem:

Matrix Community Associations	Heritage Code
Dakota Sandstone Tallgrass Prairie	CEGL005231

Large Patch Community Associations	Heritage Code
Needle-and-thread - Blue Grama Mixedgrass Prairie	CEGL002037

Small Patch Community Associations	Heritage Code
Broad-leaved Cattail Marsh	CEGL002010
Central Wet-mesic Tallgrass Prairie	CEGL002024
Southern Great Plains Cordgrass Wet Prairie	CEGL002223

Linear Community Associations	Heritage Code
Cottonwood - Green Ash Floodplain Forest	CEGL000658

Conservation Goal:

3 examples in the ecoregion

Criteria for evaluating ecological integrity: size of occurrence

The most important viability factor for this tallgrass prairie system is size. It forms the matrix vegetation in eastern portions of the Central Mixed-grass Prairie ecoregion. The size criteria take into consideration the large scale ecological processes that once shaped this matrix-forming system: fire and bison grazing. A viable example of this system should be large enough that fire and grazing can occur at spatial and temporal scales approaching those at which they naturally occurred. Given current fire suppression practices, loss of bison from the landscape, and the economics of cattle grazing, fire and grazing regimes will usually (if not always) have to be approximated by prescribed burns and carefully managed cattle grazing. It should also be large enough to represent the smaller scale communities that are associated with it, such as various wetland communities. It should be capable of supporting prairie dog colonies and other native fauna.

"Best" (A rank) size: 100,000 acres
Minimum threshold for viable example: 5,000 acres

Criteria for evaluating ecological integrity: condition of occurrence

The condition of a tallgrass prairie system occurrence is secondary to its size, although still important. One of the most important components of condition in this matrix-forming ecological system is the level of fragmentation within an occurrence. Less than 20% of the occurrence should be fragmented by non-native grasslands, row crops, or other cover types not dominated by native tallgrass prairie species. It should also be easy to prevent the spread of non-natives into the 80% (or more) unfragmented portion of the occurrence. Another important aspect of condition is the presence of the small patch communities that are typically embedded within this ecological system. Since the small patch communities are not addressed individually in this effort, all or most of those communities must be present within an individual occurrence for it to be considered viable.

A-rank threshold:
* The processes of fire and bison grazing are functioning within their natural range of variation, or are mimicked by various management techniques
* Little or no invasion by non-native or invasive or increaser species; if present, such species are easily controlled or

eliminated
* Appropriate diversity of individual plant communities are represented within the occurrence
* Plant communities are appropriately interspersed and connected
* Plant communities have representative composition and structure
* Surface and groundwater hydrologic regimes are not altered, or altered very little (applies to wetland communities embedded in prairie matrix)
* High forb diversity

Minimum (C-rank) threshold:
* The processes of fire and bison grazing are functioning well outside their natural range of variation, or are poorly mimicked by various management techniques; however, there is potential to restore these ecological processes (or their surrogates) to a natural range of variability
* Non-native or invasive or increaser species are widely present; however, there is still potential to control or eliminate these species with appropriate management or restoration over a twenty-year time horizon
* Low diversity of plant communities present
* Plant communities are lacking much of their representative composition and structure
* Surface and groundwater hydrologic regimes are highly altered, but still have the potential to be fully restored over a twenty-year time horizon
* Low forb diversity

Criteria for evaluating ecological integrity: landscape context of occurrence

A-rank threshold:
Surrounding landscape is relatively unfragmented and provides some connectivity for species dispersal, migration, or recolonization.

Minimum (C-rank) threshold:
Surrounding landscape is fragmented and provides little connectivity for species dispersal, migration, or recolonization.

Sandsage Shrubland System

The matrix community of this system is xeric shrubland dominated by sandsage with little bluestem and some other prairie grass species. It is found in the southern part of the ecoregion, primarily in the Oklahoma portion. This shrubland is also intermingled to some degree with the sand prairie systems further north. Along with the sand prairie system, it is dominant around the Cimarron River. The sandsage shrubland system transitions to the sand prairie system as you go from south to north in the ecoregion. Woody or shrubby species such as sandsage have invaded or greatly increased in density in southern arid grasslands since European settlement, and the present extent of this ecological system is likely significantly greater than it was 150 years ago.

There are several smaller communities that are embedded within the sandsage shrubland system as well. Again, riparian areas within this system contain a variety of co-occurring communities. Streams and rivers in the region may be gently or noticeably terraced, and the soil texture and height above the river determine which communities are present. Immediately along a stream or river are sand flats or strands, often with sandbar willow shrublands growing on them. Although the soil appears dry, the water table is within a few feet of the surface. In stretches with better-drained soils, cottonwood-dominated floodplain woodland or forest may be found on the next terrace, approximately three to five feet above the level of the river. If the soil is siltier and allows water to collect, open or emergent marshes may grow, and grade into wet prairies. Wooded riparian vegetation may sometimes be found immediately above marshes, rather than wet prairies. An occasional component in riparian areas is a river scour woodland. In isolated areas, localized flooding due to ice jams may occur and create small scoured areas, but this is rare in all but the largest rivers in this part of the Great Plains. The wooded riparian vegetation alternates with marsh complexes along streams and rivers in the sandsage shrubland system, according to soil texture and depth to water.

Groundwater-driven marshes and other wetlands also occur independently of streams or rivers in this system. Open and emergent marshes may be found together with wet prairies, wet meadows, and seeps. These wetlands co-occur with each other throughout the range of this system.

Other components of this system are not as widely distributed within the system. Western xeric shrublands are likely a component of the sandsage shrublands around the Cimarron River.

Community Association Types found in this sytem:

Matrix Community Associations	Heritage Code
Sand Sagebrush / Little Bluestem Shrubland	CEGL002178
Sand Sage / Sand Dropseed Shrubland	CEGL002179

Conservation Goal:

6 examples in the ecoregion (2 in each ecoregional planning unit)

Criteria for evaluating ecological integrity: size of occurrence

The most important viability factor for this system is size. The sandsage shrubland system forms the matrix vegetation in parts of the Central Mixed-grass Prairie ecoregion. The size criteria take into consideration the large scale ecological processes that once shaped this matrix-forming system: fire and bison grazing. A viable example of this system should be large enough that fire and grazing can occur at spatial and temporal scales approaching those at which they naturally occurred. Given current fire suppression practices, loss of bison from the landscape, and the economics of cattle grazing, fire and grazing regimes will usually (if not always) have to be approximated by prescribed burns and carefully managed cattle grazing. It should also be large enough to represent the smaller scale communities that are associated with it, such as various wetland communities. Where soils are suitable, it should be capable of supporting prairie dog colonies and other native fauna. Soils are too sandy in the Oklahoma portion of the ecoregion to support prairie dogs.

"Best" (A rank) size: 100,000 acres
Minimum threshold for viable example: 5,000 acres

Criteria for evaluating ecological integrity: condition of occurrence

The condition of a sandsage shrubland system occurrence is secondary to its size, although still important. One of the most important components of condition in this matrix-forming ecological system is the level of fragmentation within an occurrence. Less than 20% of the occurrence should be fragmented by non-native grasslands, row crops, or other cover types not dominated by native sandsage shrubland species. It should also be easy to prevent the spread of non-natives into the 80% (or more) unfragmented portion of the occurrence. Another important aspect of

condition is the presence of the small patch communities that are typically embedded within this ecological system. Since the small patch communities are not addressed individually in this effort, all or most of those communities must be present within an individual occurrence for it to be considered viable.

A-rank threshold:
* The processes of fire and bison grazing are functioning within their natural range of variation, or are mimicked by various management techniques
* Little or no invasion by non-native or invasive or increaser species; if present, such species are easily controlled or eliminated
* Appropriate diversity of individual plant communities are represented within the occurrence
* Plant communities are appropriately interspersed and connected
* Plant communities have representative composition and structure
* Surface and groundwater hydrologic regimes are not altered, or altered very little (applies to wetland communities embedded in sandsage shrubland matrix)
* High forb diversity

Minimum (C-rank) threshold:
* The processes of fire and bison grazing are functioning well outside their natural range of variation, or are poorly mimicked by various management techniques; however, there is potential to restore these ecological processes (or their surrogates) to a natural range of variability
* Non-native or invasive or increaser species are widely present; however, there is still potential to control or eliminate these species with appropriate management or restoration over a twenty-year time horizon
* Low diversity of plant communities present
* Plant communities are lacking much of their representative composition and structure
* Surface and groundwater hydrologic regimes are highly altered, but still have the potential to be fully restored over a twenty-year time horizon
* Low forb diversity

Criteria for evaluating ecological integrity: landscape context of occurrence

A-rank threshold:
Surrounding landscape is relatively unfragmented and provides some connectivity for species dispersal, migration, or recolonization.

Minimum (C-rank) threshold:
Surrounding landscape is fragmented and provides little connectivity for species dispersal, migration, or recolonization.

Southern Great Plains Mesquite Shrubland System

Mesquite shrublands are found in the southern part of the Central Mixed-grass Prairie ecoregion, particularly in Beckham, Greer and Harmon counties in Oklahoma. In that area, mesquite is co-occurring with red berry juniper. Mesquite shrublands also occur in Jackson, Washita, Kiowa, Tillman and Cotton counties in Oklahoma. The southern part of this ecoregion coincides generally with the northern limits of the range of mesquite.

While there is some question about the natural distribution and abundance of mesquite, it does appear that mesquite shrublands were found in southwest Oklahoma prior to settlement in the late 19th and 20th centuries. Randolph Marcy noted the presence of an "extensive tract of mezquite woodland" in the upper Red River basin of Oklahoma in an 1852 expedition. In adjacent parts of the southeast Texas panhandle, Marcy described vast areas of "mezquite" resembling a "peach orchard." General Land Office surveys of Harmon Co. Oklahoma in 1871 note the presence of large areas of "mesquite brush prairie" near the Salt Fork of the Red River. While mesquite has probably significantly increased in density, it is part of the natural biodiversity of the southern part of the ecoregion.

Historically, mesquite probably occurred only at very low densities, in stunted or low growth forms due to fire. It is theorized that the lack of seed-dispersing herbivores may have limited its dispersal prior to Euro-American settlement. Fire may have kept plants in a low-growing form, and prevented seed production. The introduction of cattle and suppression of fire are believed to have caused the invasion of mesquite into former grasslands.

With the exception of the concentration in Beckham, Greer and Harmon counties, mesquite shrublands do not form the matrix vegetation in this ecoregion. In this ecoregion, mesquite shrublands are generally found on clay soils with gypsum, on butte and mesa formations. They are most frequently associated with overgrazed pastures of wire grass and broomweed. There are a few examples of small mesquite shrublands embedded in a matrix of native grasses including little bluestem and side-oats grama.

Community Association Types found in this sytem:

Matrix Community Associations	Heritage Code
Blue Grama - Hairy Grama Shortgrass Prairie	CEGL001755
Blue Grama - Buffalograss Shortgrass Prairie	CEGL001756
Central Great Plains Little Bluestem Prairie	CEGL002246
Honey Mesquite - Lotebush Shrubland	CEGL004939

Large Patch Community Associations	Heritage Code
Western Gypsum And Redbed Clay Prairie	CEGL002252

Small Patch Community Associations	Heritage Code
Southern Great Plains Cattail - Bulrush Marsh	CEGL002032
Great Plains Neutral Seep	CEGL002033
Western Great Plains Alkaline Marsh	CEGL002040
Southern Great Plains Saline Meadow	CEGL002042
Southern Great Plains Cordgrass Wet Prairie	CEGL002223
Alkali Bulrush Marsh	CEGL002226
Chairmaker's Bulrush - Sedge species Herbaceous Vegetation	CEGL004144
Oklahoma Arrowhead Marsh	CEGL004525
Smartweed - Water-pepper Pond	CEGL004699

Linear Community Associations	Heritage Code
Cottonwood - Green Ash Floodplain Forest	CEGL000658
Cottonwood - Peach-leaf Willow Floodplain Woodland	CEGL000659
Sandbar Willow Shrubland	CEGL001197
Riverine Sand Flats	CEGL002049
Eastern Cottonwood / Black Willow Woodland	CEGL004919

Conservation Goal:

6 examples in the ecoregion (2 in each ecoregional planning unit)

Criteria for evaluating ecological integrity: size of occurrence

A rank threshold: 20,000 acres
Minimum (C-rank) threshold: 2,500 acres

Outside the Central Mixed-Grass Prairie, in the heart of this system's range, an A-rank size threshold would be on the scale of 100,000 acres. It is on the edge of its range in this ecoregion, and so would rarely occur in such large patches. Therefore, smaller size criteria were used.

Criteria for evaluating ecological integrity: condition of occurrence

A-rank threshold:
* All major plant community types which should occur there, including marshes, meadows, tallgrass prairie, riparian woodlands, etc. are represented; examples are B-rank or better quality.
* Subsurface flooding and saturation of low areas (swales, oxbows, old channels, depressions) occurs in most years as indicated by soils, vegetation, photographs.
* Overbank flooding occurs regularly as indicated by soils, vegetation, photographs.
* The floodplain is being actively developed, with multiple macrotopographic features present (e.g., oxbows, overflow/abandoned channels, floodplain, terraces, bars).
* Stream banks and channels have representative shape, are not riprapped, and are not unvegetated by excessive grazing or trampling.
* Plant communities have representative structure and composition (e.g., cottonwood stands have a diverse and well-developed shrub component).
* Regeneration is occurring and seedlings, saplings, or clonal shoots are present. Channel bar formation is creating substrate for woody vegetation colonization (this may be occurring in the system though not at the site).
* There is a high level of interspersion and connectivity among plant communities.
* Within native plant communities, no or very few exotic species are present, with no potential for expansion. Non-native pastures, row crops, or other modified vegetation types are absent or are a very minor component of the occurrence.

Minimum (C-rank) threshold for large (A-rank in size) occurrence:
Represents at least one major plant community type (i.e., marshes) in C-rank condition or better.

Minimum (C-rank) threshold for smaller (C-rank in size) occurrence:
Must represent all the potential community types, in C-rank condition or better.

Minimum (C-rank) threshold for all occurrences:
* Subsurface flooding or saturation occurs relatively frequently, but overbank flooding occurs only during high floods. Hydrologic or geomorphic modifications have systematically altered the hydrologic regime. Modifications include regional hydropower or flood control dams, extensive irrigation withdrawals or return flows, widespread ditching, moderate bank revetment, etc.
* Floodplain riverine systems have few macrotopographic features and there is no evidence of recent floodplain development.
* Stream banks are significantly altered by excessive grazing, bank stabilization, channelization, road construction, etc.
* Excessive erosion, deposition, or nutrient loading is common.
* Native plant community structure and composition has been substantially altered by grazing (including browse from native ungulates), fire suppression, logging, etc.
* Native species that increase with disturbance or changes in hydrology or nutrients are widespread.
* Native species regeneration is very restricted; no evidence of woody species colonization of channel bars.
* There is a low level of interspersion and connectivity among plant communities.
* Exotic species and cultural vegetation are widespread but potentially controllable.

Criteria for evaluating ecological integrity: landscape context of occurrence

A-rank threshold:
Surrounding landscape is relatively unfragmented and provides some connectivity for species dispersal, migration, or recolonization.

Minimum (C-rank) threshold:
Surrounding landscape is fragmented and provides little connectivity for species dispersal, migration, or recolonization.

Southern Great Plains Shin Oak Shrubland System

The shin oak shrubland system is found to a limited extent in the Central Mixed-grass Prairie; it forms a boundary between the mixed-grass and shortgrass prairies in the southern part of this ecoregion. The main part of its range lies outside this ecoregion, to the southwest. Within the Central Mixed-grass Prairie, it is found in Beckham, Custer, Dewey, Greer, Harmon, Kiowa, Roger Mills, and Woodward counties. It occurs on deep sand deposits, particularly quartz sands, in this ecoregion. In this region, it is usually embedded in a sand sagebrush shrubland (or a sand prairie system).In the Oklahoma portion of the ecoregion, the sand sage shrubland occurs in broad, east-to-west bands, on stabilized dunes and other sand deposits; the shin oak shrubland forms a mosaic with some of those sandsage shrublands. Fire was likely part of the shin oak shrubland system, but its role is currently unclear. Like the mesquite shrubland system, shin oak shrublands may have increased in density and expanded their range as a result of fire suppression and the introduction of cattle.

Community Association Types found in this sytem:

Matrix Community Associations	Heritage Code
Havard Shin Oak - Little Bluestem Shrubland	CEGL002171

Small Patch Community Associations	Heritage Code
Southern Great Plains Cattail - Bulrush Marsh	CEGL002032
Great Plains Neutral Seep	CEGL002033
Western Great Plains Alkaline Marsh	CEGL002040
Southern Great Plains Saline Meadow	CEGL002042
Southern Great Plains Cordgrass Wet Prairie	CEGL002223
Alkali Bulrush Marsh	CEGL002226
Chairmaker's Bulrush - Sedge species Herbaceous Vegetation	CEGL004144
Oklahoma Arrowhead Marsh	CEGL004525
Smartweed - Water-pepper Pond	CEGL004699

Linear Community Associations	Heritage Code
Cottonwood - Green Ash Floodplain Forest	CEGL000658
Cottonwood - Peach-leaf Willow Floodplain Woodland	CEGL000659
Sandbar Willow Shrubland	CEGL001197
Riverine Sand Flats	CEGL002049
Cottonwood - Sycamore Forest	CEGL002095
Eastern Cottonwood / Black Willow Woodland	CEGL004919

Conservation Goal:

6 examples in the ecoregion (2 in each ecoregional planning unit)

Criteria for evaluating ecological integrity: size of occurrence

A-rank threshold: 1,000 acres
Minimum (C-rank) threshold: 500 acres

In the heart of its range, this system occurs on a larger scale, and the size ranks proposed here would not be adequate. However, for this portion of its range, it is appropriate to have lower size ranks.

Criteria for evaluating ecological integrity: condition of occurrence

A-rank threshold:
* Less than 20% of the occurrence is fragmented by tillage or other cover types not dominated by native shrubland and prairie species.
* A diversity of individual plant communities are present, and are of B-rank or better condition.
* Non-native species are not present or are present in small areas/amounts and are very easily controlled or eliminated.

Minimum (C-rank) threshold:
* Less than 20% of the occurrence is fragmented by tillage or other cover types not dominated by native shrubland

and prairie species.
* Only 30-50% of the expected individual plant community types are present, and are of C-rank or better condition.
* Non-native species, though present and widespread, are still controllable with significant management and/or restoration.

This system provides important habitat for prairie chickens and they can tolerate up to 40% fragmentation; that is the basis for the minimum threshold.

Criteria for evaluating ecological integrity: landscape context of occurrence

A-rank threshold:
Surrounding landscape is relatively unfragmented and provides some connectivity for species dispersal, migration, or recolonization.

Minimum (C-rank) threshold:
Surrounding landscape is fragmented and provides little connectivity for species dispersal, migration, or recolonization.

Sandhills Wetland System

Nebraska's Sandhills form a unique physical environment that in part allowed the development of an extensive groundwater supply. The Sandhills themselves are extremely water-permeable, and rainfall or snowmelt may infiltrate the soil at well over a foot per day (in Bleed and Flowerday 1990). Underneath the sand dunes themselves are varying layers of highly permeable sands, sandy gravels, and sandstones. These layers hold the groundwater under the Sandhills, and form the northern part of the High Plains aquifer. The aquifer is thickest under the Sandhills, and is the source of most of the water in the Sandhills wetland systems.

Headwater wetlands may form in depressions, valleys or other low areas where the groundwater intersects land, and topography allows the water to pond. These wetlands drain into streams. Wetlands may also form in depressions that are located downstream along a stream or river, rather than at the headwaters. Such wetlands also eventually drain into a stream or river outlet. Some lakes and wetlands that form where groundwater intersects land are not connected to surface streams and appear to be isolated. However, they are part of the groundwater flow and are recharging the groundwater on the downgradient side of the wetland. Although the groundwater supply is extensive and relatively stable, there is still a fair amount of fluctuation in the water levels of Sandhills wetlands, both seasonally and from year to year (Bleed and Ginsberg 1990).

Sandhills wetlands are found throughout the Sandhills; there are a number of large complexes located across the Sandhills region. These complexes are in the range of hundreds of thousands of acres in the western part of the Sandhills. The best examples of this system are in the Valentine refuge.

Both the headwater and downstream riparian wetland systems are comprised of submergent marsh, emergent marsh, and wet prairies. Headwater wetland systems may also include Sandhills fens. The riparian wetlands may also have cottonwood-dominated woodlands.

Community Association Types found in this sytem:

Large Patch Community Associations	Heritage Code
Sandhills Wet-mesic Prairie	CEGL002023

Small Patch Community Associations	Heritage Code
Sandhills Wet Prairie	CEGL002028
Sandhills Bulrush Marsh	CEGL002030
Sandhills Fen	CEGL002390

Conservation Goal:

6 examples in the Sandhills

Criteria for evaluating ecological integrity: size of occurrence

A-rank threshold:
100,000 acres of wetland complex; acreage includes the sand prairie in which the wetland complex is embedded

Minimum (C-rank) threshold:
5 smaller basins totalling at least 5000 acres (hydrologically connected, and within 1 mile of each other)

Criteria for evaluating ecological integrity: condition of occurrence

A-rank: Component communities (emergent and submergent marshes, fens, meadows, etc.) are B quality or better:
* Minor or no hydrologic alterations (i.e., ditching, draining, significant groundwater withdrawals, roads, railroads, dams, dikes, etc.)
* Wetland has not been dredged or deepened
* Few or no exotic or invasive species present; if present, they are small in extent and very easily eradicated or controlled
* If haying or grazing have occurred at all, it has been light, and species composition of the component communities still reflects the abundance and diversity that would naturally be found in such communities
* No grazing has taken place during low water years
* Wetland has never been plowed

Minimum: Component communities are C quality or better
* Hydrologic alterations present, but either minor or restorable to natural conditions

* Exotic or invasive species may be more extensive and somewhat difficult (though possible) to control
* Little or some haying or grazing? Although some species diversity may be missing, relative abundance of dominants is generally appropriate to component communities, or can recover to natural composition and abundance
* Wetland has never been plowed

Criteria for evaluating ecological integrity: landscape context of occurrence

A-rank threshold:
Uplands in which the wetland complex is embedded is native sand prairie, with less than 10% fragmentation by other cover types. Native sand prairie matrix is in good condition, too (few or no exotics, etc.) Regional groundwater supply is not significantly impacted by withdrawals. Surrounding landscape is relatively unfragmented and provides some connectivity for species dispersal, migration, or recolonization.

Minimum (C-rank) threshold:
Uplands are native sand prairie, with less than 20% fragmentation by other cover types. Native sand prairie matrix is generally in good condition, but some areas may be in fair condition. Regional groundwater supply is impacted very little by withdrawals. Surrounding landscape is fragmented and provides little connectivity for species dispersal, migration, or recolonization.

Saline Sandhills Wetland System

The saline Sandhills wetland system is most commonly found in the western portion of the Nebraska Sandhills. Some examples extend over hundreds of thousands of acres in that area. The Quivera National Wildlife Refuge contains another example of this system.

The hydrology of these wetlands is similar to the Sandhills wetlands; salinity is the main factor differentiating this system from the (freshwater) Sandhills wetland system. These wetlands are scattered in the prairie matrix among alkaline meadows, ponds, and other communities.

Community Association Types found in this sytem:

Small Patch Community Associations	Heritage Code
Western Great Plains Alkaline Marsh	CEGL002040
Southern Great Plains Saline Meadow	CEGL002042

Conservation Goal:

6 examples in the Sandhills

Criteria for evaluating ecological integrity: size of occurrence

A-rank threshold:
100,000 acres of wetland complex; acreage includes the sand prairie in which the wetland complex is embedded

Minimum (C-rank) threshold:
2,000 acres (if not a single complex, should include two large complexes and a smaller one within the 2,000 acres; the basins should be hydrologically connected and located within a mile of each other to be considered part of the same occurrence)

Criteria for evaluating ecological integrity: condition of occurrence

A-rank: Component communities (emergent and submergent marshes, fens, meadows, etc.) are B quality or better:
* Minor or no hydrologic alterations (i.e., ditching, draining, significant groundwater withdrawals, roads, railroads, dams, dikes, etc.)
* Wetland has not been dredged or deepened
* Few or no exotic or invasive species present; if present, they are small in extent and very easily eradicated or controlled
* -If haying or grazing have occurred at all, it has been light, and species composition of the component communities still reflects the abundance and diversity that would naturally be found in such communities
* No grazing has taken place during low water years
* Wetland has never been plowed

Minimum: Component communities are C quality or better:
* Hydrologic alterations present, but either minor or restorable to natural conditions
* Exotic or invasive species may be more extensive and somewhat difficult (though possible) to control
* Although some species diversity may be missing, relative abundance of dominants is generally appropriate to component communities, or can recover to natural composition and abundance
* Wetland has never been plowed

Criteria for evaluating ecological integrity: landscape context of occurrence

A-rank threshold:
Uplands in which the wetland complex is embedded is native sand prairie, with less than 10% fragmentation by other cover types. Native sand prairie matrix is in good condition, too (few or no exotics, etc.) Regional groundwater supply is not significantly impacted by withdrawals. Surrounding landscape is relatively unfragmented and provides some connectivity for species dispersal, migration, or recolonization.

Minimum (C-rank) threshold:
Uplands are native sand prairie, with less than 20% fragmentation by other cover types. Native sand prairie matrix is generally in good condition, but some areas may be in fair condition. Regional groundwater supply is impacted very little by withdrawals. Surrounding landscape is fragmented and provides little connectivity for species dispersal, migration, or recolonization.

Large and Medium River Floodplain System

Rivers in the Central Mixed-grass Prairie generally flow from west to east, and are part of the Mississippi drainage, either directly or via the Missouri River. A few drain portions of the Rocky Mountains; most drain either the High Plains or the central Great Plains. Large and medium rivers in this ecoregion are defined to be those which have both their headwaters and their mouths outside the Central Mixed-grass Prairie ecoregion. Two categories of rivers fit this definition:
1) those which drain portions of the Rocky Mountains, and have their mouths east of the ecoregion, and
2) those rivers with their headwaters in the high plains or foothills of the Rockies and their mouths east of the ecoregion.
The Platte, Canadian and Arkansas Rivers are the three big rivers that drain portions of the Rocky Mountains. They are differentiated from those that start in the foothills or high plains because of the difference in the spring pulse. Those draining the Rockies get a significantly larger input of snowmelt than those starting in the plains, and so they have a much larger spring pulse. The second category of large rivers include the Niobrara, Republican, Solomon, Smoky Hill, Cimarron, and Red Rivers.

Although these floodplain systems have been defined by the size of the rivers they are associated with, this ecological system is comprised of the floodplain communities adjacent to the rivers. The floodplain is considered to be the area that could have flooded before water-control structures were in place. By definition, it forms a linear pattern on the landscape. Within this linear shape is a mosaic of large and small patch communities that are found on the terraces of the floodplain. The pattern of these communities shifts as flood events move and reshape deposited soils, and sometimes remove vegetation. Because of the natural frequency of flooding, a particular location would have shifted from one community type to another over a relatively short time period prior to the construction of water-control structures. Although the position of these communities on a landscape may change, the overall pattern and composition of communities in the mosaic will remain the same.

These large rivers in the region may be gently or noticeably terraced, and the soil texture and height above the river determine which communities are present. Immediately along the river are sand flats or strands, often with sandbar willow shrublands growing on them. On the next terrace, in stretches with a greater sand component in the soils, cottonwood-dominated floodplain woodland or forest may be found. American elm, green ash or willow species may also be abundant, depending on the location within the ecoregion. On higher, infrequently flooded terraces, there may be silver maple, hackberry, green ash and other deciduous trees present; such stands are a later seral stage that follows cottonwood-dominated woodlands. If the soil is siltier and allows water to collect, open or emergent marshes may grow; even further from the streambed, the marshes grade into wet prairies with predominantly tallgrass elements. (These riparian tallgrass prairies have largely been eliminated from this system through agricultural practices.) Marshes may also be in oxbow lakes and side channels, not far from the main channel. Along the main channel, wooded riparian vegetation may sometimes be found immediately above marshes, rather than wet prairies. Local scouring events occur frequently in the large rivers because their spring pulses are strong enough to shift ice and create ice jams. Scour woodlands are typically dominated by cottonwood and black willow. The wooded riparian vegetation alternates with marsh complexes along the rivers in this system, according to soil texture and depth to water. The sand prairies occur as small or large patches on higher, sandy ground in the floodplain; they intermingle with open wetlands and floodplain woodlands.

Fire, bison grazing, and flood events once shaped the mosaic of floodplain communities. Fire is generally suppressed, bison are no longer present, and river flows are greatly altered by dams and massive withdrawals for irrigation. The loss of fire and bison from the system as well as reduced river flows has allowed some of the woodland communities, where they are still present, to expand. They are often invaded by exotic species such as Russian olive or saltcedar.

Community Association Types found in this sytem:

Large Patch Community Associations	Heritage Code
Sand Bluestem - Prairie Sandreed Sand Prairie	CEGL001467
Prairie Sandreed - Needle-and-thread Prairie	CEGL001473
Broad-leaved Cattail Marsh	CEGL002010
Sandhills Wet-mesic Prairie	CEGL002023
Central Wet-mesic Tallgrass Prairie	CEGL002024
Northern Cordgrass Wet Prairie	CEGL002027
Southern Great Plains Cordgrass Wet Prairie	CEGL002223

Small Patch Community Associations	Heritage Code
Sandhills Wet Prairie	CEGL002028
Southern Great Plains Cattail - Bulrush Marsh	CEGL002032
Great Plains Neutral Seep	CEGL002033
Great Plains Pondweed Submerged Aquatic Wetland	CEGL002044
American Elm - (Sugarberry, Northern Hackberry) - Green Ash Forest	CEGL002090
Oklahoma Arrowhead Marsh	CEGL004525
Smartweed - Water-pepper Pond	CEGL004699

Linear Community Associations	Heritage Code
Cottonwood - Green Ash Floodplain Forest	CEGL000658
Cottonwood - Peach-leaf Willow Floodplain Woodland	CEGL000659
Sandbar Willow Shrubland	CEGL001197
Riverine Sand Flats	CEGL002049
Pecan - Sugarberry Forest	CEGL002087
Cottonwood - Sycamore Forest	CEGL002095
Eastern Cottonwood - American Elm - Sugarberry Forest	CEGL002096
Eastern Cottonwood / Black Willow Woodland	CEGL004919

Conservation Goal:

6 examples in the ecoregion (2 in each ecoregional planning unit)

Criteria for evaluating ecological integrity: size of occurrence

A-rank threshold:
25 miles in length; entire floodplain and river valley in width

Minimum (C-rank) threshold:
3 miles in length; entire floodplain and river valley in width

A viable example of this floodplain system should be sufficiently large to represent the full mosaic of riparian and wetland communities. It should be large enough to allow for the shifts in the pattern of these communities in response to catastrophic flooding.

Criteria for evaluating ecological integrity: condition of occurrence

A-rank threshold:
Captures all major types which should occur there: marshes, meadows, tallgrass prairie, terrace communities. Those communities should be in a B-rank or better quality. Individual community types that comprise this system should be listed; indicate variations that occur from northern to southern part of ecoregion (i.e., some will have woodlands present, some won't.)

Minimum (C-rank) threshold for large occurrence:
Captures at least one major type of C quality or better.

Minimum (C-rank) threshold condition for minimum size (3 miles) occurrence:
Must have all the potential community types, C quality or better.

A-rank condition should also meet the following requirements:
* Subsurface flooding and saturation of low areas (swales, oxbows, old channels, depressions) occurs in most years as indicated by soils, vegetation, photographs.
* Overbank flooding occurs regularly as indicated by soils, vegetation, photographs.
--The floodplain is being actively developed, with multiple macrotopographic features present (e.g., oxbows, overflow/abandoned channels, floodplain, terraces, bars).
* Stream banks and channels have representative shape, are not riprapped, and are not unvegetated by excessive grazing or trampling.
* Plant communities have representative structure and composition (e.g., cottonwood stands have a diverse and well developed shrub component).

* Regeneration is occurring and seedlings, saplings, or clonal shoots are present. In riverine floodplain systems, channel bar formation is creating substrate for woody vegetation colonization (this may be occurring in the system though not at the site).
* There is a high level of interspersion and connectivity among plant communities.
* Within native plant communities, no or very few exotic species are present, with no potential for expansion. Cultural or modified vegetation types are absent or are a very minor component of the site.

Minimum threshold:

* Subsurface flooding or saturation occurs relatively frequently, but overbank flooding occurs only during high floods. Hydrologic or geomorphic modifications have systematically altered the hydrologic regime. Modifications include regional hydropower or flood control dams, extensive irrigation withdrawals or return flows, widespread ditching, moderate bank revetment, etc.
* Floodplain riverine systems have few macrotopographic features and there is no evidence of recent floodplain development.
* Stream banks are significantly altered by excessive grazing, bank stabilization, channelization, road construction, etc.
* Excessive erosion, deposition, or nutrient loading is common.
* Native plant community structure and composition has been substantially altered by logging, grazing (including browse from native ungulates), fire suppression, etc.
* Native species that increase with disturbance or changes in hydrology or nutrients are widespread.
* Native species regeneration is very restricted; no evidence of woody species colonization of channel bars.
* There is a low level of interspersion and connectivity among plant communities.
* Exotic species and cultural vegetation are widespread but potentially controllable.

Take into account that one section of the Platte will have one set of communities, and another section of the Platte will have another different set of communities.

Criteria for evaluating ecological integrity: landscape context of occurrence

A-rank threshold:
The site's hydrologic regime is not altered by flow regulation, augmentation, or reduction by upstream reservoirs, groundwater pumping, or irrigation withdrawal. Site is connected hydrologically and by suitable habitat (e.g., riparian vegetation along stream corridors) to other wetlands via unaltered surface or subsurface channels. Native vegetation in good condition occupies a 100-m buffer zone around the wetland. Adjacent uplands and the upstream watershed are unaltered (> 90% natural vegetation) by urban, agricultural, or other landuses (e.g., logging) that might affect hydrology or habitat connectivity. Habitat connectivity allows natural processes and species migration to occur.

Minimum (C-rank) threshold:
Natural hydrological regimes are altered by upstream reservoirs or irrigation practices. Hydrologic connections are functional, but habitat connections are fragmented and multiple barriers are present. Landuse in the wetland buffer includes moderate grazing, logging, or haying. Adjacent uplands and upstream watershed are fragmented (20-60% natural vegetation) by urban, agricultural, or other uses.

Section B: Community Association Targets

Heritage Code	Community Association Name Scientific Name	Heritage Rank Conservation Goal	Pattern Distribution
CEGL000201	**Ponderosa Pine / Little Bluestem Woodland** *Pinus ponderosa / Schizachyrium scoparium Woodland*	G3G4 6 occurrences	Large Patch Widespread
CEGL000658	**Cottonwood - Green Ash Floodplain Forest** *Populus deltoides - Fraxinus pennsylvanica Forest*	G2G3 4 occurrences	Linear Widespread
CEGL000659	**Cottonwood - Peach-leaf Willow Floodplain Woodland** *Populus deltoides - (Salix amygdaloides) / Salix exigua Woodland*	G3G4 4 occurrences	Linear Widespread
CEGL000747	**Rocky Mountain Juniper / Little-seed Ricegrass Woodland** *Juniperus scopulorum / Oryzopsis micrantha Woodland*	G3G4 4 occurrences	Large Patch Widespread
CEGL001197	**Sandbar Willow Shrubland** *Salix exigua Temporarily Flooded Shrubland*	G5 4 occurrences	Linear Widespread
CEGL001467	**Sand Bluestem - Prairie Sandreed Sand Prairie** *Andropogon hallii - Calamovilfa longifolia Herbaceous Vegetation*	G4G5 4 occurrences	Matrix Widespread
CEGL001473	**Prairie Sandreed - Needle-and-thread Prairie** *Calamovilfa longifolia - Stipa comata Herbaceous Vegetation*	G3 4 occurrences	Matrix Widespread
CEGL001475	**Western Reed Marsh** *Phragmites australis Western North America Temperate Semi-natural Herbaceous Vegetation*	G4 2 occurrences	Small Patch Widespread
CEGL001755	**Blue Grama - Hairy Grama Shortgrass Prairie** *Bouteloua gracilis - Bouteloua hirsuta Herbaceous Vegetation*	G3G4 4 occurrences	Matrix Widespread
CEGL001756	**Blue Grama - Buffalograss Shortgrass Prairie** *Bouteloua gracilis - Buchloe dactyloides Herbaceous Vegetation*	G4 4 occurrences	Matrix Widespread
CEGL002010	**Broad-leaved Cattail Marsh** *Typha latifolia Western Herbaceous Vegetation*	G5 2 occurrences	Large Patch Widespread
CEGL002013	**Paper Birch Canyon Forest** *Betula papyrifera - (Tilia americana, Quercus macrocarpa) Canyon Forest*	G2? 16 occurrences	Large Patch Endemic
CEGL002014	**Central Green Ash - Elm - Hackberry Forest** *Fraxinus pennsylvanica - Ulmus spp. - Celtis occidentalis Forest*	G3G5 4 occurrences	Linear Widespread
CEGL002023	**Sandhills Wet-mesic Prairie** *Andropogon gerardii - Panicum virgatum Sandhills Herbaceous Vegetation*	G3? 8 occurrences	Matrix Limited
CEGL002024	**Central Wet-mesic Tallgrass Prairie** *Andropogon gerardii - Panicum virgatum - Helianthus grosseserratus Herbaceous Vegetation*	G2G3 4 occurrences	Matrix Widespread
CEGL002025	**Eastern Great Plains Big Bluestem Loess Prairie** *Andropogon gerardii - Sorghastrum nutans - Stipa spartea Loess Hills Herbaceous Vegetation*	G2 4 occurrences	Matrix Widespread

CEGL002026	**Bulrush - Cattail - Burreed Shallow Marsh**	G4G5	Small Patch
	Scirpus tabernaemontani - Typha spp. - (Sparganium spp., Juncus spp.) Herbaceous Vegetation	10 occurrences	Limited
CEGL002027	**Northern Cordgrass Wet Prairie**	G3?	Large Patch
	Spartina pectinata - Calamagrostis stricta - Carex spp. Herbaceous Vegetation	4 occurrences	Widespread
CEGL002028	**Sandhills Wet Prairie**	G3G4	Small Patch
	Calamagrostis canadensis - Juncus spp. - Carex spp. Sandhills Herbaceous Vegetation	10 occurrences	Limited
CEGL002030	**Sandhills Bulrush Marsh**	G4	Small Patch
	Scirpus acutus - Typha latifolia - (Scirpus tabernaemontani) Sandhills Herbaceous Vegetation	4 occurrences	Widespread
CEGL002032	**Southern Great Plains Cattail - Bulrush Marsh**	G3G4	Small Patch
	Typha (angustifolia, domingensis, latifolia) - Scirpus americanus Herbaceous Vegetation	4 occurrences	Widespread
CEGL002033	**Great Plains Neutral Seep**	G3	Small Patch
	Typha latifolia - Equisetum hyemale - Carex (hystericina, pellita) Seep Herbaceous Vegetation	10 occurrences	Limited
CEGL002036	**Little Bluestem Loess Mixedgrass Prairie**	G3?	Matrix
	Schizachyrium scoparium - Bouteloua curtipendula Loess Mixedgrass Herbaceous Vegetation	4 occurrences	Widespread
CEGL002037	**Needle-and-thread - Blue Grama Mixedgrass Prairie**	G5	Matrix
	Stipa comata - Bouteloua gracilis - Carex filifolia Herbaceous Vegetation	4 occurrences	Widespread
CEGL002038	**Wheatgrass Playa Grassland**	G2G3	Small Patch
	Pascopyrum smithii - Buchloe dactyloides - (Phyla cuneifolia, Oenothera canescens) Herbaceous Vegetation	10 occurrences	Widespread
CEGL002039	**Playa Marsh**	G2G4	Small Patch
	Polygonum spp. - Echinochloa spp. - Distichlis spicata Playa Lake Herbaceous Vegetation	10 occurrences	Limited
CEGL002040	**Western Great Plains Alkaline Marsh**	G3G4	Small Patch
	Scirpus pungens - Suaeda calceoliformis Alkaline Herbaceous Vegetation	10 occurrences	Limited
CEGL002041	**Central Tallgrass Fen**	G1	Small Patch
	Carex pellita - Carex spp. - Scirpus tabernaemontani Fen Herbaceous Vegetation	6 occurrences	Limited
CEGL002042	**Southern Great Plains Saline Meadow**	G3	Small Patch
	Distichlis spicata - (Hordeum jubatum, Poa arida, Sporobolus airoides) Herbaceous Vegetation	10 occurrences	Limited
CEGL002044	**Great Plains Pondweed Submerged Aquatic Wetland**	G4G5	Small Patch
	Potamogeton spp. - Ceratophyllum demersum Great Plains Herbaceous Vegetation	10 occurrences	Limited
CEGL002049	**Riverine Sand Flats**	G4G5	Linear
	Riverine Sand Flats-Bars Sparse Vegetation	2 occurrences	Widespread
CEGL002053	**Western Tallgrass Bur Oak Woodland**	G2G3	Matrix
	Quercus macrocarpa / Andropogon gerardii - Stipa spartea Woodland	6 occurrences	Widespread

CEGL002087	**Pecan - Sugarberry Forest**	G4?	Linear
	Carya illinoinensis - Celtis laevigata Forest	4 occurrences	Peripheral
CEGL002090	**American Elm - (Sugarberry, Northern Hackberry) - Green Ash Forest**	G3?	Small Patch
	Ulmus americana - Celtis (laevigata, occidentalis) - Fraxinus pennsylvanica Forest	6 occurrences	Limited
CEGL002095	**Cottonwood - Sycamore Forest**	G1G2	Linear
	Populus deltoides - Platanus occidentalis Forest	4 occurrences	Widespread
CEGL002096	**Eastern Cottonwood - American Elm - Sugarberry Forest**	G3	Linear
	Populus deltoides - Ulmus americana - Celtis laevigata Forest	6 occurrences	Limited
CEGL002103	**Black Willow Forest**	G?	Linear
	Salix nigra Forest	4 occurrences	Widespread
CEGL002121	**One-seed Juniper - Fragrant Sumac Woodland**	G?	Large Patch
	Juniperus monosperma - Rhus trilobata / Schizachyrium scoparium Woodland	6 occurrences	Limited
CEGL002147	**Post Oak - Blackjack Oak Cross Timbers Woodland**	G4	Matrix
	Quercus stellata - Quercus marilandica / Schizachyrium scoparium Woodland	4 occurrences	Limited
CEGL002171	**Havard Shin Oak - Little Bluestem Shrubland**	G3	Matrix
	Quercus havardii / Sporobolus cryptandrus - Schizachyrium scoparium Shrubland	8 occurrences	Limited
CEGL002178	**Sand Sagebrush / Little Bluestem Shrubland**	G?	Matrix
	Artemisia filifolia / Schizachyrium scoparium - Andropogon hallii Shrubland	6 occurrences	Limited
CEGL002179	**Sand Sage / Sand Dropseed Shrubland**	G?	Matrix
	Artemisia filifolia / Sporobolus cryptandrus Shrubland	6 occurrences	Limited
CEGL002223	**Southern Great Plains Cordgrass Wet Prairie**	G2G4	Large Patch
	Spartina pectinata - Eleocharis spp. - Carex spp. Herbaceous Vegetation	4 occurrences	Widespread
CEGL002226	**Alkali Bulrush Marsh**	G?	Small Patch
	Scirpus americanus Great Plains Herbaceous Vegetation	10 occurrences	Limited
CEGL002246	**Central Great Plains Little Bluestem Prairie**	G2G4	Matrix
	Schizachyrium scoparium - Bouteloua curtipendula - Bouteloua gracilis Central Plains Herbaceous Vegetation	4 occurrences	Widespread
CEGL002247	**Little Bluestem Chalkflat Mixedgrass Prairie**	G2	Matrix
	Schizachyrium scoparium - Bouteloua curtipendula Chalkflat Herbaceous Vegetation	8 occurrences	Limited
CEGL002248	**Red Hills Little Bluestem Mixedgrass Prairie**	G2Q	Matrix
	Schizachyrium scoparium - Bouteloua curtipendula Red Hills Herbaceous Vegetation	8 occurrences	Limited
CEGL002252	**Western Gypsum And Redbed Clay Prairie**	G3?	Matrix
	Schizachyrium scoparium - Lesquerella gordonii - Castilleja purpurea var. citrina Herbaceous Vegetation	10 occurrences	Limited

CEGL002259	**Spikerush Playa Lake**	G?	Small Patch
	Eleocharis palustris - (Eleocharis compressa) - Leptochloa fascicularis Herbaceous Vegetation	10 occurrences	Limited
CEGL002277	**Tailwater Playa Lake Vegetation**	G?	Small Patch
	Polygonum pensylvanicum - Polygonum lapathifolium Herbaceous Vegetation	4 occurrences	Widespread
CEGL002279	**Forb Playa Marsh**	G?	Small Patch
	Heteranthera limosa - Bacopa rotundifolia - Sagittaria latifolia Herbaceous Vegetation	10 occurrences	Limited
CEGL002390	**Sandhills Fen**	G1G2	Small Patch
	Carex interior - Eleocharis elliptica - Thelypteris palustris Herbaceous Vegetation	10 occurrences	Limited
CEGL003628	**Red Cedar / Little Bluestem Forest**	GM	Small Patch
	Juniperus virginiana var. virginiana / Schizachyrium scoparium Forest	2 occurrences	Widespread
CEGL004144	**Chairmaker's Bulrush - Sedge species Herbaceous Vegetation**	G?	Small Patch
	Scirpus americanus - Carex spp. Herbaceous Vegetation	4 occurrences	Widespread
CEGL004396	**Nuttall's Stonecrop - Peruvian Spikemoss Granitic Outcrop Sparse Vegetation**	G2	Small Patch
	Sedum nuttallianum - Selaginella peruviana Granitic Outcrop Sparse Vegetation	10 occurrences	Limited
CEGL004525	**Oklahoma Arrowhead Marsh**	G?	Small Patch
	Sagittaria latifolia - Sagittaria longiloba Herbaceous Vegetation	10 occurrences	Limited
CEGL004528	**Hornwort Submergent Marsh**	G?	Small Patch
	Ceratophyllum demersum Herbaceous Vegetation	10 occurrences	Limited
CEGL004535	**Soapberry (Chinaberry) Woodland**	G?	Small Patch
	Sapindus saponaria var. drummondii Woodland	4 occurrences	Limited
CEGL004602	**Chinquapin Oak - Shumard Oak Ozark Forest**	G2G4	Large Patch
	Quercus muehlenbergii - Quercus shumardii Forest	4 occurrences	Widespread
CEGL004699	**Smartweed - Water-pepper Pond**	G?	Small Patch
	Polygonum amphibium - (Polygonum hydropiperoides) Seasonally Flooded Herbaceous Vegetation	5 occurrences	Widespread
CEGL004794	**Western Oklahoma Maple Forest**	G2Q	Large Patch
	Acer saccharum - Ulmus rubra - Juglans nigra Forest	10 occurrences	Limited
CEGL004917	**Oklahoma Bladderpod Glade**	G?	Small Patch
	Lesquerella (gordonii, ovalifolia) - Schizachyrium scoparium Herbaceous Vegetation	10 occurrences	Limited
CEGL004919	**Eastern Cottonwood / Black Willow Woodland**	G?	Linear
	Populus deltoides - Salix nigra Woodland	4 occurrences	Widespread
CEGL004937	**Plateau Live Oak - (Post Oak) / Little Bluestem Granite Woodland**	G2?	Large Patch
	Quercus fusiformis - (Quercus stellata) / Schizachyrium scoparium Granite Woodland	10 occurrences	Limited

CEGL004938	**Oklahoma Blackjack Oak / Little Bluestem Woodland** *Quercus marilandica / Schizachyrium scoparium Woodland*	G? 6 occurrences	Matrix Widespread
CEGL004939	**Honey Mesquite - Lotebush Shrubland** *Prosopis glandulosa - Ziziphus obtusifolia Shrubland*	G2G3 10 occurrences	Large Patch Limited
CEGL004940	**Pinchot Juniper / Sideoats Grama - Hairy Grama Woodland** *Juniperus pinchotii / Bouteloua curtipendula - Bouteloua hirsuta Woodland*	G? 6 occurrences	Large Patch Limited
CEGL005231	**Dakota Sandstone Tallgrass Prairie** *Andropogon gerardii - Panicum virgatum - Schizachyrium scoparium - (Tradescantia tharpii) Herbaceous Vegetation*	 2 occurrences	Small Patch Peripheral

Appendix 2. Terrestrial Species Target Information for the Central Mixed-Grass Prairie Ecoregion.

General guidelines set forth by The Nature Conservancy (Groves et. al. 2000a) were used for the selection of most species targets. These targets were chosen based on regional rarity, vulnerability, and existing and potential threats. In addition, additional criteria provided by Partners In Flight and The Nature Conservancy's Migratory Bird Program were used to select avian targets.

A total of 47 terrestrial species conservation targets were identified for the region: 6 mammals, 19 birds, 3 reptiles, 6 insects, and 13 plants.

Animals

Mammals

Bat Caves — **Bat Caves**
Heritage Code: OTHER00002
Heritage Rank:
Conservation Goal: 4 caves
Distribution relative to ecoregion: Widespread

Eastern Spotted Skunk — **Spilogale putorius**
Heritage Code: AMAJF05010
Heritage Rank: G5
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Franklin's Ground Squirrel — **Spermophilus franklinii**
Heritage Code: AMAFB05120
Heritage Rank: G5
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral

Prairie Dog Towns — **Prairie Dog Towns**
Heritage Code: OTHER00003
Heritage Rank:
Conservation Goal: 4 good quality towns
Distribution relative to ecoregion: Widespread

Swift Fox — **Vulpes velox**
Heritage Code: AMAJA03030
Heritage Rank: G3
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Townsend's Big-eared Bat — **Corynorhinus townsendii**
Heritage Code: AMACC08010
Heritage Rank: G4
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Birds

American White Pelican — **Pelecanus erythrorhynchos**
Heritage Code: ABNFC01010
Heritage Rank: G3
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Bald Eagle — **Haliaeetus leucocephalus**
Heritage Code: ABNKC10010
Heritage Rank: G4
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Bell's Vireo — **Vireo bellii**
Heritage Code: ABPBW01110
Heritage Rank: G5
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Black Rail — **Laterallus jamaicensis**

Heritage Code: ABNME03040
Heritage Rank: G4
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral

Black-capped Vireo — **Vireo atricapillus**

Heritage Code: ABPBW01120
Heritage Rank: G2G3
Conservation Goal: 750 pairs in south ecoregional planning unit
Distribution relative to ecoregion: Limited
Federally Endangered Species

Cassin's Sparrow — **Aimophila cassinii**

Heritage Code: ABPBX91070
Heritage Rank: G5
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral

Dickcissel — **Spiza americana**

Heritage Code: ABPBX65010
Heritage Rank: G5
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Greater Prairie Chicken — **Tympanuchus cupido pinnatus**

Heritage Code: ABNLC13013
Heritage Rank: G4T4
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Henslow's Sparrow — **Ammodramus henslowii**

Heritage Code: ABPBXA0030
Heritage Rank: G4
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral

Interior Least Tern — **Sterna antillarum athalassos**

Heritage Code: ABNNM08102
Heritage Rank: G4T2Q
Conservation Goal: 1000 individuals in north ecoregional planning unit.
Distribution relative to ecoregion: Widespread

Lesser Prairie Chicken — **Tympanuchus pallidicinctus**

Heritage Code: ABNLC13020
Heritage Rank: G3
Conservation Goal: 4000 pairs (2000 pairs in the middle and south ecoregional planning unit)
Distribution relative to ecoregion: Limited

Loggerhead Shrike — **Lanius ludovicianus**

Heritage Code: ABPBR01030
Heritage Rank: G5
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Long-billed Curlew — **Numenius americanus**

Heritage Code: ABNNF07070
Heritage Rank: G5
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Migratory Water Bird Areas — **Migratory Water Bird Areas**

Heritage Code: OTHER00001
Heritage Rank:
Conservation Goal: 4 areas
Distribution relative to ecoregion: Widespread

Piping Plover — **Charadrius melodus**

Heritage Code: ABNNB03070
Heritage Rank: G3
Conservation Goal: 500 pairs in ecoregion
Distribution relative to ecoregion: Widespread

Scissor-tailed Flycatcher — **Tyrannus forficatus**

Heritage Code: ABPAE52100
Heritage Rank: G5
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Snowy Plover — **Charadrius alexandrinus**

Heritage Code: ABNNB03030
Heritage Rank: G4
Conservation Goal: 2000 individuals (1000 individuals in middle and south ecoregional planning units)
Distribution relative to ecoregion: Peripheral

Trumpeter Swan — **Cygnus buccinator**

Heritage Code: ABNJB02030
Heritage Rank: G4
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Whooping Crane — **Grus americana**

Heritage Code: ABNMK01030
Heritage Rank: G1
Conservation Goal: All regular stopover sites (regular stopover sites defined as those used an average of every other year).
Distribution relative to ecoregion: Undetermined

Reptiles

Massasauga — **Sistrurus catenatus**

Heritage Code: ARADE03010
Heritage Rank: G3G4
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Texas Garter Snake — **Thamnophis sirtalis annectens**

Heritage Code: ARADB36131
Heritage Rank: G5T3
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral

Texas Horned Lizard — **Phrynosoma cornutum**

Heritage Code: ARACF12010
Heritage Rank: G4G5
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Insects

American Burying Beetle — **Nicrophorus americanus**
- Heritage Code: IICOL42010
- Heritage Rank: G1
- Conservation Goal: 4 occurrences

Distribution relative to ecoregion: Widespread
Federally Endangered Species

Arogos Skipper — **Atrytone arogos**
- Heritage Code: IILEP70010
- Heritage Rank: G3G4
- Conservation Goal: 4 occurrences

Distribution relative to ecoregion: Widespread

Dotted Skipper — **Hesperia attalus attalus**
- Heritage Code: IILEP65121
- Heritage Rank: G3G4T3T4
- Conservation Goal: 7 occurrences

Distribution relative to ecoregion: Limited

Ottoe Skipper — **Hesperia ottoe**
- Heritage Code: IILEP65050
- Heritage Rank: G3G4
- Conservation Goal: 4 occurrences

Distribution relative to ecoregion: Widespread

Prairie Mole Cricket — **Gryllotalpa major**
- Heritage Code: IIORT17010
- Heritage Rank: G3
- Conservation Goal: 7 occurrences

Distribution relative to ecoregion: Limited

Regal Fritillary — **Speyeria idalia**
- Heritage Code: IILEPJ6040
- Heritage Rank: G3
- Conservation Goal: 4 occurrences

Distribution relative to ecoregion: Widespread

Plants

Vascular Plants

A Wild-buckwheat — **Eriogonum effusum var rosmarinoides**
Heritage Code: PDPGN081W2
Heritage Rank: G4G5T?
Conservation Goal: 10 occurrences
Distribution relative to ecoregion: Endemic

American Dwarf Burhead — **Echinodorus parvulus**
Heritage Code: PMALI02050
Heritage Rank: G3Q
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral

Blowout Penstemon — **Penstemon haydenii**
Heritage Code: PDSCR1L300
Heritage Rank: G1
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited
Federally Endangered Species

Fremont Evening-primrose — **Oenothera macrocarpa ssp fremontii**
Heritage Code: PDONA0C1P1
Heritage Rank: G5T?
Conservation Goal: 10 occurrences
Distribution relative to ecoregion: Endemic

Hall's Bulrush — **Scirpus hallii**
Heritage Code: PMCYP0Q0R0
Heritage Rank: G2
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral

Long-hair Phlox — **Phlox longipilosa**
Heritage Code: PDPLM0D160
Heritage Rank: G2Q
Conservation Goal: 10 occurrences
Distribution relative to ecoregion: Endemic

Missouri Primrose subspecies incana — **Oenothera macrocarpa ssp incana**
Heritage Code: PDONA0C1P2
Heritage Rank: G5T?
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Missouri Primrose subspecies oklahomensis — **Oenothera macrocarpa ssp oklahomensis**
Heritage Code: PDONA0C1P4
Heritage Rank: G5T?
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Oklahoma Beardtongue — **Penstemon oklahomensis**
Heritage Code: PDSCR1L4B0
Heritage Rank: G3
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral

Oklahoma Phlox — **Phlox oklahomensis**

Heritage Code: PDPLM0D1E0
Heritage Rank: G3
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Prairie Fame-flower — **Talinum rugospermum**

Heritage Code: PDPOR080G0
Heritage Rank: G3?
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral

Resin-dot Skullcap — **Scutellaria resinosa**

Heritage Code: PDLAM1U140
Heritage Rank: G4G5
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Western Prairie Fringed Orchid — **Platanthera praeclara**

Heritage Code: PMORC1Y0S0
Heritage Rank: G2
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Peripheral
Federally Threatened Species

Appendix 3. Aquatic Ecological System and Species Target Information for the Central Mixed-Grass Prairie Ecoregion.

A hierarchical abiotic classification on streams was developed for the region, distinguishing stream types based on zoogeographic history, major physiographic features, local geology, permanence of flow, size, network position, and gradient (based on methodology developed by Higgins et. al. 1999). Spatial data are used to describe units of aquatic ecosystems in terms of the regional driving factors that influence community distribution and composition. In total, 86 stream types were identified in 10 ecological drainage units (EDUs) that intersect the region.

Aquatic species targets were identified at an experts workshop to include species endemic or emblematic of the region. Most of these species are severely threatened by the changes in flow and sediment patterns of the rivers. A total of 29 aquatic species targets were identified: 18 fish or fish assemblages; 2 herptiles; 3 insects or insect assemblages; 3 mollusks or mollusk assemblages; and 3 snail or snail assemblages.

Section A: Aquatic Ecological System Targets

Arkansas River East Aquatic System 1-1

Intermittent, low and moderate gradient, headwater streams in loess.
Total Number Occurrences in Ecoregion: 306
Conservation Goal: 92 occrrences

Arkansas River East Aquatic System 1-2

Intermittent, moderate and high gradient, headwaters in shale, limestone and fine sandstone.
Total Number Occurrences in Ecoregion: 218
Conservation Goal: 65 occurrences

Arkansas River East Aquatic System 1-6

Intermittent, low and moderate gradient headwaters in evaporite.
Total Number Occurrences in Ecoregion: 236
Conservation Goal: 71 occurrences

Arkansas River East Aquatic System 1-673

Perennial headwaters, low and moderate gradient, in loess (1 watershed in this cluster).
Total Number Occurrences in Ecoregion: 1
Conservation Goal: 1 occurrences

Arkansas River East Aquatic System 2-11

Intermittent, small river, low and moderate gradient in shale and carbonate/limetone.
Total Number Occurrences in Ecoregion: 27
Conservation Goal: 8 occurrences

Arkansas River East Aquatic System 2-12

Intermittent, small river, low and moderate gradient, in young alluvium, old alluvium, sand and evaporite.
Total Number Occurrences in Ecoregion: 33
Conservation Goal: 10 occurrences

Arkansas River East Aquatic System 2-13

Perennial small river with intermittent tributaries, low, moderate and high gradient, in fine sandstone, evaporite, shale.
Total Number Occurrences in Ecoregion: 37
Conservation Goal: 11 occurrences

Arkansas River East Aquatic System 2-41

Intermittent small river becoming perennial in some cases in lower reach, all intermittent tributaries, low gradient mainstem, moderate gradient tributaries, in loess.
Total Number Occurrences in Ecoregion: 79
Conservation Goal: 24 occurrences

Arkansas River East Aquatic System 3-1

Perennial medium river, low gradient with low to moderate gradient intermittent tributaries in alluvium, some sand.
Total Number Occurrences in Ecoregion: 5
Conservation Goal: 2 occurrences

Arkansas River East Aquatic System 3-2

Perennial medium river, low gradient with moderate to high gradient intermittent tributaries in loess.

Total Number Occurrences in Ecoregion: 33

Conservation Goal: 10 occurrences

Arkansas River East Aquatic System 3-224

Perennial medium river, low gradient with moderate to high gradient intermittent tributaries in evaporite.

Total Number Occurrences in Ecoregion: 5

Conservation Goal: 8 occurrences

Arkansas River East Aquatic System 3-3

Perennial medium river, low gradient with moderate to high gradient intermittent tributaries in fine sandstone, evaporite/shale, and some alluvium.

Total Number Occurrences in Ecoregion: 8

Conservation Goal: 2 occurrences

Arkansas River East Aquatic System 4-1

Large river, perennial in lower stretch, intermittent headwaters and tributaries, low gradient, in loess, coarse sandstone and alluvium.

Total Number Occurrences in Ecoregion: 12

Conservation Goal: 4 occurrences

Arkansas River East Aquatic System 4-4

Perennial large river, low gradient with moderate to high gradient intermittent tributaries in fine sandstone, evaporite/shale, and some alluvium.

Total Number Occurrences in Ecoregion: 3

Conservation Goal: 1 occurrence

Arkansas River East Aquatic System 4-92

Perennial large river, low gradient with moderate to high gradient intermittent tributaries in evaporite.

Total Number Occurrences in Ecoregion: 4

Conservation Goal: 1 occurrence

Arkansas River East Aquatic System 5-2

Arkansas River (tributaries include Ninnescah, Walnut Creek)

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 example

Arkansas River East Aquatic System 5-7

group 1: Chikaskia, Salt Fork Arkansas, Medicane Lodge; group 3: Cimarron

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 example

Arkansas River West Aquatic System 1-1

Intermittent, low and moderate gradient, headwater streams in loess.

Total Number Occurrences in Ecoregion: 40

Conservation Goal: 12 occurrences

Arkansas River West Aquatic System 1-2

Intermittent, moderate and high gradient, headwaters in Ogalalla coarse sandstone.

Total Number Occurrences in Ecoregion: 7

Conservation Goal: 2 occurrences

Arkansas River West Aquatic System 1-6

Intermittent, low and moderate gradient headwaters in evaporite.

Total Number Occurrences in Ecoregion: 30

Conservation Goal: 9 occurrences

Arkansas River West Aquatic System 2-1

Intermittent, low gradient small river with moderate gradient tributaries, in sand, alluvium, and find sandstone.

Total Number Occurrences in Ecoregion: 5

Conservation Goal: 2 occurrences

Arkansas River West Aquatic System 2-224

Intermittent, low gradient small river with high and moderate gradient tributaries in evaporite.

Total Number Occurrences in Ecoregion: 4

Conservation Goal: 1 occurrence

Arkansas River West Aquatic System 2-41

Intermittent, low gradient small river with high and moderate gradient tributaries in loess. Some streams become perennial in lower reach.

Total Number Occurrences in Ecoregion: 12

Conservation Goal: 4 occurrences

Arkansas River West Aquatic System 3-2

Perennial medium river, low gradient with moderate to high gradient intermittent tributaries in loess.

Total Number Occurrences in Ecoregion: 5

Conservation Goal: 2 occurrences

Arkansas River West Aquatic System 3-223

Perennial medium river, low gradient with moderate to high gradient intermittent tributaries in evaporite.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 occurrences

Arkansas River West Aquatic System 4-1

Large river, perennial in lower stretch, intermittent headwaters and tributaries, low gradient, in loess, coarse sandstone and alluvium.

Total Number Occurrences in Ecoregion: 2

Conservation Goal: 1 occurrence

Arkansas River West Aquatic System 4-92

Perennial large river, low gradient with moderate to high gradient intermittent tributaries in evaporite.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 occurrences

Arkansas River West Aquatic System 5-2

Arkansas River.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 example

Arkansas River West Aquatic System 5-7

Upper Cimarron (group 2)

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 example

Big Blue Aquatic System 1-1

Intermittent, low and moderate gradient headwaters in loess.

Total Number Occurrences in Ecoregion: 147

Conservation Goal: 44 occurrences

Big Blue Aquatic System 2-12

Intermittent, small river, moderate and high gradient, in coarse sandstone (ver yfew examples).

Total Number Occurrences in Ecoregion: 45

Conservation Goal: 2 occurrences

Big Blue Aquatic System 2-3

Intermittent, small river, low gradient and mostly low gradient tributaries in loess.

Total Number Occurrences in Ecoregion: 45

Conservation Goal: 14 occurrences

Big Blue Aquatic System 3-2

Medium river, perennial in lower stretch, intermittent headwaters and tributaries, low gradient mainstem, in loess.

Total Number Occurrences in Ecoregion: 12

Conservation Goal: 4 occurrences

Big Blue Aquatic System 4-1

Large river, perennial in lower stretch, intermittent headwaters and tributaries, low gradient, in loess, coarse sandstone and alluvium. (Upper watershed of Little Blue River).

Total Number Occurrences in Ecoregion: 6

Conservation Goal: 2 occurrences

Big Blue Aquatic System 4-3

Large river, perennial in lower stretch, low gradient, in alluvial channel; headwaters in loess and calcareous limestone; coarse sandstone dominates drainage area.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 occurrences

Big Blue Aquatic System 5-4

Little Blue River.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 example

Canadian River Aquatic System 1-1

Intermittent, moderate gradient headwaters in young alluvium and fine sandstone.

Total Number Occurrences in Ecoregion: 45

Conservation Goal: 14 occurrences

Canadian River Aquatic System 2-1

Perennial mainstem (at least in lower reach) with intermittent moderate gradient tributaries, low gradient mainstem, originating in coarse sandstone, flowing in to fine sandstone and alluvium.

Total Number Occurrences in Ecoregion: 12

Conservation Goal: 4 occurrences

Canadian River Aquatic System 2-2

Perennial low gradient mainstem, with intermittent moderate gradient tributaries originating in fine sandstone, mostly alluvium, some shale.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 occurrences

Canadian River Aquatic System 3-1

Perennial medium river, low gradient with low to moderate gradient intermittent tributaries in alluvium, some sand.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 occurrences

Canadian River Aquatic System 3-3

Perennial medium river, low gradient with moderate to high gradient intermittent tributaries in fine sandstone, evaporite/shale, and some alluvium.

Total Number Occurrences in Ecoregion: 2

Conservation Goal: 1 occurrence

Canadian River Aquatic System 5-1

North Canadian.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 example

Canadian River Aquatic System 5-7

Canadian.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 example

Red River Aquatic System 1-1

Moderate to high gradient headwaters, mostly intermittent with some perennial streams, in shale, sandstone and some alluvium.

Total Number Occurrences in Ecoregion: 216

Conservation Goal: 65 occurrences

Red River Aquatic System 1-158

Intermittent, high gradient headwaters in granite and limestone.

Total Number Occurrences in Ecoregion: 22

Conservation Goal: 7 occurrences

Red River Aquatic System 1-550

Perennial, low to moderate gradient headwaters in fine sandstone and siltsonte (very limited type).

Total Number Occurrences in Ecoregion: 2

Conservation Goal: 1 occurrence

Red River Aquatic System 1-626

Perennial, low gradient headwaters in fine sandstone (one watershed in this cluster).

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 occurrences

Red River Aquatic System 2-1

Perennial mainstem (at least in lower reach) with intermittent moderate gradient tributaries, low gradient mainstem, originating in coarse sandstone, flowing in to fine sandstone and alluvium.

Total Number Occurrences in Ecoregion: 24

Conservation Goal: 7 occurrences

Red River Aquatic System 2-2

Perennial low gradient mainstem, with intermittent moderate gradient tributaries originating in fine sandstone, mostly in alluvium, some shale.

Total Number Occurrences in Ecoregion: 37

Conservation Goal: 11 occurrences

Red River Aquatic System 2-224

Intermittent, small river, low to high gradient, in evaporite and shale.

Total Number Occurrences in Ecoregion: 6

Conservation Goal: 2 occurrences

Red River Aquatic System 3-223

Perennial medium river, low gradient with moderate to high gradient intermittent tributaries in evaporite/shale.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 occurrences

Red River Aquatic System 3-3

Perennial medium river, low gradient with moderate to high gradient intermittent tributaries in fine sandstone, shale, and some alluvium.

Total Number Occurrences in Ecoregion: 14

Conservation Goal: 4 occurrences

Red River Aquatic System 4-2

Perennial large river, low gradient with moderate gradient tributaries, most intermittent, originating in coarse sandstone and sand, terminus in shale and sandstone.

Total Number Occurrences in Ecoregion: 4

Conservation Goal: 1 occurrence

Red River Aquatic System 4-4

Perennial large river, low gradient with moderate to high gradient intermittent tributaries in fine sandstone, evaporite/shale, and some alluvium.

Total Number Occurrences in Ecoregion: 2

Conservation Goal: 1 occurrence

Red River Aquatic System 4-92

Perennial large river, low gradient with moderate to high gradient intermittent tributaries in evaporite.
Total Number Occurrences in Ecoregion: 1
Conservation Goal: 1 occurrence

Red River Aquatic System 5-11

Washita River.
Total Number Occurrences in Ecoregion: 1
Conservation Goal: 1 example

Red River Aquatic System 5-7

Red River.
Total Number Occurrences in Ecoregion: 1
Conservation Goal: 1 example

Republican Aquatic System 1-1

Intermittent headwaters, moderate and high gradient, in loess.
Total Number Occurrences in Ecoregion: 108
Conservation Goal: 32 occurrences

Republican Aquatic System 2-3

Low gradient small river with moderate and high gradient intermittent tributaries in loess.
Total Number Occurrences in Ecoregion: 21
Conservation Goal: 6 occurrences

Republican Aquatic System 4-1

Large river, perennial in lower stretch, intermittent headwaters and tributaries, low gradient, in loess, coarse sandstone and alluvium.
Total Number Occurrences in Ecoregion: 7
Conservation Goal: 2 occurrences

Sandhills Aquatic System 1-1

Perennial, low-gradient, headwater streams in sand.
Total Number Occurrences in Ecoregion: 156
Conservation Goal: 47 occurrences

Sandhills Aquatic System 1-11

Intermittent, moderate gradient, headwater streams in loess.
Total Number Occurrences in Ecoregion: 401
Conservation Goal: 120 occurrences

Sandhills Aquatic System 2-1

Groundwater fed, perennial, low gradient small streams in sand.
Total Number Occurrences in Ecoregion: 34
Conservation Goal: 10 occurrences

Sandhills Aquatic System 2-12

Intermittent, moderate gradient, small streams in coarse sandstone.
Total Number Occurrences in Ecoregion: 15
Conservation Goal: 5 occurrences

Sandhills Aquatic System 2-3

Perennial, moderate gradient, small streams in loess with intermittent tributaries.
Total Number Occurrences in Ecoregion: 106
Conservation Goal: 32 occurrences

Sandhills Aquatic System 3-1

Groundwater fed, perennial, low gradient medium river in sand.
Total Number Occurrences in Ecoregion: 6
Conservation Goal: 2 occurrences

Sandhills Aquatic System 3-2

Perennial, low gradient, medium river, with intermittent moderate and high gradient tributaries in loess.
Total Number Occurrences in Ecoregion: 19
Conservation Goal: 6 occurrences

Sandhills Aquatic System 3-3

Perennial, low gradient, medium river with intermittent moderate tributaries in coarse sandstone.
Total Number Occurrences in Ecoregion: 2
Conservation Goal: 1 occurrence

Sandhills Aquatic System 4-1

Perennial large river with groundwater fed headwaters, and many intermittent small tributaries, in sand and loess, low gradient mainstems with moderate to high gradient tributaries.
Total Number Occurrences in Ecoregion: 12
Conservation Goal: 4 occurrences

Sandhills Aquatic System 4-2

Perennial large river in sand, low gradient, groundwater fed (Niobrara River).
Total Number Occurrences in Ecoregion: 1
Conservation Goal: 1 occurrence

Sandhills Aquatic System 5-1

Niobrara River basin.
Total Number Occurrences in Ecoregion: 3
Conservation Goal: 1 example

Sandhills Aquatic System 5-2

Loup River basin (Platte River).
Total Number Occurrences in Ecoregion: 3
Conservation Goal: 1 example

Smoky Hills Aquatic System 1-1

Intermittent moderate and low gradient headwaters in carbonate limestone and loess.
Total Number Occurrences in Ecoregion: 923
Conservation Goal: 277 occurrences

Smoky Hills Aquatic System 1-62

Intermittent, moderate and low gradient headwaters in alluvium.
Total Number Occurrences in Ecoregion: 25
Conservation Goal: 8 occurrences

Smoky Hills Aquatic System 2-1

Intermittent, low gradient mainstems with moderate and high gradient tributaries, in alluvium.
Total Number Occurrences in Ecoregion: 3
Conservation Goal: 1 occurrence

Smoky Hills Aquatic System 2-12

Intermittent, low gradient mainstems with moderate and high gradient tributaries, in coarse sandstone, low in drainage.
Total Number Occurrences in Ecoregion: 47
Conservation Goal: 14 occurrences

Smoky Hills Aquatic System 2-14

Intermittent, low gradient mainstems with moderate and high gradient tributaries, in shale.
Total Number Occurrences in Ecoregion: 24
Conservation Goal: 7 occurrences

Smoky Hills Aquatic System 2-2

Intermittent, low gradient mainstems with moderate and high gradient tributaries, in loess, some carbonates and coarse sandstone also.
Total Number Occurrences in Ecoregion: 169
Conservation Goal: 51 occurrences

Smoky Hills Aquatic System 3-2

Medium river, perennial in lower stretch, intermittent tributaries and headwaters in loess.
Total Number Occurrences in Ecoregion: 29
Conservation Goal: 9 occurrences

Smoky Hills Aquatic System 3-3

Medium river, perennial in the lower stretch, at bottom of the watershed, intermittent tributaries and headwaters, in coarse sandstone, shale and some evaporite.
Total Number Occurrences in Ecoregion: 12
Conservation Goal: 4 occurrences

Smoky Hills Aquatic System 4-1

Large, perennial, low gradient river, all tributaries are intermittent and drain limestone and loess, and coarse sand.
Total Number Occurrences in Ecoregion: 14
Conservation Goal: 4 occurrences

Smoky Hills Aquatic System 4-11

Large river, perennial with intermittent tributaries, in lower watershed, low gradient mainstem, in carbonate sedimentary rock with some coarse sandstone.

Total Number Occurrences in Ecoregion: 4

Conservation Goal: 1 occurrence

Smoky Hills Aquatic System 4-3

large, perennial river, in wide alluvial basin, at bottom of watershed, formed by three type 3-3 rivers.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 occurrences

Smoky Hills Aquatic System 5-1

Republican River.

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 example

Smoky Hills Aquatic System 5-3

Solomon River, Saline River, Smoky Hills River

Total Number Occurrences in Ecoregion: 1

Conservation Goal: 1 example

South Platte Aquatic System 2-1

Perennial, low gradient, small stream in sand.

Total Number Occurrences in Ecoregion: 4

Conservation Goal: 1 example

Section B: Aquatic Species Targets

Fishes

Arkansas Darter — **Etheostoma cragini**
Tracking Code: AFCQC02170
Heritage Rank: G3
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Arkansas River Shiner — **Notropis girardi**
Tracking Code: AFCJB28490
Heritage Rank: G2
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited
Federally Threatened Species

Arkansas River Speckled Chub — **Macrhybopsis tetranema**
Tracking Code: AFCJB53070
Heritage Rank: G?
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Big River Fish Assemblage — **Big River Fish Assemblage**
Tracking Code: OTHER0009
Heritage Rank:
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Flathead Chub — **Platygobio gracilis**
Tracking Code: AFCJB57010
Heritage Rank: G5
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Widespread

Headwater Fish Assemblage — **Headwater Fish Assemblage**
Tracking Code: OTHER0007
Heritage Rank:
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Plains Killifish — **Fundulus zebrinus**
Tracking Code: AFCNB04210
Heritage Rank: G5
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Widespread

Plains Minnow — **Hybognathus placitus**
Tracking Code: AFCJB16050
Heritage Rank: G4
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Plains Topminnow — **Fundulus sciadicus**
Tracking Code: AFCNB04170
Heritage Rank: G4
Conservation Goal: 10 occurrences
Distribution relative to ecoregion: Limited

Red River Pupfish Tracking Code: AFCNB02100 Heritage Rank: G4 Conservation Goal: 7 occurrences	**Cyprinodon rubrofluviatilis** Distribution relative to ecoregion: Limited
Red River Shiner Tracking Code: AFCJB28160 Heritage Rank: G3 Conservation Goal: 2 occurrences	**Notropis bairdi** Distribution relative to ecoregion: Limited
Sandhills Headwater Stream Community Tracking Code: OTHER0010 Heritage Rank: Conservation Goal: 10 occurrences	**Sandhills Headwater Stream Community** Distribution relative to ecoregion: Endemic
Shoal Chub Tracking Code: AFCJB53080 Heritage Rank: G5 Conservation Goal: 7 occurrences	**Macryhybopsis hyostoma** Distribution relative to ecoregion: Limited
Shovelnose Sturgeon Tracking Code: AFCAA02020 Heritage Rank: G4 Conservation Goal: 4 occurrences	**Scaphirhynchus platorynchus** Distribution relative to ecoregion: Widespread
Spring Fish Assemblage Tracking Code: OTHER0008 Heritage Rank: Conservation Goal: 7 occurrences	**Spring Fish Assemblage** Distribution relative to ecoregion: Limited
Sturgeon Chub Tracking Code: AFCJB53020 Heritage Rank: G3 Conservation Goal: 2 occurrences	**Macrhybopsis gelida** Distribution relative to ecoregion: Widespread
Topeka Shiner Tracking Code: AFCJB28960 Heritage Rank: G2 Conservation Goal: 2 occurrences	**Notropis topeka** Distribution relative to ecoregion: Limited Federally Endangered Species
Western Silvery Minnow Tracking Code: AFCJB16010 Heritage Rank: G4 Conservation Goal: 4 occurrences	**Hybognathus argyritis** Distribution relative to ecoregion: Widespread

Aquatic Reptiles

Blanding's Turtle — **Emydoidea blandingii**
Tracking Code: ARAAD04010
Heritage Rank: G4
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Yellow Mud Turtle — **Kinosternon flavescens**
Tracking Code: ARAAE01020
Heritage Rank: G5
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Disjunct

Aquatic Insects

A Sand-Filtering Mayfly — **Homoeoneuria ammophila**
Tracking Code: IIEPH03030
Heritage Rank: G3
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Limited

Platte River Caddisfly — **Irinoquia plattensis**
Tracking Code: NOCODE0001
Heritage Rank: G?
Conservation Goal: 7 occurrences
Distribution relative to ecoregion: Endemic

Spring Invertebrate Assemblage — **Spring Invertebrate Assemblage**
Tracking Code: OTHER0011
Heritage Rank:
Conservation Goal: 10 occurrences
Distribution relative to ecoregion: Endemic

Mollusks

Cylindrical Papershell — **Anodontoides ferussacianus**
Tracking Code: IMBIV05010
Heritage Rank: G5
Conservation Goal: 10 occurrences
Distribution relative to ecoregion: Peripheral

Gravel Bottom Mussel Assemblage — **Gravel Bottom Mussel Assemblage**
Tracking Code: OTHER0005
Heritage Rank:
Conservation Goal: 10 occurrences
Distribution relative to ecoregion: Endemic

Sandy Plains Stream Mussel Assemblage — **Sandy Plains Stream Mussel Assemblage**
Tracking Code: OTHER0004
Heritage Rank:
Conservation Goal: 10 occurrences
Distribution relative to ecoregion: Limited

Aquatic Crustaceans

A Crayfish — **Orconectes neglectus**

Tracking Code: ICMAL11240
Heritage Rank: G5
Conservation Goal: 4 occurrences
Distribution relative to ecoregion: Widespread

Conchas Crayfish — **Orconectes deanae**

Tracking Code: ICMAL11110
Heritage Rank: G3
Conservation Goal: 2 occurrences
Distribution relative to ecoregion: Disjunct

Gill-breathing Snails — **Gill-breathing Snails**

Tracking Code: OTHER0006
Heritage Rank:
Conservation Goal: 10 occurrences
Distribution relative to ecoregion: Peripheral

Appendix 4. Areas of Biodiversity Significance within the Central Mixed-Grass Prairie Ecoregion.

The ultimate goal of the planning process for this region was the identification of areas of biodiversity significance intended to conserve the native species, ecological communities, and systems of the region. The final "portfolio" of conservation areas includes all coarse-scale targets and multiple examples of conservation targets represented across the diversity of environmental gradients in the region. In this region, areas of biodiversity significance were delineated which represent the most important areas for the conservation of biological diversity. These areas will direct the activities of The Nature Conservancy in the region, as well as assist partners agencies and organizations in meeting their goals.

A total of 57 terrestrial sites and 67 aquatic sites were identified as areas of biodiversity significance. The following report lists each area, by site number, and details important information about each area, including a site description, known threats, size of site, ownership information, targets found at each site, and viability information pertaining to those targets. Maps depicting the location of these sites are found in Figures 7 and 8.

Note: Terrestrial sites are numbered from 1-57. Aquatic sites are numbered from 62-128. There is a gap in sequential numbering to allow the addition of terrestrial sites in future iterations of planning for this region.

Minnechaduza Creek Sandhills

Site Number: 1
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Excellent large scale wetland features exist within this site near the northern boundary of both the ecoregion and the Sandhills site. The site lies along either side of its namesake creek which is a major, high quality tributary of the Niobrara river. The landscape is a sparsely populated, untilled grassland/wetland area that is privately owned and used for range livestock production.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 409,626 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	408,412	99.70%
• STATE	1,214	0.30%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%
Community Associations	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Great Plains Neutral Seep (CEGL002033)	1	9	11%
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1	7	14%
• Northern Cordgrass Wet Prairie (CEGL002027)	1	19	5%
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1	5	20%
• Sandhills Bulrush Marsh (CEGL002030)	1	8	13%
• Sandhills Wet Prairie (CEGL002028)	1	9	11%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• Long-billed Curlew (ABNNF07070)	1
• Trumpeter Swan (ABNJB02030)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Sandhills Fen (CEGL002390)	5

Middle Niobrara Sandhills

Site Number: 2
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The primary landscape feature of this site is the western extent of the Niobrara river valley where it has sand prairie on both sides. As a result the site is a medium river floodplain system in a large unfragmented landscape. The close proximity and juxtaposition of native woodland and grassland communities results in very high quality habitat diversity.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13). However, due to the high scenic quality of the landscape, the proximity to Chadron, NE, and a highway access the threat of fragmentation by recreational property development is relatively high. Fire suppression at this site has a more immediate role in woody plant expansion onto local grasslands, due to their natural proximity within the riparian corridor.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 24,520 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	24,520	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Large and Medium River Floodplain System (SYSTEM0003)	1	6	17%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Cottonwood - Peach-leaf Willow Floodplain Woodland (CEGL000659)	1	3	33%
• Great Plains Neutral Seep (CEGL002033)	1	9	11%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Riverine Sand Flats (CEGL002049)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Sandhills Wet Prairie (CEGL002028)	1
• Sandhills Wet-mesic Prairie (CEGL002023)	1

Niobrara/Snake Confluence

Site Number: 3
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The topographic relief and resulting riparian/woodland vegetation associated with the Niobrara River where its major tributary the Snake River empties into it form a unique physiogamy within the Sandhills site. Much of this site is already held by individuals that do not rely on the native landscape to sustain their livihoods.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13). However, at this site the fragmentation threat is significant from second homes, and recreational property and resort development. In addition, a Bureau of Reclamation dam and reservoir approximately 11 miles up the Snake River significantly influences hydrological processes at its confluence with the Niobrara. Fire suppression at this site plays a more immediate role in woody plant expansion onto local grasslands, due to the proximity of natural woodlands in the riparian corridor.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 54,887 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	52,216	95.13%
• FEDERAL	2,257	4.11%
• STATE	414	0.75%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Large and Medium River Floodplain System (SYSTEM0003)	1	6	17%
Community Associations	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Great Plains Neutral Seep (CEGL002033)	1	9	11%
• Ponderosa Pine / Little Bluestem Woodland (CEGL000201)	1	1	100%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	2
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Riverine Sand Flats (CEGL002049)	1
• Sandhills Bulrush Marsh (CEGL002030)	1
• Sandhills Wet Prairie (CEGL002028)	1
• Sandhills Wet-mesic Prairie (CEGL002023)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Cottonwood - Peach-leaf Willow Floodplain Woodland (CEGL000659)	1
• Northern Cordgrass Wet Prairie (CEGL002027)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1
• Western Tallgrass Bur Oak Woodland (CEGL002053)	1

Sandhills Upland/Wetland Complex

Site Number: 4
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site is a large site embedded within the much larger Sandhills site, and has embedded within it another important conservation site (which one? Upper N Loup R? The map I have doesn't show site #3). The site has large expanses of open water and wetlands which represent the Ogallala aquifer at the surface within the inter-dunal valleys. Upland sand prairie communities of the site are the watershed surface with high percolation (little potential for run-off) rates. The overflow from this site eventually organizes into the headwater areas for several high quality sandhill streams.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 575,650 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	500,565	86.96%
• FEDERAL	72,716	12.63%
• STATE	2,368	0.41%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Sandhills Wetland System (SYSTEM0010)	1	8	13%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Northern Cordgrass Wet Prairie (CEGL002027)	1	19	5%
• Sandhills Bulrush Marsh (CEGL002030)	1	8	13%
• Sandhills Fen (CEGL002390)	3	12	25%
• Sandhills Wet Prairie (CEGL002028)	1	9	11%
• Sandhills Wet-mesic Prairie (CEGL002023)	1	11	9%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	1
• Great Plains Neutral Seep (CEGL002033)	1
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sandhills Wet-mesic Prairie (CEGL002023)	1

Animals	Number THIS Area
• Trumpeter Swan (ABNJB02030)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Sandhills Fen (CEGL002390)	4
• Sandhills Wet Prairie (CEGL002028)	3

Valentine NWR

Site Number: 5
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site is embedded in the Sandhills Upland/Wetland Complex Site # 3. This refuge was also established during the 1930's dust bowl era when Homesteaders and Kincaiders, unable to make a living on the actively eroding dunes, gave up their claims en mass. Today the dunes are generally well vegetated except for increasingly isolated blowouts. Most of the lowlands between the dunes are wet meadow, marsh, and open water communities. The primary management of the refuge has been towards high herbaceous standing crop in the uplands for nesting grassland and waterfowl, and a mosaic of wetland vegetation and open water.

The exact boundary of the area of biodiversity significance is unclear. The boundary reflected in this report likely includes many undesirable areas. Future iterations of ecoregional planning should refine this boundary (contact Gerry Steinauer at the Nebraska Game and Parks Commission).

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13), but are slightly unique to this area since this is a USFWS Refuge. As with the Crescent Lake site, management for the blowout penstemon species target will conflict with management for the upland plant communities of the larger sites within which this one is embedded. Other threats include: incompatible grazing practices; draining for hay; collecting of reptiles, orchids, butterflies, insects; fire suppression (a little prescribed burning, accidental burns occur); wetland drainage; pivots or municipalities (can draw water and lower water table); invasives (smooth brome, kentucky bluegrass, leafy spurge, canada thistle, russian olive, reed canary grass, spotted knapweed, loostrife, timothy).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 151,009 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	75,984	50.32%
• FEDERAL	72,692	48.14%
• STATE	2,333	1.54%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Northern Cordgrass Wet Prairie (CEGL002027)	1	19	5%
• Sandhills Fen (CEGL002390)	1	12	8%
• Sandhills Wet Prairie (CEGL002028)	1	9	11%
Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blowout Penstemon (PDSCR1L300)	1	8	13%
• Western Prairie Fringed Orchid (PMORC1Y0S0)	1	3	33%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• American Burying Beetle (IICOL42010)	1	3	33%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• Greater Prairie Chicken (ABNLC13013)	1

Duck Lake

Site Number: 6
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Duck Lake Site is a cluster of active blowout habitat embedded within the generally high seral habitats of the Upper North Loup River Site # 7. Private range livestock operations in and around this site are based on maintaining sustainable harvests from productive high quality native herbaceous vegetation.

KNOWN THREATS:

Advancing plant succession (good range management) is the primary threat to the blowout penstemon target at this site. In contrast, the two lowland plant communities identified as targets for this site are generally benefited by good range management practices, as are most plant community targets associated with the larger site (#7) within which this one is embedded.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 2,183 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	2,183	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blowout Penstemon (PDSCR1L300)	1	8	13%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Northern Cordgrass Wet Prairie (CEGL002027)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Sandhills Fen (CEGL002390)	1

Upper North Loup River

Site Number: 7
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The North Loup river is the central natural drainage for Ogallala aquifer overflow in the Sandhills site. In its upper reaches this watershed lies within the least fragmented and best managed portion of the Nebraska Sandhills. Physiogamy ranges from very large tall dunes to broad gently rolling sandhills with wet and sub-irrigated meadows, marshes and fens along the river.

Sandhill ranches in this site are some of the largest and most remote, and as a result are almost exclusively based on a sustainable harvest of native sand prairie forage.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 462,575 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	459,690	99.38%
• STATE	2,885	0.62%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Sandhills Wetland System (SYSTEM0010)	1	8	13%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Great Plains Neutral Seep (CEGL002033)	1	9	11%
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1	7	14%
• Northern Cordgrass Wet Prairie (CEGL002027)	1	19	5%
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1	14	7%
• Sandhills Bulrush Marsh (CEGL002030)	1	8	13%
• Sandhills Fen (CEGL002390)	3	12	25%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1

Animals	Number THIS Area
• Trumpeter Swan (ABNJB02030)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Sandhills Fen (CEGL002390)	8
• Sandhills Wet Prairie (CEGL002028)	3
• Sandhills Wet-mesic Prairie (CEGL002023)	1

Upper Elkhorn River Watershed

Site Number: 8
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Upper Elkhorn River Watershed site is characterized by sand prairie on "sand sheet" topography. It lies along the northeast border of the Sandhills site and thus has higher annual precipitation. The upland sand prairie is significantly more productive than it is farther to the west.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13). The threat from center pivot agriculture is elevated at this site due to the more gently rolling sand prairie surface. Extensive wet meadow communities are more intensively managed for hay production due to the proximity to intensive cattle feeding areas.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 881,646 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	879,971	99.81%
• STATE	1,396	0.16%
• FEDERAL	279	0.03%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Sandhills Wetland System (SYSTEM0010)	1	8	13%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Great Plains Neutral Seep (CEGL002033)	1	9	11%
• Northern Cordgrass Wet Prairie (CEGL002027)	1	19	5%
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1	5	20%
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1	14	7%
• Sandhills Wet Prairie (CEGL002028)	1	9	11%
• Sandhills Wet-mesic Prairie (CEGL002023)	2	11	18%

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Hall's Bulrush (PMCYP0Q0R0)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Sandbar Willow Shrubland (CEGL001197)	1
• Sandhills Wet-mesic Prairie (CEGL002023)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1
• Sandhills Fen (CEGL002390)	1
• Sandhills Wet Prairie (CEGL002028)	8
• Sandhills Wet-mesic Prairie (CEGL002023)	2

Calamus Headwater Wetlands

Site Number: 9
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Some of the larger wetland features are protected as state wildlife management areas. More than a dozen large natural lakes formed by sand dune dams define the headwater source for the high quality Calamus river. Surrounding lands are managed within private range livestock systems.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13). However, due to state recreation/conservation land base the surrounding private lands are more subject to the threat of fragmentation by recreational property sub-division.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 69,438 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	68,498	98.65%
• STATE	940	1.35%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Sandhills Wetland System (SYSTEM0010)	1	8	13%
Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Great Plains Neutral Seep (CEGL002033)	1	9	11%
• Northern Cordgrass Wet Prairie (CEGL002027)	1	19	5%
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1	5	20%
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1	14	7%
• Sandhills Bulrush Marsh (CEGL002030)	1	8	13%
• Sandhills Wet Prairie (CEGL002028)	1	9	11%
• Sandhills Wet-mesic Prairie (CEGL002023)	1	11	9%
Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Hall's Bulrush (PMCYP0Q0R0)	1	7	14%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Sandhills Fen (CEGL002390)	1

Duff Sandhills Wetlands

Site Number: 10
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This is a high quality eastern sandhills wetland site identified by two small Calamus river tributaries (Bloody and Skull creeks) with fen and marsh communities in their headwater areas and high quality wet meadows along their courses to the Calamus.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 33,022 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	31,796	96.29%
• STATE	1,226	3.71%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Sandhills Wetland System (SYSTEM0010)	1	8	13%
Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Bulrush Marsh (CEGL002030)	1	8	13%
• Sandhills Wet-mesic Prairie (CEGL002023)	1	11	9%
Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Hall's Bulrush (PMCYP0Q0R0)	2	7	29%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Great Plains Neutral Seep (CEGL002033)	1
• Northern Cordgrass Wet Prairie (CEGL002027)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1
• Sandhills Fen (CEGL002390)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Sandhills Wet Prairie (CEGL002028)	1

Hill Haven Ranch Site

Site Number: 11
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site is a small cluster of blowout habitat on private ranchland that is embedded in the larger Sandhills Alkali Lakes (site 12).

KNOWN THREATS:

Threats are similar to the following sites: Graves' Ranch (site 19), Crescent Lake (site 21), and Mule Shoe Bar Ranch (site 16).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 34 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	34	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blowout Penstemon (PDSCR1L300)	1	8	13%

Sandhills Alkali Lakes

Site Number: 12
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site is an impressive, large intact landscape with abundant lakes, wetlands, choppy and rolling sandhills. Lakes and wetlands of this site can be in freshwater, alkaline or hyperalkaline basins adding considerably to plant, aquatic, and waterbird diversity. The boundary of this site is delineated by the intense clustering of open-water habitats easily recognized from even coarse resolution remote sensed images. Land ownership is large in this site whether in private ranches or the USFWS Crescent Lake refuge.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 818,765 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	790,487	96.55%
• FEDERAL	27,612	3.37%
• STATE	666	0.08%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Saline Sandhills Wetland System (SYSTEM0011)	1	2	50%
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Sandhills Wetland System (SYSTEM0010)	1	8	13%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Great Plains Neutral Seep (CEGL002033)	1	9	11%
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1	7	14%
• Sandhills Bulrush Marsh (CEGL002030)	1	8	13%
• Southern Great Plains Saline Meadow (CEGL002042)	4	12	33%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Western Great Plains Alkaline Marsh (CEGL002040)	1

Animals	Number THIS Area
• Long-billed Curlew (ABNNF07070)	1
• Trumpeter Swan (ABNJB02030)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Southern Great Plains Saline Meadow (CEGL002042)	2

Sandhills Prairie

Site Number: 13
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Sandhills Prairie (Sand Prairie Ecological System) site is the largest, least fragmented native landscape in the Central Mixed-Grass region and is considered a funcitonal landscape. The site occupies about the north central third of Nebraska and a small portion of extreme south central South Dakota. The site boundary is established by a well-defined edaphic transition from deep sands to finer textured soils. The deep sands overlay an impermeable layer (Pierre Shale) across most of the site producing a saturated sand and gravel aquifer known as the Ogallala aquifer. Presently the sandy substrate is well vegetated, however, at several times during the Holocene epoch large portions of the site have been active dune fields. Throughout the site, large wetland complexes are expressions of the aquifer at the land surface and these areas form the headwaters of major, high quality streams that are unique for their very stable annual hydrographs. A number of areas were delineated which "overlap" this site. The targets found within these smaller areas have special conservation needs; they are highlighted as distinct conservation areas to emphasize these needs.

The Sandhills site is mostly privately owned and managed in relatively large [5,000 - 50,000+ acre] ranches. Based on human population density the site qualifies as "frontier" with fewer than 3 people per square mile. Several large public and private land holdings are dedicated to wildlife conservation and natural resource/grazing research. Because of the sensitive nature of the uplands (which can be destabilized to a low value, actively eroding condition), grassland management is generally good to excellent.

A regional NGO known as the Sandhills Task Force is in place to address conservation in the context of the primary land use. The boundary of the Sandhills site is the same as the focal area of the Sandhills Task Force. The goal of the Sandhills Task Force is "to enhance the sandhill wetland-grassland ecosystem in a way that sustains profitable private ranching, wildlife and vegetative diversity, and associated water supplies". There are 15 Task Force members with a minimum of nine Sandhill ranchers. In addition, there is a representative from the U.S. Fish and Wildlife Service, Natural Resources Conservation Service, a Rural Resource Conservation and Development Council, a Natural Resource District, Nebraska Game and Parks Commission, Nebraska Association of County Officials, Nebraska Cattlemen, and The Nature Conservancy. The Sandhills Task Force has been in existence since 1993, has well developed financial resources and a full time staff person to implement conservation practices through grants and cost share programs.

KNOWN THREATS:

Large scale, out-of-basin sale and transport of water from the readily accessable Ogalla aquifer could seriously degrade the wetland, riparian, and aquatic systems of the site. The Nebraska Sandhills have been described as the Saudi Arabia of water reserves in proposals that would make this threat a reality. A more local but real threat to wetland, riparian, and aquatic systems are the wet meadow, marsh and fen ditching/draining efforts intended to increase winter hay production on Sandhill ranches.

Grassland fragmentation occurred during the 1970's in many areas of the Sandhills through conversion to center pivot irrigated cropland. Because of the readily accessible ground water for irrigation and relatively inexpensive land, a significant increase in global demand for agricultural commodities could once again raise the threat of grassland conversion. In very localized Sandhill areas with high scenic quality, fragmentation may result from recreational property development.

Fire suppression results in a very real threat of woody plant (primarily eastern red cedar) invasion. This threat has been most severe near riparian breaks and scarps from which native woody species expand through seed dispersal. However, many windbreaks were planted to eastern red cedar during the last 50 years and these trees now provide an effective seed source throughout the site.

Exotic species are relatively few since most problem species are associated with agriculture and not well adapted to the extensive sand prairie of the site. However, several species of grasses and legumes have been inter-seeded to wet meadow communities to improve forage quality/production. A few wetland species (e.g. purple loose-strife) are threats to native plant and aquatic communities.

Inappropriate grazing may be considered a threat to some specialized upland and wetland plant communities. However, the vast majority of the site has had many natural successions from denuded dunes to high seral sand

prairie. The ecological system has an inherently wide ecological amplitude. Indeed, the only endangered plant species occurring within the site "requires" actively moving sand dune habitat (today a rare native habitat type).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 12,035,241 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	11,664,235	96.92%
• FEDERAL	324,560	2.70%
• STATE	46,446	0.39%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Sandhills Wetland System (SYSTEM0010)	1	8	13%
Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Great Plains Neutral Seep (CEGL002033)	1	9	11%
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1	7	14%
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	2	2	100%
• Northern Cordgrass Wet Prairie (CEGL002027)	1	19	5%
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1	5	20%
• Riverine Sand Flats (CEGL002049)	2	5	40%
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	3	14	21%
• Sandhills Bulrush Marsh (CEGL002030)	1	8	13%
• Sandhills Fen (CEGL002390)	5	12	42%
• Sandhills Wet Prairie (CEGL002028)	1	9	11%
• Sandhills Wet-mesic Prairie (CEGL002023)	6	11	55%
• Southern Great Plains Cattail - Bulrush Marsh (CEGL002032)	1	5	20%
• Southern Great Plains Saline Meadow (CEGL002042)	4	12	33%
Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Hall's Bulrush (PMCYP0Q0R0)	1	7	14%
• Western Prairie Fringed Orchid (PMORC1Y0S0)	1	3	33%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Sandhills Fen (CEGL002390)	2
Animals	Number THIS Area
• Bell's Vireo (ABPBW01110)	1
• Whooping Crane (ABNMK01030)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Sandhills Bulrush Marsh (CEGL002030)	1
• Sandhills Fen (CEGL002390)	7
• Sandhills Wet Prairie (CEGL002028)	9
Animals	Number THIS Area
• Eastern Spotted Skunk (AMAJF05010)	1
• Regal Fritillary (IILEPJ6040)	1
• Swift Fox (AMAJA03030)	1

Crouse Ranch Site

Site Number: 14
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Crouse Ranch Site extends into the extreme western lobe of the large-scale Sandhills Prairie (site 13) in north central Morrill County. The site is on private ranchland and is identified by a clustering of active blowout habitat.

KNOWN THREATS:

Site threats are similar to the following sites: Graves Ranch (site 19), Crescent Lake (site 21), Mule Shoe Bar Ranch (site 16) and Hill Haven Ranch (site 34).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 21,443 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	21,443	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blowout Penstemon (PDSCR1L300)	1	8	13%

Spring Valley

Site Number: 15
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Although there are a few Sandhill lakes in this site (primarily in the southern portion), the sand prairie is generally characterized as more choppy and dry than typical. This site appears to have a more recent active dune period driven by prevailing northwesterly winds.

KNOWN THREATS:

Grazing pressure appears to be uncharacteristically heavy in much of this site. This may be a traditional feature of local ranch operations (primarily large and extensively managed), a recent period of active wind erosion, or a combination of the two. Although this may be interpreted as an increased threat from inappropriate grazing, it might also be the best large scale example early seral conditions in the sand prairie ecological system.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 654,572 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	654,193	99.94%
• STATE	379	0.06%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Sandhills Wetland System (SYSTEM0010)	1	8	13%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1	7	14%
• Northern Cordgrass Wet Prairie (CEGL002027)	1	19	5%
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1	5	20%
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1	14	7%
• Sandhills Bulrush Marsh (CEGL002030)	1	8	13%
• Sandhills Wet Prairie (CEGL002028)	1	9	11%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Sandhills Wet-mesic Prairie (CEGL002023)	1

Animals	Number THIS Area
• Long-billed Curlew (ABNNF07070)	1
• Trumpeter Swan (ABNJB02030)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Sandhills Fen (CEGL002390)	2

Mule Shoe Bar Ranch

Site Number: 16
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site is also embedded within the Sandhills Alkali Lake Site #9, on private ranchland. The site is characterized by a cluster of active blowout habitats. However, other plant communities are viable at this site in addition to the highly ranked blowout penstemon plant species.

KNOWN THREATS:

Threats to blowout penstemon are the same as Graves' Ranch (site 19) and Crescent Lake (site21). It should be noted that the threats to blowout penstemon would be the inverse of those to the plant community targets.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 4,792 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	4,792	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1	7	14%
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	2	14	14%
• Southern Great Plains Saline Meadow (CEGL002042)	1	12	8%
• Western Great Plains Alkaline Marsh (CEGL002040)	3	3	100%

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blowout Penstemon (PDSCR1L300)	1	8	13%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Sandhills Bulrush Marsh (CEGL002030)	1

American Burying Beetle Site

Site Number: 17
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site is centered on the Halsey unit of the Nebraska National Forest (USFS). This is a man-made forest establish as part of an early 20th Century landscape scale experiment to determine why the Great Plains were treeless. It is situated in the fork between the Dismal River and the main stem of the Middle Loup River and as a result is somewhat protected from the regional fire regime. Many of the trees in the "forest" are exotic, though none but the native eastern red cedar and possibly ponderosa pine is likely to invade beyond the forest boundary. The landscape beyond the USFS unit is typical of the Sandhills site with respect to ownership and management.

KNOWN THREATS:

Threats are similar to the Sandhills Prairie (site 13). However, the target species (American burying beetle) on which the site is based may be relying on an increased food base associated with the forest plantation (i.e. song birds and small mamals). If this is the case, the primary threat may well be a return to a more natural fire regime which would eliminate the "forest" in the grassland landscape.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 58,910 acres

Ownership Composition	Acres Owned	Percent of Site
• FEDERAL	33,987	57.69%
• PRIVATE	24,923	42.31%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• American Burying Beetle (IICOL42010)	1	3	33%

Dismal River Terrestrial

Site Number: 18
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site consists of the riparian corridor of a pristine sandhills stream. Due to the steep sand bluffs and dunes adjacent to the stream woody vegetation appears to have been unusually persistent at this site in the middle of the Sandhills region. Isolated woody communities such as those represented at this site offer important evolutionary settings and also provide emergency refuge for migratory birds during severe weather events

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13). The scenic qualities of this site, and proximity to North Platte and the Sandhills Golf Course increase the threat of fragmentation due to recreational property development.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 31,934 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	30,889	96.73%
• FEDERAL	1,045	3.27%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Great Plains Neutral Seep (CEGL002033)	1	9	11%
• Rocky Mountain Juniper / Little-seed Ricegrass Woodland (CEGL000747)	1	1	100%
• Sandbar Willow Shrubland (CEGL001197)	1	6	17%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Cottonwood - Peach-leaf Willow Floodplain Woodland (CEGL000659)	1
• Northern Cordgrass Wet Prairie (CEGL002027)	1
• Sandhills Bulrush Marsh (CEGL002030)	1

Graves' Ranch

Site Number: 19
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Graves Ranch site is embedded with the Sandhills Alkali Lakes (site 12). It consists of an area of choppy sandhills with a recent history of active wind erosion, as evidenced by more blowout habitat than typical of contemporary sandhills. The site is on Conservancy property, and adjacent lands owned by the USFWS Cresent Lake Refuge and the Eldred ranch. Conservancy management is intended to maintain or lower range condition in order to improve the blowout habitat required by Blowout penstemon (Penstemon haydenii). The neighboring properties generally manage for good to excellent range condition.

KNOWN THREATS:

Paradoxically, this site is threatened by good range management practices which re-vegetate blowouts and maintain high seral conditions, thus reducing habitat for the target species. This is an especially challenging issue on the Crescent Lake NWR where management for waterfowl nesting cover is a high priority.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 13,031 acres

Ownership Composition	Acres Owned	Percent of Site
• FEDERAL	8,818	67.67%
• PRIVATE	4,213	32.33%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blowout Penstemon (PDSCR1L300)	1	8	13%

Dismal River South

Site Number: 20
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site consists of private ranchland along the south side of the Dismal River in an area where very choppy sands have a recent history of active dune movement. Remnant active blowout habitats support a small population of blowout penstemon. The primary area of habitat is located in a narrow band of choppy hills just south of the Dismal and east of hard surface road proceeding south of Seneca, NE near the Hooker-Thomas County line. The site has a current history of summer grazing by private ranchers.

KNOWN THREATS:

In appropriate grazing for this site, and conservation target, means that grazing is to light to maintain actively eroding sand dune habitat. Under certain climatic/weather conditions overgrazing may not be enough to reduce vegetation cover to the point of active erosion.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 4,905 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	4,905	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blowout Penstemon (PDSCR1L300)	1	8	13%

Crescent Lake

Site Number: 21
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site is on the Crescent Lake NWR, embedded within the Sandhills Alkali Lakes (site 12), and characterized by a high concentration of active blowout habitat. This refuge was established during the 1930's dust bowl era when Homesteaders and Kincaiders, unable to make a living on the actively eroding dunes, gave up their claims en mass. Today the dunes are generally well vegetated except for increasingly isolated blowouts. Most of the lowlands between the dunes are wet meadow, marsh, and open water communities. The primary management of the refuge has been towards high herbaceous standing crop in the uplands for nesting grassland and waterfowl, and a mosaic of wetland vegetation and open water.

KNOWN THREATS:

Threats to the site are similar to Sandhills Prairie (site 13), with the twist that this is part of a USFWS Refuge. Advancing plant succession on choppy dune blowout habitats is the primary threat to the target species.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 11,711 acres

Ownership Composition	Acres Owned	Percent of Site
• FEDERAL	6,842	58.42%
• PRIVATE	4,869	41.58%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blowout Penstemon (PDSCR1L300)	1	8	13%

Loup River Terrestrial

Site Number: 22
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Loup River Terrestrial Site extends from about 10 miles above the confluence of the Loup River with the Platte River, upstream to the confluence of the Middle Loup River and the main stem of the Loup. An interesting band of Quercus macrocarpa woodland was noted by Hillary Loring in her site visit (at the base of the loess bluffs near the Cedar River confluence). The floodplain is privately owned and highly fragmented by agricultural practices. However, the rivers are free flowing with near normal hydrographs. Since the rivers have their origins in the Sandhills Prairie (site 13), they exhibit relatively stable flows. Yet, since the lower portions of their watersheds are in the Loess Hills, local flooding and accretion processes occur in this site.

KNOWN THREATS:

Threats at this site included incompatible crop production practices, incompatible grazing practices, conversion to agriculture, and invasion by exotics such as smooth bromegrass.

Systematic GIS threat assessment rank (see Appendix 6 for more information): High

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 217,182 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	213,937	98.51%
• STATE	3,245	1.49%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Large and Medium River Floodplain System (SYSTEM0003)	1	6	17%
Community Associations	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	4	9	44%
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	4	9	44%
• Northern Cordgrass Wet Prairie (CEGL002027)	10	19	53%
• Riverine Sand Flats (CEGL002049)	1	5	20%
• Sandbar Willow Shrubland (CEGL001197)	3	6	50%
• Southern Great Plains Cattail - Bulrush Marsh (CEGL002032)	1	5	20%
• Western Tallgrass Bur Oak Woodland (CEGL002053)	1	3	33%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Interior Least Tern (ABNNM08102)	1	5	20%
• Migratory Water Bird Areas (OTHER00001)	1	12	8%
• Piping Plover (ABNNB03070)	1	2	50%
• Regal Fritillary (IILEPJ6040)	1	3	33%
• Whooping Crane (ABNMK01030)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Green Ash - Elm - Hackberry Forest (CEGL002014)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	2
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1

Central Table Playas

Site Number: 23
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Central Table Playas occur on the tablelands to the north and west of the steeply dissected Loup River Loess Hills (site 25). In this site, the land surface is more gently sloping and water ponds seasonally over the impermeable clay layers of shallow basins. The site is privately owned and managed as crop and pastureland.

KNOWN THREATS:

A site visit during the planning process noted that almost all of the level areas were under cultivation. Threats include: incompatible crop production practices, conversion to agriculture, and exotic invasion of native plant communities.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 2,373,754 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	2,368,590	99.78%
• STATE	5,006	0.21%
• FEDERAL	158	0.01%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Little Bluestem Loess Mixedgrass Prairie (CEGL002036)	1	3	33%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Whooping Crane (ABNMK01030)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Great Plains Neutral Seep (CEGL002033)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Northern Cordgrass Wet Prairie (CEGL002027)	1
• Playa Marsh (CEGL002039)	1
• Wheatgrass Playa Grassland (CEGL002038)	1

Platte Confluence

Site Number: 24
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Underlying the river vally in western Nebraska is clay, silt, and sand Quaternary alluvium. Below this layer is the Ogallala aquifer, an extensive Tertiary sedimentary formation underlying much of the Great Plains (Currier et al. 1985).

Both the North and South Platte rivers are fed by snowmelt from the Rocky Mountains, forming braided, sand-bottomed systems that join together just east of North Platte, Nebraska. The Platte Confluence is bordered to the north by the Nebraska Sandhills; the Central High Tablelands of the Central Shortgrass Prairie ecoregion is to the south.

Between its headwaters and the junction with the South Platte river, the North Platte river is greately impacted by water withdrawl for irrigation and impoundments for hydropowe. This has had the impact of decreasing peak flows and narrowing the river channel (Currier et al. 1985).

The floodplain of the North and South Platte rivers is flat with vegetated and non-vegetated sandbars, wooded accreation ground, sloughs, marshes, and wet-mesic and terrace prairies. The accreation ground ranges from dense, closed canopy to scattered, open canopy cottonwood stands with green ash and willow also present. Tallgrass plant species are characteristic of the cottonwood understory and adjacent prairies. The Platte Confluence is a staging site for Sandhill cranes, supports blue heron rookeries, bald eagle nests, as well as provides habitat for grassland birds.

Current TNC Activity:
At the 1334-acre North Platte River Preserve/Kelly tract many restoration/management activities are on-going. Removal of eastern redcedar and russian olive from approximately 650 acres of cottonwood woodland was completed in Spring 2001 with the cooperation of the Nebraska Game and Parks Commission. Future re-establishment of these species will be controlled through the implementation of a prescribed fire program. Working with Central Nebraska Public Power and Irrigation District and the U.S. Fish and Wildlife Service, a portion of the wet-mesic prairie will be managed for Sandhill crane and migratory waterfowl.

Efforts are being made cooperatively by the Nebraska Game and Parks Commission, Natural Resources District, U.S. Fish and Wildlife Service and TNC to work with private landowners to control invasive species along the North Platte River through tree removal, prescribed fire, and grazing.

Literature Cited:
CURRIER, P.J. , G.R. LINGLE, J.G. VANDERWALKER. 1985. Migratory bird habitat on the Platte and North Platte Rivers in Nebraska. The Platte River Whooping Crane Critical Habitat Maintenance Trust. Grand Island, Nebraska. 184 pps.

KNOWN THREATS:

The primary threats to the systems in the Platte Confluence are agricultural conversion, overgrazing, and invasive species. Center pivot irrigation has led to the conversion of meadows to row-cropping.in the river valley. In addition, invasion of eastern redcedar and russian olive is a serious threat facing the site. These species form dense stands, shading out native warm-season plants and encouraging invasion of exotic grass species. Other invasive plant species of concern at this site are reed canarygrass, common reed (Phragmites), smooth brome, kentucky bluegrass, and purple loosestrife.

Systematic GIS threat assessment rank (see Appendix 6 for more information): High

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 82,901 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	82,042	98.96%
• STATE	859	1.04%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Cottonwood - Peach-leaf Willow Floodplain Woodland (CEGL000659)	1	3	33%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Migratory Water Bird Areas (OTHER00001)	1	12	8%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	1
• Northern Cordgrass Wet Prairie (CEGL002027)	1
• Smartweed - Water-pepper Pond (CEGL004699)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1
• Sandbar Willow Shrubland (CEGL001197)	1

Loup River/Loess Hills

Site Number: 25
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Large intact areas of loess hills grassland exist within this site. The site is fragmented by croplands especially in the valleys of the Middle and South Loup Rivers and along the Wood River

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

The native grasslands are threatened by exotics such as smooth brome, Kentucky bluegrass, and cheatgrass. These exotic grasses increase and can become the dominant species with inappropriate grazing management. In the absence of fire, eastern red cedar aggressively invades these productive loess soils and can become the dominant overstory of a fire post-climax. The remaining native grasslands are probably safe from conversion to cropland due to the high erosion potential on steep loess slopes.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 1,218,430 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	1,215,834	99.79%
• STATE	2,539	0.21%
• COUNTY	56	0.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1	9	11%
• Little Bluestem Loess Mixedgrass Prairie (CEGL002036)	1	3	33%
• Riverine Sand Flats (CEGL002049)	2	5	40%
• Sandbar Willow Shrubland (CEGL001197)	1	6	17%
• Western Tallgrass Bur Oak Woodland (CEGL002053)	1	3	33%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Playa Marsh (CEGL002039)	1
• Rocky Mountain Juniper / Little-seed Ricegrass Woodland (CEGL000747)	1

Animals	Number THIS Area
• Prairie Dog Towns (OTHER00003)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	1
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1
• Great Plains Neutral Seep (CEGL002033)	1
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1
• Northern Cordgrass Wet Prairie (CEGL002027)	1

Animals	Number THIS Area
• Prairie Dog Towns (OTHER00003)	1

Central Platte River

Site Number: 26
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The boundary of this site was drawn around an occurrence of a large/medium river floodplain system type. The bird concentration area found within this site is smaller than the entire site.

The Central Platte River is ecologically significant for several reasons, the foremost of which is the concentration of migratory birds that use it as a staging area during the spring. Approximately 500,000 sandhill cranes use the river for overnight roosts and spend the days foraging and loafing in nearby wetlands, grasslands, and cropfields. In addition, whooping cranes are regular spring vistors, as well as 7-9 million ducks and geese each year. The river also has some relatively high-quality examples of wet meadow and wet-mesic prairie along its corridor.

Least terns and piping plovers use the river at times, but most of the nesting for both species currently occurs in off-river sand and gravel mines. Terns use the river for feeding, but neither species successfully nests with any regulariy along the river.

Most of the river and adjacent land is privately-owned. Conservation groups active along the river include TNC, The Platte River Whooping Crane Habitat Maintenance Trust (Crane Trust), USFWS, Nebraska Game and Parks Commission, National Audubon Society, Prairie Plains Resource Institute, and some other smaller local groups. The conservation organizations own or have protected about 12,000 acres along the important stretch of the river, but the majority is still under private ownership.

To protect TNC's main targets (plant communities and migratory waterbirds), it is important to keep and increase the number of acres along the river that are in grassland. More importantly, it is important to maintain the current agricultural landscape (which is much better than the alternatives - sand and gravel mining and urban development).

The area has a history of hostility between landowners and conservation groups which includes a number of lawsuits and settlements including some going on at the current time. Irrigated agriculture is the dominant land use and there are numerous gravity and center-pivot irrigated cropfields. Grasslands in private hands are mainly hayed annually or grazed season-long. TNC has a good reputation with landowners relative to other conservation groups, but is still viewed very suspiciously and with hostility - making conservation work difficult.

Current TNC strategies include acquisition and restoration of grasslands, cooperative work with other groups and landowners to increase the amount and quality of grasslands along the river, work to improve the profitability and sustainability of agriculture as the dominant land use, and participation in strategies to design and provide habitat complexes for migratory waterbirds.

KNOWN THREATS:

Threats include: upstream water diversions and impoundments, changed hydrograph, urban development, icompatible grassland management, loss of grasslands to row-crop conversion, sand and gravel mining - followed by housing developments, fragementation of grasslands by trees, invasion of trees and narrowing of the river channel (loss of open sandbars for crane roosts), hostility of landowners towards conservation groups and efforts. and invasive species.

Systematic GIS threat assessment rank (see Appendix 6 for more information): High

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 362,658 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	357,507	98.58%
• STATE	4,149	1.14%
• FEDERAL	869	0.24%
• COUNTY	133	0.04%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Large and Medium River Floodplain System (SYSTEM0003)	1	6	17%
Community Associations	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	4	9	44%
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1	9	11%
• Northern Cordgrass Wet Prairie (CEGL002027)	1	19	5%
• Sandbar Willow Shrubland (CEGL001197)	1	6	17%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Bald Eagle (ABNKC10010)	2	2	100%
• Interior Least Tern (ABNNM08102)	1	5	20%
• Migratory Water Bird Areas (OTHER00001)	1	12	8%
• Piping Plover (ABNNB03070)	1	2	50%
• Regal Fritillary (IILEPJ6040)	1	3	33%
• Whooping Crane (ABNMK01030)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Green Ash - Elm - Hackberry Forest (CEGL002014)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Great Plains Neutral Seep (CEGL002033)	1
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1
• Riverine Sand Flats (CEGL002049)	1

Plum Creek Canyons

Site Number: 27
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Plum Creek Canyons lie just south of the Platte River valley in south central Nebraska. The terrain consists of rugged, tree clad loess hills dissected by deep canyons. The elevation varies from around 3,000' on the tallest hill tops, to 2,700' in the valley bottoms. The site is within a larger loess hill landscape, but is defined by the known range of one of the world's largest populations of the federally endangered American burying beetle. The primary terrestrial system represented here is the Mixed-grass prairie system. Livestock grazing is the predominant use of this landscape, with farming occurring on the flatter mesa-like hilltops, and hayfields of both native and introduced species in many of the valley bottoms. The landscape is almost exclusively private land, with some state school lands, which are leased to private individuals, and a small percentage of game and parks land. There is very little live water in this landscape, with Cut Creek and Medicine Creek being two of the more notable exceptions.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Home development, crop production on steep loess slopes, incompatible grazing practices, fire suppression, and invasion by brome grass and juniper are all occurring on this site. The area seems particularly prone to woody invasion. Proximity to large towns could make it a target for additional development threats.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 296,597 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	296,553	99.99%
• STATE	44	0.01%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%
Community Associations	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1	1	100%
• Little Bluestem Loess Mixedgrass Prairie (CEGL002036)	1	3	33%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• American Burying Beetle (IICOL42010)	1	3	33%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Rocky Mountain Juniper / Little-seed Ricegrass Woodland (CEGL000747)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	1
• Great Plains Neutral Seep (CEGL002033)	1
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1

Rainwater Basin

Site Number: 28
State: NE
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The rainwater basin wetlands spread over 17 counties (split into west and east groups). The wetlands are shallow depressions carved out of the landscape by wind and fill up with water from rain. Most have a clay-pan that holds water in the wetlands. The area is extremely valuable to migratory waterfowl and shorebirds. Most of the plant communities around the wetlands have been lost to cropland conversion.

The major landuse of the surrounding landscape is row-crop agriculture. There is very little grassland. Many of the basin wetlands have been ditched and drained and are now being farmed through. Others have silted in because of erosion from nearby cropfields.

The Rainwater Basin Joint Venture is the group coordinating conservation work in the basins. Members of the Joint Venture include USFWS, Nebraska Game and Parks Commission, The Nature Conservancy, Ducks Unlimited, NRCS, and others. Major strategies employed by the RBJV include purchase and restoration of basins, and working with landowners to come up with compatible strategies for wetland use.

Current TNC activities are limited to participation in the Joint Venture and the handling of real estate transactions of land eventually transferred to other members of the JV.

Site boundary based on the polygon identified in: LaGrange, Ted. 1997. Guide to Nebraska's wetlands and their conservation needs. Nebraska Game and Parks Commission, Lincoln NE.

KNOWN THREATS:

Major threats include ditching and draining of the wetlands (due to conversion to agriculture), loss of adjacent upland habitat to row-crop conversion, and sedimentation of wetlands from erosion of adjacent cropland.

Systematic GIS threat assessment rank (see Appendix 6 for more information): High

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 2,557,693 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	2,524,829	98.72%
• FEDERAL	23,821	0.93%
• STATE	9,043	0.35%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Bulrush - Cattail - Burreed Shallow Marsh (CEGL002026)	30	30	100%
• Playa Marsh (CEGL002039)	2	2	100%
• Wheatgrass Playa Grassland (CEGL002038)	2	2	100%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Migratory Water Bird Areas (OTHER00001)	1	12	8%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Bulrush - Cattail - Burreed Shallow Marsh (CEGL002026)	10
Animals	Number THIS Area
• Eastern Spotted Skunk (AMAJF05010)	1
• Franklin's Ground Squirrel (AMAFB05120)	1
• Whooping Crane (ABNMK01030)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1

Animals	Number THIS Area
• American White Pelican (ABNFC01010)	1

Jamestown Wildlife Area

Site Number: 29
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Jamestown used to be one of the larger salt marshes in KS. Converted by KDWP to an impounded wetland that receives lots of irrigation tailwater. Bill Busby (Kansas Biological Survey) says that his impression from recent visits is that it faces tremendous management challenges due to sediment introduced by irrigation water and by emergent vegetation (cattail) that has taken over much of the surface of the two reservoirs in recent years. KBS observed about 10,000 shorebirds here in the spring during one year when conditions were ideal. However, management issues appear to preclude ideal conditions most years. Because of the altered nature of the site, it has limited potential or value from a natural community or plant species perspective. Plant communities here are salt affiliated.

KNOWN THREATS:

Threats include altered hydrology and sedimentation.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 3,158 acres

Ownership Composition	Acres Owned	Percent of Site
• STATE	2,205	69.84%
• PRIVATE	953	30.16%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Migratory Water Bird Areas (OTHER00001)	1	12	8%

North Solomon Breaks

Site Number: 30
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was selected from satellite imagery as having a large area of intact native vegetation. Visit to site confirms this intactness. At this time, no additional information about this area is known.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Incompatible grazing practices.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 68,950 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	68,950	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1	9	11%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Prairie Dog Towns (OTHER00003)	1

South Solomon Breaks

Site Number: 31
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was selected from satellite imagery as having a large area of intact native vegetation. Visit to site confirms this intactness. This site does not include floodplain areas, as those areas have very degraded cottonwood and other riparian community types. At this time, no additional information about this area is known.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Most of site is untillable, however there has been some conversion to agriculture along some of the roads and creeks. In addition, the current boundaries include small portions of the floodplain, which is almost all agricultural. Kansas Biological Survey study of Solomon River Floodplain contains more information about threats to this area.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 77,798 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	77,798	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%
Community Associations	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1	9	11%
• Central Green Ash - Elm - Hackberry Forest (CEGL002014)	1	2	50%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Prairie Dog Towns (OTHER00003)	1

Northern Dakota Hills

Site Number: 32
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was selected from satellite imagery as having a large area of intact native vegetation. Visit to site confirms this intactness. At this time, no additional information about this area is known.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Incompatible livestock production practices, incompatible forestry practices

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 111,070 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	111,070	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Dakota Sandstone Tallgrass Prairie System (SYSTEM0013)	1	4	25%
Community Associations	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Dakota Sandstone Tallgrass Prairie (CEGL005231)	1	5	20%
• Western Tallgrass Bur Oak Woodland (CEGL002053)	1	3	33%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1
Community Associations	**Number THIS Area**
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Eastern Cottonwood / Black Willow Woodland (CEGL004919)	1

Greenhorn Limestone

Site Number: 33
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was selected from satellite imagery as having a large area of intact native vegetation. Visit to site confirms this intactness. At this time, no additional information about this area is known.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Incompatible oil or gas drilling. There is some fragmentation from roads and conversion to agriculture. Most of the land is not tillable.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 702,690 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	680,754	96.88%
• FEDERAL	19,661	2.80%
• STATE	2,275	0.32%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%
Community Associations	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1	9	11%
• Dakota Sandstone Tallgrass Prairie (CEGL005231)	1	5	20%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Broad-leaved Cattail Marsh (CEGL002010)	1
• Chairmaker's Bulrush - Sedge species Herbaceous Vegetation (CEGL004144)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Dakota Sandstone Tallgrass Prairie System (SYSTEM0013)	1
Community Associations	**Number THIS Area**
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Little Bluestem Loess Mixedgrass Prairie (CEGL002036)	1
Animals	**Number THIS Area**
• Prairie Dog Towns (OTHER00003)	1

North-Central Dakota Hills

Site Number: 34
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was selected from satellite imagery as having a large area of intact native vegetation. Visit to site confirms this intactness. At this time, no additional information about this area is known.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Incompatible crop production practices, incompatible grazing practices.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 90,157 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	90,157	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Dakota Sandstone Tallgrass Prairie System (SYSTEM0013)	1	4	25%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Dakota Sandstone Tallgrass Prairie (CEGL005231)	1	5	20%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• Prairie Dog Towns (OTHER00003)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1

Community Associations	Number THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1

Coronado Hills

Site Number: 35
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

A significant portion of this area is occupied by the Smoky Hill Air National Guard Range, the largest ANG range in the country. This mission of the range is to maintain peace by providing the best air tactics training environment possible. Personnel of the Kansas Air National Guard's 184th Bomb Group carefully manages the natural and cultural resources of the Range, protecting the environment and providing recreational opportunities, as well as generating revenues from agricultural leases.

In response to comments by the Kansas Biological Survey on a 2001 draft management plan, the ANG Range emphasized their commitment to sound land management practices, specifically in the area of range science, looking for ways to decrease the impacts from aerial spraying and improving their prescribed burning program.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Incompatible crop production practices, incompatible grazing practices. Possible threat of housing development due to proximity to Salina. Broadcast spraying for musk thistle is a danger to diversity. large scale spraying for musk thistle (We are talking spraying from bombers), conversion of current hay meadows to rangeland, increasing the number of stock ponds, and the plowing of firebreaks in steep highly erodible prairie.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 232,486 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	192,498	82.80%
• FEDERAL	37,288	16.04%
• STATE	2,700	1.16%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Dakota Sandstone Tallgrass Prairie System (SYSTEM0013)	1	4	25%
Community Associations	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1	9	11%
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1	9	11%
• Dakota Sandstone Tallgrass Prairie (CEGL005231)	1	5	20%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1
Community Associations	**Number THIS Area**
• Eastern Cottonwood / Black Willow Woodland (CEGL004919)	1
Animals	**Number THIS Area**
• Prairie Dog Towns (OTHER00003)	1

Southern Dakota Hills

Site Number: 36
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was selected from satellite imagery as having a large area of intact native vegetation. Visit to site confirms this intactness. At this time, no additional information about this area is known.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Incompatible crop production practices, incompatible grazing practices, incompatible oil or gas drilling.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 163,106 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	158,994	97.48%
• FEDERAL	4,097	2.51%
• STATE	15	0.01%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Dakota Sandstone Tallgrass Prairie System (SYSTEM0013)	1	4	25%
Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1	9	11%
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1	9	11%
• Dakota Sandstone Tallgrass Prairie (CEGL005231)	1	5	20%
• Eastern Cottonwood / Black Willow Woodland (CEGL004919)	1	1	100%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1
Animals	Number THIS Area
• Prairie Dog Towns (OTHER00003)	1

Cheyenne Bottoms

Site Number: 37
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Cheyenne Bottoms is an internationally important wetlands complex within a roughly circular and nearly flat-bottom 41,000-acre natural land sink. The basin is bounded on the north, south and west by low sandstone bluffs. The enclosing wall on the east and southeast sides are composed of dune sands. The Bottoms is comprised of a diverse array of wetlands, from ephemeral "micro-depression" wetlands of a few square meters to semi-permanent wetlands of several thousand acres, imbedded within a backdrop of mixed-grass prairie and cultivated land. It has been designated as a Hemispheric Reserve of the Western Hemisphere Shorebird Reserve Network by the Wetlands of the Americas Organization and as a Wetland of International Importance via the Ramsar Convention.

Blood Creek enters the basin from the west and Deception Creek and an unnamed stream enter from the north. At the southeast is a slightly elevated outlet, Little Cheyenne Creek. Land use changes (advent of irrigation) along these streams and drainage efforts within the basin have significantly altered the area's hydrology. Additionally, water is diverted into the Bottoms from Wet Walnut Creek and the Arkansas River from the west. Diversions are intended to augment natural inflows that are reduced from historic levels.

Cheyenne Bottoms is an extremely important staging site for shorebird migration. An estimated 45% of all species of shorebirds and 90% of populations of several species in North America east of the Rocky Mountains stop at Cheyenne Bottoms during spring migration. Whooping cranes stop during spring and fall migrations. Numerous other birds rely on the area's diverse wetland habitats, including waterfowl, sandhill cranes and a variety of wading birds. Some 320 species of birds have been documented at Cheyenne Bottoms.

Two managed areas occur at Cheyenne Bottoms. The KDWP owns and manages the nearly 20,000-acre Cheyenne Bottoms Wildlife Area and TNC owns a 7,350-acre preserve. KDWP lands were acquired in the 1950s and a system of dikes was built to divide the more permanent wetland area into 5 management pools. In the early 1990s, extensive renovation divided these pools further and included addition of pumping stations and other facilities so that the area could be better managed to accommodate a spectrum of wetland habitats from mudflats to semi-permanent pools. The TNC preserve is comprised of smaller and more ephemeral wetlands and includes significant upland area. Both native mixed-grass prairie, featuring inland saltgrass (Distichlis spicata) and formerly cultivated land allowed to "go-back" to grassland, are prominent on the preserve. Management is focused on removing low berms, drainage ditches and encroaching trees to provide a prairie wetland complex that compliments the wetlands on the state area.

KNOWN THREATS:

Incompatible crop production practices, incompatible livestock production practices, incompatible grazing practices, incompatible wastewater treatment, incompatible primary and secondary home development, construction of ditches/drainage/diversion systems, incompatible operation of drainage and diversion systems, incompatible oil or gas driling, crane hunting, fire suppression, invasion of Tamarix.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low (note: review by planning team would increase the threat rank of this site to Medium due to threats to hydrology from oil and gas)

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 26,333 acres

Ownership Composition	Acres Owned	Percent of Site
• STATE	17,375	65.98%
• PRIVATE	8,958	34.02%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Broad-leaved Cattail Marsh (CEGL002010)	1	1	100%
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1	7	14%
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1	14	7%
• Smartweed - Water-pepper Pond (CEGL004699)	1	1	100%
• Southern Great Plains Cattail - Bulrush Marsh (CEGL002032)	1	5	20%
• Southern Great Plains Cordgrass Wet Prairie (CEGL002223)	1	3	33%
• Southern Great Plains Saline Meadow (CEGL002042)	1	12	8%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Migratory Water Bird Areas (OTHER00001)	1	12	8%
• Whooping Crane (ABNMK01030)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• Long-billed Curlew (ABNNF07070)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Black Rail (ABNME03040)	1
• Eastern Spotted Skunk (AMAJF05010)	1
• Interior Least Tern (ABNNM08102)	1
• Piping Plover (ABNNB03070)	1
• Prairie Dog Towns (OTHER00003)	1
• Snowy Plover (ABNNB03030)	2

McPherson Valley Wetlands

Site Number: 38
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The McPherson Valley Wetlands area represents a critical wetland resource, that over a century ago rivaled Cheyenne Bottoms and the Quivira Salt Marshes in hosting migratory waterfowl and other wetland wildlife. At the time of settlement, the McPherson Valley Wetlands consisted of some 9,000 acres of wetlands in 52 individual basins in an area encompassing approximately 126 square miles. Lake Inman, considered by many to be the only remaining natural lake in Kansas, is one of the few in this broad array of wetlands that still exists in a somewhat natural state. The largest of the wetland sites was the 2,000-acre Big Basin about five miles west of present day McPherson.

Extensive drainage projects beginning in the early 1900s eliminated most of the natural wetlands at McPherson Valley. However, an ambitious restoration project began in 1989 when the Kansas Department of Wildlife and Parks first purchased land in the Big Basin. KDWP has been joined by Ducks Unlimited, TNC, NRCS and many other partners since then. Presently, approximately 3,750 acres are owned and managed by KDWP. Wetland restoration activities on these lands are is various stages. They are focused not so much on restoring historic natural communities, but in providing various wetland habitat important to migratory waterbirds. Plans for continued wetland acquisition and restoration would bring the size of the managed area up to at least 5,000 acres.

Since, restoration work commenced in 1989, 112 species of birds have been documented using the site, including the federally endangered whooping crane, federally threatened bald eagle, and state threatened white-faced ibis and snowy plover.

KNOWN THREATS:

Continued operation of drainage ditches. Siltation from adjacent cultivated lands.

Systematic GIS threat assessment rank (see Appendix 6 for more information): High (note: review by planning team would decrease the threat rank of this site to Medium of Low due to restoration and because targets at site aren't affected by level of fragmentation)

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 25,636 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	25,636	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Migratory Water Bird Areas (OTHER00001)	1	12	8%

Ness/Hodgeman Counties Prairie Chick

Site Number: 39
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was one of two high priority sites identified by Randy Rodgers, Kansas Department of Wildlife and Parks, for the conservation of Lesser Prairie Chicken. The boundaries here are very rough -- the extent of lessers to the west into the Central Shortgrass was unknown. Future iterations of this ecoregional plan should work with the Central Shortgrass Prairie ecoreigonal planning team to draw more accurate boundaries. The Lesser Prairie Chicken relies on CRP within this area for nesting/loafing cover and thus might not be closely tied to the native range sites contained within this area.

The KDWP prairie dog surveys indicated some PD towns within this site, but they aren't thought to be very extensive.

Some suggest that the quality of this site is very poor and should thus be further evaluated for inclusion in this conservation plan.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Conservation Reserve Program land is important for Lesser Prairie Chickens, the long term existence of these areas are dependent on federal farm program appropriations.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 992,120 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	991,011	99.89%
• STATE	1,109	0.11%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blue Grama - Buffalograss Shortgrass Prairie (CEGL001756)	3	4	75%
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1	9	11%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Lesser Prairie Chicken (ABNLC13020)	1	4	25%
• Prairie Dog Towns (OTHER00003)	1	1	100%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Eastern Cottonwood / Black Willow Woodland (CEGL004919)	1

Hutchison Dunes

Site Number: 40
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was selected from satellite imagery as having a large area of intact native vegetation. Visit to site confirms this intactness. At this time, no additional information about this area is known.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Incompatible crop production practices, incompatible grazing practices, incompatible primary home development, imcompatible oil or gas drilling, fire suppression

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 77,594 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	77,594	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1	14	7%
• Sandhills Wet Prairie (CEGL002028)	1	9	11%
• Southern Great Plains Cordgrass Wet Prairie (CEGL002223)	1	3	33%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Sandhills Wet-mesic Prairie (CEGL002023)	1

Plants	Number THIS Area
• American Dwarf Burhead (PMALI02050)	1

Quivira

Site Number: 41
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This area includes the Quivira National Wildlife Refuge. The refuge is managed primarily to provide migratory waterfowl with food, water, and shelter. Other migratory birds, endangered species, and wildlife, such as deer and pheasant, also benefit from habitat programs, such as cooperative farming, employed by refuge managers. Habitat management programs include a high-intensity, short-duration cattle crazing program and deliberate, well planned burns to improve grasslands for wildlife nesting and cover. Additionally, 21 miles of canals and numerous water control structures divert water to over 34 wetlands ranging in size from 10 to 1,500 acres and totaling over 6,000 acres of marshlands.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Incompatible crop production practices, incompatible grazing practices.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 110,428 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	96,305	87.21%
• FEDERAL	14,123	12.79%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Saline Sandhills Wetland System (SYSTEM0011)	1	2	50%
• Sand Prairie System (SYSTEM0002)	1	14	7%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	1	9	11%
• Sandhills Wet Prairie (CEGL002028)	1	9	11%
• Southern Great Plains Cattail - Bulrush Marsh (CEGL002032)	1	5	20%
• Southern Great Plains Cordgrass Wet Prairie (CEGL002223)	1	3	33%
• Southern Great Plains Saline Meadow (CEGL002042)	1	12	8%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Black Rail (ABNME03040)	1	1	100%
• Interior Least Tern (ABNNM08102)	1	5	20%
• Migratory Water Bird Areas (OTHER00001)	1	12	8%
• Regal Fritillary (IILEPJ6040)	1	3	33%
• Snowy Plover (ABNNB03030)	1	2	50%
• Whooping Crane (ABNMK01030)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Eastern Cottonwood / Black Willow Woodland (CEGL004919)	1
• Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	1

Animals	Number THIS Area
• Piping Plover (ABNNB03070)	1
• Prairie Dog Towns (OTHER00003)	1

Kinsley Sandhills

Site Number: 42
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was selected from satellite imagery as having a large area of intact native vegetation. Visit to site confirms this intactness. At this time, no additional information about this area is known.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Incompatible crop production practices, incompatible grazing practices, excessive groundwater withdrawl, incompatible oil or gas drilling. Center pivots may lower the water table and also allow conversion to agriculture. HL thinks that no new permits for center pivots are being issued here.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 89,426 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	89,426	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Large and Medium River Floodplain System (SYSTEM0003)	1	6	17%
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Sandsage Shrubland System (SYSTEM0009)	1	2	50%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	2	14	14%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Lesser Prairie Chicken (ABNLC13020)	1	4	25%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	1
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Sand Sagebrush / Little Bluestem Shrubland (CEGL002178)	1
• Southern Great Plains Cattail - Bulrush Marsh (CEGL002032)	1
• Southern Great Plains Cordgrass Wet Prairie (CEGL002223)	1

Animals	Number THIS Area
• Prairie Dog Towns (OTHER00003)	1

Meade County Wetlands

Site Number: 43
State: KS
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was ecommended by Bill Busby (Kansas Natural Heritage Program) on the basis of migratory bird use of the many playas in this area. According to Tom Flowers (NRCS, Meade), the area hosts several hundred 1000 sandhill cranes during migration in wet years. When playas have water, the use by migratory shorebirds and waterfowl is moderate and high, respectively. The site is centered on some large playas between Meade and Fowler. Site boundaries are very crude and it is unclear how the area should be defined. Playas extend extensively in most directions, especially to the north and west. Tom Flowers may be able to provide information on how extensively the area is used by sandhill cranes. Much of the area is cultivated agriculture; there are no large blocks of untilled vegetation.

KNOWN THREATS:

incompatible crop production practices, incompatible grazing practices, center pivots.

Systematic GIS threat assessment rank (see Appendix 6 for more information): High

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 77,852 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	77,852	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Spikerush Playa Lake (CEGL002259)	1	1	100%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Migratory Water Bird Areas (OTHER00001)	1	12	8%

Red Hills

Site Number: 44
State: KS/OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Red Hills of Kansas and Oklahoma comprise the largest tract of untilled landscape in the Red Plains section of the Central Mixed-Grass Prairie ecoregion. This site is considered a functional landscape. The rough, rolling topography is characterized by red Permian shales and gypsum outcrops, dominated by Red Hills Little Bluestem Mixed-grass Prairie, Western Gypsum and Redbed Clay Prairie, and various other grassland associations. Small sandy areas scattered throughout the feature support sand prairie and sand sage shrubland communities.

Numerous gypsum dissolution caves occur in the Oklahoma portion of the Red Hills. The state-owned Selman Bat Cave, and Merrihew Cave, owned by Ted Turner, house maternity colonies of Mexican free-tailed bats, while smaller caves in the area harbor Townsend's big-eared bats.

Populations of lesser prairie chicken persist in the western section of the Red Hills, often found near sandier soils where shrubs and tall grass cover are available. The U.S. Fish and Wildlife Service is actively pursuing conservation agreements aimed at the protection of this declining species in the Red Hills.

Since settlement, the area has been composed of large private cattle ranches, though fragmentation by small scale ownership and cropland is increasing. In the Oklahoma portion of the Red Hills, less than 10 percent of the land area remains in large, untilled parcels of 5,000 acres or greater.

As with many of the conservation areas described in this section of the ecoregion, eastern redcedar is rapidly invading many types of plant communities, and will have a markedly negative effect on the biodiversity of the region in the coming years. Though prescribed fire has not been used extensively as a management tool, recent demonstration burns coordinated by the U.S. Fish and Wildlife Service have met with positive results. More effort is needed by the Conservancy and partner organizations to promote prescribed fire as a beneficial range management practice in the Red Hills.

Current/future TNC strategies at site:
Support partner agencies in conservation initiatives for the lesser prairie chicken & other threatened species; initiate prescribed fire cooperatives with partner agencies and private ranching organizations; acquire key tracts for long-term protection of target elements, use as demonstration sites for prescribed fire & other range management activities.

Site boundary overlaps the Lower Cimmarron site (KS) delineated by the CSP. In future iterations, need to work out one boundary that will address all targets present.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Threats include: ncompatible crop production practices, incompatible grazing practices, incompatible oil and gas drilling, fire suppression, invasive eastern red cedar, altered fire regime, habitat fragmentation, and agricultural conversion. Bill Busby (KBS) feels that the threats facing the Red Hills are not severe or immediate. The scarcity of good water makes agricultural threats low. Cedar invasion is a problem that is increasingly recognized by landowners and federal and state agencies who are taking corrective steps.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low (note: review by planning team would increase the threat rank of this site to High due to woody encroachment)

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 1,801,559 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	1,798,266	99.82%
• STATE	3,293	0.18%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%
• Sand Prairie System (SYSTEM0002)	1	14	7%

Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Blue Grama - Buffalograss Shortgrass Prairie (CEGL001756)	1	4	25%
• Central Great Plains Little Bluestem Prairie (CEGL002246)	3	9	33%
• Central Green Ash - Elm - Hackberry Forest (CEGL002014)	1	2	50%
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1	9	11%
• Cottonwood - Peach-leaf Willow Floodplain Woodland (CEGL000659)	1	3	33%
• Red Hills Little Bluestem Mixedgrass Prairie (CEGL002248)	1	1	100%
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1	14	7%
• Southern Great Plains Cattail - Bulrush Marsh (CEGL002032)	1	5	20%
• Southern Great Plains Saline Meadow (CEGL002042)	1	12	8%
• Western Gypsum And Redbed Clay Prairie (CEGL002252)	1	1	100%

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Hall's Bulrush (PMCYP0Q0R0)	1	7	14%
• Oklahoma Phlox (PDPLM0D1E0)	1	2	50%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Bat Caves (OTHER00002)	4	9	44%
• Lesser Prairie Chicken (ABNLC13020)	1	4	25%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas Darter (AFCQC02170)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Terrestrial Ecological Systems	Number THIS Area
• Sandsage Shrubland System (SYSTEM0009)	1

Animals	Number THIS Area
• Townsend's Big-eared Bat (AMACC08010)	4

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Community Associations	Number THIS Area
• Alkali Bulrush Marsh (CEGL002226)	1
• Broad-leaved Cattail Marsh (CEGL002010)	1
• Eastern Cottonwood / Black Willow Woodland (CEGL004919)	1
• Sand Sagebrush / Little Bluestem Shrubland (CEGL002178)	1
• Southern Great Plains Cordgrass Wet Prairie (CEGL002223)	1
• Western Great Plains Alkaline Marsh (CEGL002040)	1

Animals	Number THIS Area
• Black Rail (ABNME03040)	1
• Lesser Prairie Chicken (ABNLC13020)	1
• Prairie Dog Towns (OTHER00003)	1
• Texas Garter Snake (ARADB36131)	1

Great Salt Plains

Site Number: 45
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Along the Salt Fork of the Arkansas River in northern Oklahoma, brines from groundwater dissolution of Permian salt beds seep to the surface, creating a vast, nearly level salt flat occupying 25 sq. miles of land to the southeast of the river. This immense salt flat and associated marshes and wet prairies form the Great Salt Plains ecological system. The 32,000 acre Salt Plains National Wildlife Refuge encompasses the salt flat and surrounding area.

The refuge was partially inundated in the 1940s by a dam built on the river. The shallow lake and abundant food supply in the area attract great numbers of sandhill cranes, Canada geese, and other migratory waterfowl. Ralstin Island hosts thousands of nesting herons and egrets in the summer. Large expanses of bare ground around the reservoir attract numerous ground nesting birds, including a large population of interior least terns. The area also serves as a regular stopover site for the whooping crane.

Upstream from the salt flat and reservoir, low-lying areas among the numerous watercourses support high-quality saline meadow, marsh, and wet prairie communities. To the north, sandy soils grade into clay and gypsum supporting mixed-grass prairie associations, fragmented by cropland.

The shallow surface water and saline soils of this site provide an ideal growing environment for saltcedar, which is abundant in riparian zones throughout the area. Many acres of native vegetation and wildlife habitat have been lost to this invasive plant.

A site visit during the planning process indicated that the site boundary could be enlarged to include the area east of NS272 Rd/Hwy 38.

KNOWN THREATS:

Threats include: invasive species (saltcedar, eastern redcedar), roads, improper livestock grazing, and altered fire regime. A site visit during the planning process identified the following threats: incompatible crop production practices, incompatible grazing practices, conversion to agriculture, incompatible oil/gas drilling, fire suppression and invasion of Tamarisk.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 72,523 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	40,280	55.54%
• FEDERAL	32,218	44.42%
• STATE	25	0.03%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Interior Least Tern (ABNNM08102)	2	5	40%
• Migratory Water Bird Areas (OTHER00001)	1	12	8%
• Snowy Plover (ABNNB03030)	1	2	50%
• Whooping Crane (ABNMK01030)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Alkali Bulrush Marsh (CEGL002226)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1
• Southern Great Plains Saline Meadow (CEGL002042)	1
• Western Great Plains Alkaline Marsh (CEGL002040)	1
• Western Gypsum And Redbed Clay Prairie (CEGL002252)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Large and Medium River Floodplain System (SYSTEM0003)	1
• Mixed-grass Prairie System (SYSTEM0001)	1
• Sand Prairie System (SYSTEM0002)	1

Cimarron River Terrestrial

Site Number: 46
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Cimarron River rises in the high plains of Colfax County, New Mexico, and meanders 670 miles east to its confluence with the Arkansas River near Tulsa, Oklahoma. In the Central Mixed-Grass Prairie ecoregion, the Cimarron flows across a wide, braided channel of coarse sand through southwestern sections of the Red Hills.

To the north of the river, a narrow belt of gently sloping windblown sand dunes are stabilized by sand-sage shrublands. To the south and southwest, steep bluffs of sandstone and gypsum approach the banks of the river, vegetated by Red Hills Little Bluestem Mixed-grass Prairie and Western Gypsum and Redbed Clay Prairie associations.

Narrow belts of cottonwood, sandbar willow, and black willow are often found along the riverbanks. In other areas, various wet prairie and marsh associations are observed. Eastern redcedar is spreading in riparian woodlands and upland areas along the length of the site.

At least two expansive salt flats occur where the river flows over ancient Permian sea evaporates; saline marsh and meadow communities are found near these sites. The large reaches of salt and bare soil attract a number of ground-nesting birds, including the Snowy plover and the endangered Interior least tern.

This reach of the Cimarron River has been designated as critical habitat for the federally listed Arkansas River shiner. Upstream diversions and groundwater withdrawals for irrigation, as well as competition with the introduced Red River shiner, threaten to eliminate the Arkansas River Shiner from this system.

Current/future TNC strategies at site:
Support partner agencies in conservation initiatives for the lesser prairie chicken & other threatened species; initiate prescribed fire cooperatives with partner agencies and private ranching organizations; acquire key tracts for long-term protection of target elements, use as demonstration sites for prescribed fire & other range management activities.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Threats include: nvasive species (eastern redcedar, saltcedar), altered fire regime, diversions, and groundwater withdrawal. A site visit during the planning process identified the following threats: incompatible crop production practices, incompatible grazing practices, incompatible mining practices, incompatible oil/gas drilling, fire suppression, and invasion of tamarix (salt cedar).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 76,029 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	76,029	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River Shiner (AFCJB28490)	1	2	50%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Terrestrial Ecological Systems	Number THIS Area
• Large and Medium River Floodplain System (SYSTEM0003)	1
• Sand Prairie System (SYSTEM0002)	1
• Sandsage Shrubland System (SYSTEM0009)	1

Community Associations	Number THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Cottonwood - Peach-leaf Willow Floodplain Woodland (CEGL000659)	1
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1
• Sand Sage / Sand Dropseed Shrubland (CEGL002179)	1
• Southern Great Plains Cattail - Bulrush Marsh (CEGL002032)	1
• Southern Great Plains Cordgrass Wet Prairie (CEGL002223)	1
• Western Gypsum And Redbed Clay Prairie (CEGL002252)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Interior Least Tern (ABNNM08102)	1

Woodward Co. Phlox

Site Number: 47
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This small site encompasses an isolated population of Oklahoma phlox. While apparently not as vigorous as the Red Hills population to the north, plants are occasionally observed in the rolling sandy loam soils of the area. Eastern redcedar is rapidly invading the native mixed-grass prairie communities at this site.

Current/future TNC strategies at site:
Work with Oklahoma Natural Areas Registry program to monitor & protect plant occurrences.

KNOWN THREATS:

Threats include: invasive species (eastern redcedar), altered fire regime, improper livestock grazing, and erosion. A site visit during the planning process identified the following threats: incompatible crop production practices, incompatible grazing practices, incompatible oil/gas drilling, and invasion of eastern red cedar.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 15,378 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	15,378	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Oklahoma Phlox (PDPLM0D1E0)	1	2	50%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1
• Western Gypsum And Redbed Clay Prairie (CEGL002252)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1
• Sand Prairie System (SYSTEM0002)	1

Lower Cimarron

Site Number: 48
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This site was meant to be "attached" to the existing Lower Cimarron portfolio site in the adjacent Central Shortgrass ecoregion (it appears that this team drew the site right up to the ecoregion boundary, and then stopped.)

The boundary between the CSP and CM-GP in Oklahoma is unchanged from the old Bailey's classification, and is not very precise. The belt of sand sage shrubland that was meant to be encompassed by the Lower Cimarron site is bisected by the ecoregion boundary, and is practically identical on either side.

The Lesser prairie chicken occurs here, though you're not likely to find EOs confirming that, given Oklahoma's lack of heritage data. No other rare or threatened species immediately come to mind. As for an ecological system, I would call this area sand sage shrubland, rather than sand sage prairie or sand prairie.

This area of sand sage shrubland near the North Canadian River is was intended to be "added on" to the existing Lower Cimarron site identified by the Central Shortgrass Prairie ecoregional planning team. The CSP site appears to "stop" at the ecoregion boundary just to the west, and does not include important, high-quality occurrences of sand prairie and sand sage shrubland on the 15,000 acre Cooper Wildlife Management area.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

unknown

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 88,981 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	88,206	99.13%
• STATE	775	0.87%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%
• Sandsage Shrubland System (SYSTEM0009)	1	2	50%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Lesser Prairie Chicken (ABNLC13020)	1	4	25%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Terrestrial Ecological Systems	Number THIS Area
• Sand Prairie System (SYSTEM0002)	1
Community Associations	Number THIS Area
• Alkali Bulrush Marsh (CEGL002226)	1
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Central Green Ash - Elm - Hackberry Forest (CEGL002014)	1
• Central Wet-mesic Tallgrass Prairie (CEGL002024)	1
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Red Hills Little Bluestem Mixedgrass Prairie (CEGL002248)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1

- Sand Sage / Sand Dropseed Shrubland (CEGL002179) 1
- Sand Sagebrush / Little Bluestem Shrubland (CEGL002178) 2
- Sandhills Wet-mesic Prairie (CEGL002023) 1
- Southern Great Plains Cattail - Bulrush Marsh (CEGL002032) 1
- Western Great Plains Alkaline Marsh (CEGL002040) 1
- Western Gypsum And Redbed Clay Prairie (CEGL002252) 1

Glass Mountains

Site Number: 49
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Glass (or Gloss) Mountains are a small, but unfragmented area. These rugged gypsum hills sport mesquite (Prosopis glandulosa), junipers, four-wing saltbrush (Atriplex canescens), and tamarix in a matrix orf Western Gypsum and Redbed Clay Prairie and Southern Great Plains Saline Meadow. Salt grass (Distichlis spicata), alkali sacaton (Sporobolus airoides), and side-oats grama (Bouteloua curtipendula) are very common on the flats. Petroleum extraction occurs throughout the feature. A few salt flats could still be plowed but this highly erodible land will probably end up in CRP. A quarter-section of the salt flats recently had been cleared and plowed.

The Glass Mountains conservation area captures a series of intact prairie fragments and large cave systems in western Major County, Oklahoma. Soils consist of Permian shales and sandstones, intermeshed with deep gypsum layers of the Blaine formation. Wide mesas and escarpments resembling badlands topography occur near the Cimarron River. An isolated group of small buttes east of the site boundary are known locally as the "glass" or "gloss" mountains for the small, clear gypsum fragments littering their slopes.

Mixed-grass prairie associations dominate the hills and breaks, grading into sand sage shrubland and post oak - blackjack oak woodlands in sandier soils near the southern border. Saline meadow associations are found in the valleys and flats near the Cimarron River. Mesquite has invaded the eroded clayey soils on flats and escarpments, and a heavy infestation of eastern redcedar occurs to the south.

A number of dissolution caves occur in the deep gypsum layers of the western part of the site. At least two of these caves support large maternity colonies of Mexican free-tailed bats, numbering in the millions in late summer.

Current/future TNC strategies at site:
Support partner agencies in conservation initiatives for the lesser prairie chicken & other threatened species; initiate prescribed fire cooperatives with partner agencies and private ranching organizations; acquire key tracts for long-term protection of target elements, use as demonstration sites for prescribed fire & other range management activities.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Threats include: nvasive species (eastern redcedar, mesquite), altered fire regime, mining (gypsum), improper livestock grazing, habitat fragmentation, and herbicide application. Site visit during the planning process identified the following threats: incompatible crop production practices, incompatible grazing practices, conversion to agriculture, incompatible oil/gas drilling. There is a low-level nuclear waste site within this conservation area.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 109,291 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	109,291	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Bat Caves (OTHER00002)	3	9	33%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1
• Little Bluestem Chalkflat Mixedgrass Prairie (CEGL002247)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1
• Sand Sagebrush / Little Bluestem Shrubland (CEGL002178)	1
• Sandhills Wet-mesic Prairie (CEGL002023)	1
• Southern Great Plains Saline Meadow (CEGL002042)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Loggerhead Shrike (ABPBR01030)	1
• Texas Horned Lizard (ARACF12010)	1

Salt Creek Canyon

Site Number: 50
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Salt Creek Canyon and surrounding draws are home to the northernmost remaining population of the endangered black-capped vireo. Once found from Mexico to south-central Kansas, this small neo-tropical migrant has been extirpated from large sections of the northern and eastern parts of its historical range; a small population of 30-40 individuals persists along the brushy escarpment of the Cimarron River in Blaine County, Oklahoma.

Since 1990, the Oklahoma Chapter of The Nature Conservancy, in partnership with the U.S. Fish and Wildlife Service and the Oklahoma Department of Wildlife Conservation, has led an annual effort to monitor vireo nests and trap brown-headed cowbirds (nest predators) on private lands in the area. In the winters of 2001 & 2002, the Conservancy directed a habitat restoration project aimed at removing invading eastern redcedar timber from canyon slopes and draws near historic vireo nesting locations.

Current/future TNC strategies at site:
Continue partnership with U.S. Fish and Wildlife Service, Oklahoma Department of Wildlife Conservation, and others on monitoring & cowbird control; seek additional funding sources for ongoing habitat restoration project; cultivate relationships with large private landowners to secure access for monitoring and habitat work.

KNOWN THREATS:

Threats include: invasive species (eastern redcedar), altered fire regime mining (gypsum), and altered grazing regime. A site visit during the planning process identified the following threats: incompatible grazing practiceds, incompatible mining for gypsum, incompatible oil/gas drilling, rattlesnake roundups, and spraying for mesquite.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium (note: review by planning team would increase the threat rank of this site to High due to woody encroachment)

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 12,144 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	11,732	96.60%
• STATE	412	3.40%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Black-capped Vireo (ABPBW01120)	1	2	50%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1
• Little Bluestem Chalkflat Mixedgrass Prairie (CEGL002247)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1

Canadian River Terrestrial

Site Number: 51
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Canadian River rises in the foothills of the Rocky Mountains in Las Animas County, Colorado, and flows 900 miles eastward across the Great Plains before merging with the Arkansas River in eastern Oklahoma. In the Texas Panhandle and western Oklahoma, the Canadian River flows through a deep, incised valley generally unsuitable for cultivation, and harbors one of the few remaining intact large river floodplain systems in the region.

Although groundwater withdrawal, damming, and saltcedar infestation have effectively de-watered the river west of the 100th meridian, many reaches in Oklahoma have semi-permanent flow, and high-quality aquatic and riparian communities persist. Mixed-grass and tallgrass prairie associations are found on the steep breaks and valleys, while various marshes and riparian woodlands occur along the riverbanks. The Canadian River supports one of the only remaining populations of the federally listed Arkansas River shiner. Several nesting colonies of the endangered interior least tern are known from the area.

The combination of reduced peak flows and expansion of woody vegetation (saltcedar) effectively stabilize the banks of the once wide, meandering river. The large scouring flood events that shaped the system occur only rarely; remaining flows are increasingly confined to a relatively deep, narrow channel. Eastern redcedar is rapidly invading cottonwood gallery forests and upland areas throughout the length of the site.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Threats include: groundwater withdrawal, dams, invasive species (saltcedar, eastern redcedar), and altered fire regime. A site visit during the planning process identified the following threats: incompatible crop production practices, incompatible grazing practices, incompatible oil/gas drilling, fire suppression, invasive salt cedar and plume grass (Erianthus ravennae).

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 56,315 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	56,315	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Large and Medium River Floodplain System (SYSTEM0003)	1	6	17%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Terrestrial Ecological Systems	Number THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1
• Sandsage Shrubland System (SYSTEM0009)	1

Community Associations	Number THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1
• Sand Sage / Sand Dropseed Shrubland (CEGL002179)	1

- Southern Great Plains Cattail - Bulrush Marsh (CEGL002032) 1
- Southern Great Plains Cordgrass Wet Prairie (CEGL002223) 1
- Western Gypsum And Redbed Clay Prairie (CEGL002252) 1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Sand Prairie System (SYSTEM0002)	1
• Sandsage Shrubland System (SYSTEM0009)	1

Black Kettle

Site Number: 52
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Black Kettle conservation area is composed of a series of untilled prairie fragments in the Washita River drainage of west-central Oklahoma.

The western edge of the site marks the boundary with the Southern Shortgrass Prairie ecoregion, and a distinct ecotone may be observed along much of its length. The erosional front of the Ogallala formation occurs as a crescent-shaped feature straddling the Washita River; the coarse water-bearing sands abruptly give way to relatively dry, non-porous Permian redbed shales to the east. A marked difference in plant communities parallels the shift in soils; shinnery oak shrublands, sand sage shrublands, and little bluestem prairie communities grade into various blue grama and buffalograss associations from west to east. A number of small spring-fed streams emerge along the base of the Ogallala, supporting a diversity of riparian communities and small patch woodland associations.

The Black Kettle National Grassland was established in the 1930's Dust Bowl as an effort to return badly eroded croplands to native grass cover. Currently, scattered parcels of restored prairie and native rangeland totaling 32,000 acres are managed for livestock production, recreation, and wildlife. The Black Kettle National Grassland, which holds scattered parcels within this site, does burn their prairies. They eradicated prairie dogs in the 1950s, but would like them back now.

The spread of invasive and exotic species has the potential to seriously affect the native prairie and shrublands of the area. Eastern redcedar has become increasingly abundant in the last decade, and various woody plants have begun to spread outwards from plantings and stream bottoms, especially in the southern and western parts of the site. Scotch thistle, a noxious weed, has become established in the area, and threatens to completely out-compete the native prairie vegetation in some locations.

Current/future TNC strategies at site:
Initiate a private/public lands prescribed fire cooperative with NRCS, Oklahoma State University, and Black Kettle National Grassland. Secure conservation easements on remaining large ranch properties. Work with Oklahoma Natural Areas Registry program to identify & protect unique natural features and high-quality communities.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Threats include: nvasive species (eastern redcedar, scotch thistle), altered fire regime, habitat fragmentation, and improper livestock grazing. Visits to site during planning process identified: incompatible crop production practices, incompatible grazing practices, incompatible oil/gas drilling, dam construction, channelization of rivers or streams,and fire suppression.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 321,160 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	315,744	98.31%
• FEDERAL	5,416	1.69%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%
• Southern Great Plains Shin Oak Shrubland System (SYSTEM0005)	1	1	100%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Texas Garter Snake (ARADB36131)	1	1	100%
• Texas Horned Lizard (ARACF12010)	1	1	100%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Central Green Ash - Elm - Hackberry Forest (CEGL002014)	1
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Eastern Cottonwood / Black Willow Woodland (CEGL004919)	1
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1
• Havard Shin Oak - Little Bluestem Shrubland (CEGL002171)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1
• Sand Sage / Sand Dropseed Shrubland (CEGL002179)	1
• Sand Sagebrush / Little Bluestem Shrubland (CEGL002178)	1
• Western Gypsum And Redbed Clay Prairie (CEGL002252)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Loggerhead Shrike (ABPBR01030)	1
• Prairie Dog Towns (OTHER00003)	1

Washita National Wildlife Refuge

Site Number: 53
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

This refuge, located at the upper end of Foss Reservoir along the Washita River, protects a wintering area for large numbers of Canada geese and other waterfowl.

KNOWN THREATS:

Site visits during the planning process identified the following threats: incompatible crop production practices, incompatible operation of drainage or diversion systems, fire suppression, management for huntable wildlife over non-game, managmenet with herbicide for invasive species, invasive blackspot horn poppy (Glaucium corniculatum), salt cedar (Tamarix ramosissima) and Johnson grass (Sorghum halepence). Current manager seems intelligent and well schooled in conservation practices. Refuge is not grazed but surrounding areas are well-utilized.

Systematic GIS threat assessment rank (see Appendix 6 for more information): High (note: review by planning team didn't consider this site highly threatened because most of the site is under federal ownership and is well managed)

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 12,479 acres

Ownership Composition	Acres Owned	Percent of Site
• FEDERAL	8,210	65.79%
• PRIVATE	4,269	34.21%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Migratory Water Bird Areas (OTHER00001)	1	12	8%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Large and Medium River Floodplain System (SYSTEM0003)	1
• Mixed-grass Prairie System (SYSTEM0001)	1
• Sand Prairie System (SYSTEM0002)	1

Elm Fork Breaks

Site Number: 54
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Elm Fork Breaks, known locally as "the Breaks", encompass a large tract of rough broken land in the upper Red River basin of southwestern Oklahoma & the southeast Texas Panhandle. Soils consist of thin Permian shales, intermingled & capped with layers of gypsum and dolomitic limestone. Steep mesas and buttes occur as erosional features on the surface of the landscape, appearing as a series of ledges or steps.

The Breaks represent the only example of the mesquite shrublands ecological system in the Central Mixed-Grass Prairie ecoregion. Similar in appearance to locations further south and west in Texas, the landscape is dominated by mesquite and redberry juniper shrubland associations, with scattered areas of open grassland. Fine sediments and salt flats along major stream courses support various marsh and riparian woodland communities, with small patches of shinnery oak and sand sage shrubland in the alluvial sands along the Salt Fork of the Red River.

Both mesquite and redberry juniper have increased in density over the past century in response to land use practices. Additionally, many thousands of acres of open mesquite "savannah" have been "converted" to impenetrable thickets by control attempts with herbicide in the last few decades. The practice of indiscriminant aerial application of herbicides also negatively impacts the diverse cacti and forb communities of the area.

Although there is some question as to the distribution and abundance of mesquite in parts of Oklahoma before late 19th century, it does appear that mesquite shrublands were found in this portion of the state prior to the Texas cattle drives and later settlement. Colonel Randolph B. Marcy noted the presence of "an extensive tract of mezquite woodland" in the upper Red River basin of Oklahoma in an 1852 expedition, and described vast areas of "mezquite" resembling a "peach orchard" in the adjacent southeast Texas Panhandle. General Land Office surveys of Harmon Co. Oklahoma in 1871 note the presence of large areas of "mesquite brush prairie" near the Salt Fork of the Red River. Available information suggests that the once isolated stands of mesquite expanded and coalesced in recent times in response to fire suppression and seed dispersal by grazing animals.

Several large gypsum dissolution caves underlie the eastern portion of the Breaks. A proposed dam along the Salt Fork of the Red River near Mangum threatens to flood the ecologically significant Reed Bat Cave, which houses a large maternity colony of Mexican free-tailed bats.

Current/future TNC strategies at site:
Facilitate the formation of cooperative land management working groups with government agencies, private ranches, and research universities to develop and implement ecologically beneficial mesquite & redberry juniper control programs. Work with Sandy Sanders WMA to ensure management for biodiversity. Monitor proposed dam locations, assist in site placement away from important cave systems.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Threats include: invasive species (mesquite, redberry juniper, Bromus spp.), herbicide application, altered fire regime, dams, improper livestock grazing, harvest/collecting (Echinocereous spp.), and mining (gypsum). A site visit during the planning process identified the following threats: incompatible crop production practices, incompatible grazing practices, incompatible mining for gypsum and salt, incompatible oil or gas drilling, excessive groundwater withdrawl, fire suppresion, and spraying of mesquite which could impact forbs.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 584,562 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	567,902	97.15%
• STATE	16,660	2.85%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sand Prairie System (SYSTEM0002)	1	14	7%
• Southern Great Plains Mesquite Shrubland System (SYSTEM0004)	1	2	50%
Community Associations	Number THIS Area	Number ALL Areas	Percent THIS Area
• Pinchot Juniper / Sideoats Grama - Hairy Grama Woodland (CEGL004940)	1	1	100%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Bat Caves (OTHER00002)	2	9	22%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Terrestrial Ecological Systems	Number THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1
• Sandsage Shrubland System (SYSTEM0009)	1
Community Associations	Number THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1
• Havard Shin Oak - Little Bluestem Shrubland (CEGL002171)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	1
• Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	1
• Sand Sage / Sand Dropseed Shrubland (CEGL002179)	1
• Western Gypsum And Redbed Clay Prairie (CEGL002252)	1
Animals	Number THIS Area
• Prairie Dog Towns (OTHER00003)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Texas Horned Lizard (ARACF12010)	1

Quartz Mountain State Park

Site Number: 55
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The isolated granite hills at the western terminus of the Wichita Mountains harbor the world's only known occurrences of long-hair phlox. The plants are observed in open live oak woodlands near the bases of Quartz Mountain, King Mountain, and other peaks in and around Quartz Mountain State Park.

Current/future TNC strategies at site:
Work with Quartz Mountain State Park to prevent trampling and collection of plants; assist Oklahoma Natural Areas Registry Program in identification and protection of occurrences on private lands.

KNOWN THREATS:

Threats include harvest/collecting, recreation, and altered fire regime. Site visits during the planning process identified the following threats: incompatible mining practices (quarry operation), fire suppression. The granite hills themselves seem fairly impervious to road building or development. The surrounding area is intensively farmed. The state park has recently built an elaborite arts and conference center. This will greatly increase visitorship. Adjacent development could affect water quality of the lakes.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Medium

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 10,291 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	6,917	67.21%
• FEDERAL	3,374	32.79%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Long-hair Phlox (PDPLM0D160)	1	1	100%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Post Oak - Blackjack Oak Cross Timbers Woodland (CEGL002147)	1
• Western Gypsum And Redbed Clay Prairie (CEGL002252)	1
• Western Tallgrass Bur Oak Woodland (CEGL002053)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Bald Eagle (ABNKC10010)	1
• Scissor-tailed Flycatcher (ABPAE52100)	1

Wichita Mountains

Site Number: 56
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

The Wichita Mountains form a unique ecological system in southwestern Oklahoma. The ancient, rounded mountains consist mainly of granite, rhyolite, and other igneous rocks uplifted during the Cambrian Period. Several peaks reach over 2,400 feet above sea level, with relief of near 1,000 feet above the surrounding plains and valleys. Gentler slopes and valleys between the mountains have developed soils that support a mosaic of prairie and woodland communities, predominantly mixed-grass prairie interspersed with patches of post oak - blackjack oak forest. REA indicated that the dominant community type of this area is crosstimbers oak woodland system, a type that is peripheral to ecoregion and not a target. A number of plant and animal species reach the western limit of their range here, and "relict" populations of both eastern and western trees can be found scattered throughout the range. The 59,000 acre Wichita Mountains National Wildlife Refuge, established as a national forest in 1905, encompasses the greater part of the mountain system. Bison were reintroduced in 1910, followed by elk, and a small herd of Texas longhorn cattle. The refuge has an active prescribed fire program, and is one of the oldest continuously managed federal properties in the U.S. The mountains extend southeast over the 94,000 acre Fort Sill Military Reservation, and north and west across private lands. Scrub oak woodlands in the central part of the refuge are home to a thriving population of the endangered black-capped vireo.

The Wichita Mountains proper are flanked on the northeast by the Slick Hills, a series of folded and steeply dipping limestones deposited subsequent to the formation of the granite mountains. The hills are vegetated by various mixed-grass prairie communities, with tallgrass and woodland associations occurring in the valleys. The area is composed mostly of large private ranches.

Current/future TNC strategies at site:
Pursue ecological assessment partnership with Ft. Sill Military Reservation through National Cooperative Agreement with the Department of Defense. Work with U.S. Fish and Wildlife Service to develop/implement ecological management activities on surrounding private lands. Acquire conservation easements on private lands in the Slick Hills area susceptible to commercial & residential development.

See Loring et. al. 2000 for more information about Rapid Ecological Assessment (REA) conducted in this area.

KNOWN THREATS:

Threats include: altered fire regime, windpower development, residential development, improper livestock grazing, invasive species (eastern redcedar, sericea), recreation, and mining (granite, limestone). Site visits during the planning process indicated the following threats: incompatible crop production practices, incompatible grazing practices, incompatible second hom/resort development, conversion to agriculture, marina development, incompatible mining of limestone/granite rock and gravel, fire suppresion. The management practices of Fort Sill, which occupies a large part of this site, are unknown.

Systematic GIS threat assessment rank (see Appendix 6 for more information): Low

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 296,284 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	201,703	68.08%
• FEDERAL	94,489	31.89%
• STATE	92	0.03%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Terrestrial Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1	11	9%
• Southern Great Plains Mesquite Shrubland System (SYSTEM0004)	1	2	50%

Plants	Number THIS Area	Number ALL Areas	Percent THIS Area
• Hall's Bulrush (PMCYP0Q0R0)	1	7	14%
• Oklahoma Beardtongue (PDSCR1L4B0)	1	1	100%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Black-capped Vireo (ABPBW01120)	1	2	50%
• Whooping Crane (ABNMK01030)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Community Associations	Number THIS Area
• Central Great Plains Little Bluestem Prairie (CEGL002246)	1
• Cottonwood - Green Ash Floodplain Forest (CEGL000658)	1
• Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	1
• Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	1
• Nuttall's Stonecrop - Peruvian Spikemoss Granitic Outcrop Sparse Vegetation (CEGL004396)	1
• Oklahoma Blackjack Oak / Little Bluestem Woodland (CEGL004938)	1
• Plateau Live Oak - (Post Oak) / Little Bluestem Granite Woodland (CEGL004937)	1
• Post Oak - Blackjack Oak Cross Timbers Woodland (CEGL002147)	1
• Western Gypsum And Redbed Clay Prairie (CEGL002252)	1
• Western Tallgrass Bur Oak Woodland (CEGL002053)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Texas Horned Lizard (ARACF12010)	1

Hackberry Flat

Site Number: 57
State: OK
Site Type: Terrestrial

DESCRIPTION OF THIS AREA:

Hackberry flat is an isolated wetland complex near the Red River in southwestern Oklahoma. Drained and modified by settlers in the early 20th century, the Oklahoma Department of Wildlife Conservation completed the purchase and restoration of the system in the 1990s. Many thousands of waterfowl and shorebirds can be found at the flats during spring and fall migrations.

KNOWN THREATS:

Site visit during the planning proces identified the following threats: incompatible crop production practices, invasion of Johnson grass and Tamarisk. She noted: the restored wetland appears to provide excellent habitat for migratory water birds, unfortunately, it is surrounded by intensive agriculture, a possible source of runoff containing herbicides, pesticides, and eroded soil. A buffer of native grassland might be advantageou. A valuable restoration on the Red River floodplain.

Systematic GIS threat assessment rank (see Appendix 6 for more information): High (note: review by planning team didn't consider this site highly threatened because most of the site is under federal ownership and is well managed; also site is a restoration area)

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 6,678 acres

Ownership Composition	Acres Owned	Percent of Site
• STATE	6,641	99.45%
• PRIVATE	37	0.55%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Migratory Water Bird Areas (OTHER00001)	1	12	8%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Terrestrial Ecological Systems	Number THIS Area
• Mixed-grass Prairie System (SYSTEM0001)	1

Animals	Number THIS Area
• Loggerhead Shrike (ABPBR01030)	1

Leander Creek Watershed

Site Number: 62
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

KNOWN THREATS:

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 199,286 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	199,286	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	1	24	4%

Fairfield Creek Watershed

Site Number: 63
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

KNOWN THREATS:

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 103,482 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	103,482	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	1	24	4%

Niobrara River

Site Number: 64
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Nice representative great plains river. Drew site east to confluence. Eastern part is a wild and scenic river. Groundwater dominated. Fish community includes: sand shiners, bignose shiners, carp suckers, brassy minnows, top minnows, darter species (including iowa johnny), quill back, carp suckers and shorthead redhorses.

Site includes Pine Creek, Leander Creek and Fairfield Creek. These tributaries were included because they contain good examples of a sandhills headwater community. However, the streams are highly degraded and it is likely that fish are not moving between sites.

KNOWN THREATS:

Threats include: purple loostrife, incompatible second home development, and road development. Threats to Pine Creek, Leander Creek and Fairfield Creek: invasive salmonids, dam construction, ditch cleaning

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 710 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	4	24	17%
• Sandhills Aquatic System 4-2 (SYSTEM0182)	1	1	100%
• Sandhills Aquatic System 5-1 (SYSTEM0109)	2	3	67%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Flathead Chub (AFCJB57010)	1	6	17%
• Headwater Fish Assemblage (OTHER0007)	1	3	33%
• Sandhills Headwater Stream Community (OTHER0010)	3	11	27%

Evergreen Creek - Cedar Creek

Site Number: 65
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Included because contains a good example of a sandhills headwater community. This stream is highly degraded and it is likely that fish are not moving between sites.

KNOWN THREATS:

Salmonids are invasive here. Dam construction. Cleaning out of ditches.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 84 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 5-1 (SYSTEM0109)	1	3	33%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Sandhills Headwater Stream Community (OTHER0010)	1	11	9%

Evergreen Creek - Cedar Creek Waters

Site Number: 66
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 297,653 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	297,653	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	1	24	4%
• Sandhills Aquatic System 2-1 (SYSTEM0102)	2	9	22%

Upper Snake River

Site Number: 67
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Only including the upper reaches in this stie because lower reach is dammed for a reservoir and stocked with non-native fish. Very beautiful stream with waterfalls. Needs more inventory for invertebrates. Fish community is representative of sandhills streams and includes: brassy minnow, sand shiner, topminnow, bigmouth shiner, stonerollers, and longnose dace.

KNOWN THREATS:

Channelization, water diversion is possible, very little agricultural production, half dozen large landowners. Trout, sunfish exotics from ponds.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 46 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Headwater Stream Community (OTHER0010)	1	11	9%

Bone-Sand Draw Creeks

Site Number: 68
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 44 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Snake River Watershed

Site Number: 69
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 641,536 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	641,536	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	1	24	4%
• Sandhills Aquatic System 2-1 (SYSTEM0102)	1	9	11%

Sand Draw Creek Watershed

Site Number: 70
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Includes Skull Creek (Rock County NE, Calumus River)

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 317,018 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	317,018	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	2	24	8%
• Sandhills Aquatic System 2-1 (SYSTEM0102)	1	9	11%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Headwater Fish Assemblage (OTHER0007)	1	3	33%

Elkhorn River

Site Number: 71
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

In upper reaches, behavior is allowed to be natural because flows through meadows and not manipulated for water. A lot of ducks use this river. Groundwater fed.

KNOWN THREATS:

Livestock grazing, crops, municipal wastewater, dams, some stabilization on lower part. There is a housing development just outside town of Norfork (just at eastern edge of ecoregion).

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 329 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	1	24	4%
• Sandhills Aquatic System 4-1 (SYSTEM0108)	1	5	20%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Big River Fish Assemblage (OTHER0009)	1	5	20%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• Cylindrical Papershell (IMBIV05010)	2

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Flathead Chub (AFCJB57010)	1

Elkhorn River Watershed

Site Number: 72
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 662,493 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	662,493	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	2	24	8%
• Sandhills Aquatic System 2-1 (SYSTEM0102)	1	9	11%
• Sandhills Aquatic System 3-1 (SYSTEM0105)	1	4	25%

North Loop River Watershed

Site Number: 73
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 1,131,597 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	1,131,597	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	3	24	13%
• Sandhills Aquatic System 2-1 (SYSTEM0102)	1	9	11%
• Sandhills Aquatic System 3-1 (SYSTEM0105)	1	4	25%

North Loop River and Tributaries

Site Number: 74
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Natural range of conditions still exist here. The bank is well stabalized with grass and there are very stable flows. Dominant ecological processes include groundwater inflow, shifting sand in mainste, and flooding over meadows at upper parts during snow melt and high rain events. The site wasn't drawn all the way to the main stem of the Loup River because of intensive agriculture. Site only drawn to include high quality areas.

KNOWN THREATS:

Incompatible crop production practices are not extensive now, but could be in future. Cleaning of ditches and diversion systems is a problem. Drainage systems for hay. Potential for shoreline stabilization. Very light home development, golf course development. Stocking trout. Overgrazing. Incompatible grazing practices. Conversion to agriculture. Channilization of streams. Livestock feedlots. Fire suppression.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 499 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 4-1 (SYSTEM0108)	1	5	20%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Flathead Chub (AFCJB57010)	1	6	17%
• Plains Minnow (AFCJB16050)	1	12	8%
• Sandhills Headwater Stream Community (OTHER0010)	5	11	45%
• Western Silvery Minnow (AFCJB16010)	1	8	13%

Dismal River - Middle Loup Watershed

Site Number: 75
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 1,368,804 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	1,368,804	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	2	24	8%
• Sandhills Aquatic System 2-1 (SYSTEM0102)	1	9	11%
• Sandhills Aquatic System 3-1 (SYSTEM0105)	1	4	25%

Upper Cedar River Watershed

Site Number: 76
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 446,476 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	446,476	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	2	24	8%
• Sandhills Aquatic System 2-1 (SYSTEM0102)	1	9	11%
• Sandhills Aquatic System 3-1 (SYSTEM0105)	1	4	25%

Cedar River

Site Number: 77
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Floodplain vegetation community includes cedars, cottonwoods and box elders. Fens in headwaters. Upper stretch fish community unknown. Upper part is groundwater dominated. Lower part has mixed hydrologic inputs.

KNOWN THREATS:

Point and non-point pollution from municipalities and animal confinements. Shoreline stabilization.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 259 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 4-1 (SYSTEM0108)	1	5	20%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Flathead Chub (AFCJB57010)	1	6	17%
• Plains Minnow (AFCJB16050)	1	12	8%
• Western Silvery Minnow (AFCJB16010)	1	8	13%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• Big River Fish Assemblage (OTHER0009)	1

Unnamed Sandhills Watershed Site A

Site Number: 78
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 73,337 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	73,337	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 3-2 (SYSTEM0106)	1	5	20%

Dismal River - Middle Loup River

Site Number: 79
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Groundwater dominated (not included with South Loup site because that river is surface water dominated). Classic large, sandy stream fish community includes: flathead chub, carp suckers, silvery minnow, plains minnow. Plains topminnow found in springs.

KNOWN THREATS:

Incompatible management of/for certain species(trout stocking) in Upper Dismal. Invasives from pond building. Same threats as North Loup site.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 349 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 4-1 (SYSTEM0108)	1	5	20%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Flathead Chub (AFCJB57010)	1	6	17%
• Plains Killifish (AFCNB04210)	1	8	13%
• Plains Minnow (AFCJB16050)	1	12	8%
• Sandhills Headwater Stream Community (OTHER0010)	1	11	9%
• Western Silvery Minnow (AFCJB16010)	1	8	13%

Lower Cedar River Watershed

Site Number: 80
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 87,550 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	87,550	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 3-2 (SYSTEM0106)	2	5	40%

South Loup River Watershed

Site Number: 81
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 419,547 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	419,547	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 1-1 (SYSTEM0100)	4	24	17%
• Sandhills Aquatic System 2-1 (SYSTEM0102)	1	9	11%
• Sandhills Aquatic System 3-2 (SYSTEM0106)	2	5	40%

Loup River

Site Number: 82
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

90-95% of water diverted at Cenoa - dumps water into Platte below the confluence for power generation. Sand bars in mainstem. Good base flow from tributaries. Shorthead redhorse. Quillback carpsucker

KNOWN THREATS:

shoreline stabilization, water withdrawl, point/nonpoint pollution problems.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 188 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 5-2 (SYSTEM0110)	1	3	33%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Big River Fish Assemblage (OTHER0009)	1	5	20%
• Flathead Chub (AFCJB57010)	1	6	17%
• Plains Minnow (AFCJB16050)	1	12	8%
• Western Silvery Minnow (AFCJB16010)	1	8	13%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• Shovelnose Sturgeon (AFCAA02020)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Cylindrical Papershell (IMBIV05010)	1

South Loup River

Site Number: 83
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Surface water dominated. (This section of the Loup was not included with the Middle Loup/Dismal site because that is groundwater dominated.) More agriculture here. Lots of center pivot irrication.

Midium river in main stem. Fish community includes sand shiners, bigmouth shiners (more common), carp suckers.

KNOWN THREATS:

Threats same as other large rivers systems. Non point and point source pollution includes municipal facilities and feed lots.) Dairy operations.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 200 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 4-1 (SYSTEM0108)	1	5	20%
• Sandhills Aquatic System 5-2 (SYSTEM0110)	1	3	33%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Flathead Chub (AFCJB57010)	1	6	17%
• Plains Minnow (AFCJB16050)	1	12	8%
• Western Silvery Minnow (AFCJB16010)	1	8	13%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Plains Killifish (AFCNB04210)	1

Platte River

Site Number: 84
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

This aquatic site includes the Platte River below the J2 dam to the confluence with the Loup (outside the ecoregion). It becomes a mighty river with big fish assemblages at this point outside the ecoregion - a much different river than what flows through the ecoregion. Hydrology is dominated by snowmelt. 70% of presettlement flow is now diverted to agriculture. Historically was dominated by Rocky Mountain melt, but because of recent irrigation, now dominated by sandhills melt. This is a braided river system.

KNOWN THREATS:

Hydrologic alteration, dams, water withdrawls, livestock, woody vegetation (significant evaportranpiration), sand and gravel mining, center pivots. Nutrient loading caused by E. coli from livestock and municipalities (preliminatry TMDL work has been done).

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 438 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Sandhills Aquatic System 5-2 (SYSTEM0110)	1	3	33%
Plants	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Western Prairie Fringed Orchid (PMORC1Y0S0)	1	3	33%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Big River Fish Assemblage (OTHER0009)	2	5	40%
• Plains Killifish (AFCNB04210)	2	8	25%
• Plains Minnow (AFCJB16050)	2	12	17%
• Western Silvery Minnow (AFCJB16010)	2	8	25%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• A Crayfish (ICMAL11240)	1
• A Sand-Filtering Mayfly (IIEPH03030)	1
• Cylindrical Papershell (IMBIV05010)	1
• Platte River Caddisfly (NOCODE0001)	1
• Sandy Plains Stream Mussel Assemblage (OTHER0004)	1
• Spring Fish Assemblage (OTHER0008)	2

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Flathead Chub (AFCJB57010)	1
• Shovelnose Sturgeon (AFCAA02020)	2

Little Blue River

Site Number: 85
State: NE
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

This site is mostly outside ecoregion, but was included in this portfolio so that the significant aspects are remembered for future planning efforts with neighboring ecoregion.

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 35 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Big River Fish Assemblage (OTHER0009)	1	5	20%
• Plains Killifish (AFCNB04210)	1	8	13%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Plains Minnow (AFCJB16050)	1
• Western Silvery Minnow (AFCJB16010)	1

Republican River

Site Number: 86
State: NE/KS
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Very modified landscape. Highly altered flow regime. Sometimes no water leaves NE. Bank degredation. Don't think main stem of Republican has viable habitat for mussels. Loose sand. Good macroinvertebrate community in KS. Thin woody riparian cooridor, row crop on either side. Archaelogical middens with huge array of snails and mussels. Used to have big river mussel species in abundance. Corps of Engineers operates Harlan Reservoir. Big river fish and plains killifish here. Turbid river adapted fish species are in Beaver Creek and Sappa Creek.

Kansas Biological Survey questions the inclusion of this river in the portfolio. Impacts and alterations are severe; highly altered hydrology and reduced aquatic fauna. However, the planning team decided to include it in the final portfolio because it is one of the major rivers in the region and there were few other aquatic sites available in this part of the region to choose from.

KNOWN THREATS:

Many dams on Republican are Bureau of Reclamation and are operated for irrigation. Failed hog confinement lagoons. Clay Center - bad track record. Invasives include corbicula and reservoir fish. Incompatible crop production practices. Channelization of rivers or streams. Incompatible operation of drainage or diversion systems. Incompatible wastewater treamtnet (Concordia).

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 361 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Smoky Hills Aquatic System 5-1 (SYSTEM0185)	1	1	100%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• A Sand-Filtering Mayfly (IIEPH03030)	1	1	100%
• Plains Killifish (AFCNB04210)	1	8	13%
• Plains Minnow (AFCJB16050)	2	12	17%
• Shovelnose Sturgeon (AFCAA02020)	1	1	100%
• Western Silvery Minnow (AFCJB16010)	1	8	13%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• A Crayfish (ICMAL11240)	1
• Gill-breathing Snails (OTHER0006)	1

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Big River Fish Assemblage (OTHER0009)	1
• Cylindrical Papershell (IMBIV05010)	1
• Plains Minnow (AFCJB16050)	1
• Western Silvery Minnow (AFCJB16010)	1

North Fork of the Ninnescah River Wat

Site Number: 87
State: KS
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 369,733 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	369,733	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-6 (SYSTEM0146)	2	5	40%
• Arkansas River East Aquatic System 2-12 (SYSTEM0149)	1	3	33%
• Arkansas River East Aquatic System 2-13 (SYSTEM0150)	1	8	13%
• Arkansas River East Aquatic System 3-1 (SYSTEM0152)	1	2	50%

North Fork of Ninnescah River

Site Number: 88
State: KS
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Sandy, braided channel. Riparian wetlands in spots. Spring fed. Grassland right to steam, young cottonwood forest. Plains killifish. Has white perch. Very good viability of arkansas darter. Area of restoraion. Have been fencing out cattle with a local initiative. Good wetland riparian communities. Corbicula throughout. Made least impacted stream list. Site could be linked to South Fork.

KNOWN THREATS:

All streams around Wichita are threatened. Dam is downstream - barrier and provides opportunity for exotics to migrate up (ex. white perch). Agriculture - water withdrawl and grazing. Potentiall biocides. Dam = fragmentation. Loss of riparian wetlands has changed stream channel. Lost 2/5 of mussel species in Nihniscah basin. Incompatible crop production and grazing practices. Incompatible development of roads or utilities. Incompatible operation of diversion systems, excessive groundwater withdrawl. Some livestock feedlots.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 174 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 4-1 (SYSTEM0156)	1	3	33%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Arkansas Darter (AFCQC02170)	2	7	29%

Smoots Creek Watershed

Site Number: 89
State: KS
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 99,788 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	99,788	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-6 (SYSTEM0146)	1	5	20%
• Arkansas River East Aquatic System 2-12 (SYSTEM0149)	1	3	33%
• Arkansas River East Aquatic System 3-2 (SYSTEM0153)	1	2	50%

South Fork of the Ninnescah River Wat

Site Number: 90
State: KS
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 160,233 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	160,233	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-1 (SYSTEM0144)	1	4	25%
• Arkansas River East Aquatic System 2-41 (SYSTEM0151)	1	2	50%
• Arkansas River East Aquatic System 3-2 (SYSTEM0153)	1	2	50%

South Fork of Ninnescah River

Site Number: 91
State: KS
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Sandy, braided River. Derives from sandhills, limited topographic relief. 300 acre natural area maintained by Wichita State (Dan Distler would know landowners). Plains killifish and southern redbelly dace here. Site could be linked to North Fork. Water quality is lower in North Fork.

KNOWN THREATS:

Low head dams. Invasion of white perch and corbicula. Fish hatchery causes water withdrawl and invasives. Sand pit mining. Incompatible crop production and grazing practices. Incompatible development of roads or utilities. Incompatible operation of diversion systems. Excessive groundwater withdrawl. Livestock feedlot. Incompatible wastewater treatment. Fire suppression caused change in riparian community.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 169 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 4-1 (SYSTEM0156)	1	3	33%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas Darter (AFCQC02170)	1	7	14%
• Plains Minnow (AFCJB16050)	1	12	8%

Chikaskia River Watershed

Site Number: 92
State: KS
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 85,624 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	85,624	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-6 (SYSTEM0146)	2	5	40%
• Arkansas River East Aquatic System 2-12 (SYSTEM0149)	1	3	33%
• Arkansas River East Aquatic System 3-1 (SYSTEM0152)	1	2	50%

Medicine Lodge River and Tributaries

Site Number: 93
State: NE/KS
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

This site inlcudes tributaries to Medicine Lodge, including Elm Creek. Downstream boundary of this site is uncertain, its degrated outside terrestrial site number 56, characteristics differ - out of grassland into flats, more cropland and agriculture. This is a distict type in the Red Hills (also called southwest tablelands). Fine sand substrate. High mineral content. No unionids. More relief than is typical. Good dependable flow. Springs out of westlands have interesting macroinvertebrates. Elm Creek has savannah type conditions. This aquatic site is partially included in the Red Hills terrestrial site. Has naturally high TDS, should influence community. Natural depauperate.

KNOWN THREATS:

Municipal wastewater treatment in Medicine Lodge is a low threat. Reservoirs have been proposed for boating and fishing. Invasion of tamarisk is low now but may be coming. Also incompatible grazing practices.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 153 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-1 (SYSTEM0144)	3	4	75%
• Arkansas River East Aquatic System 2-41 (SYSTEM0151)	1	2	50%
• Arkansas River East Aquatic System 4-92 (SYSTEM0158)	1	1	100%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas Darter (AFCQC02170)	1	7	14%
• Plains Minnow (AFCJB16050)	1	12	8%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• Cylindrical Papershell (IMBIV05010)	1

Chikaskia River

Site Number: 94
State: KS/OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Consistently rated one of the top streams in Kansas for intactness and aquatic integrity. One of top five streams in state for macroinvertebrates and pollution metrics. Flows over red clay, low chloride levels (highly variable in minerals in this part of state). Fish community includes eastern species (don't find in other streams in state), bluntface shiner, ghost shiner, freckled madtom, plains killisfish. Richest of plains streams for unionid mussels (historically 20+ species, now 12 or so). Arkansas darter found in larger habitat of mainstem. Mainstem is free flowing. Some water withdrawl in headwaters, now restricted. Prime wheat producing counties, but has good riparian buffers (grassy and woody). Privately owned wildlife refuges along river. Highest fish value. NPS outstanding, remarkable, best of southern plains. At the time of the planning process, the team could not conclude how far to extend the downstream boundary for this site - should eventually follow-up with someone more knowledgeable about this site.

KNOWN THREATS:

The river is freeflowing until Blackwell OK (2000 sq. mile basin). City of Wichita is biggest threat due to the reservoir for water consumption. No Corbicula spp. (as of 1999). Arkansas darter may be artifically expanding range into this river. A dam has been proposed but is currently not under consideration. Other threats are incompatible crop production practices, channilization, and incompatible operation of diversion systems.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 179 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 4-1 (SYSTEM0156)	1	3	33%
• Arkansas River East Aquatic System 5-2 (SYSTEM0159)	1	1	100%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas Darter (AFCQC02170)	1	7	14%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• A Sand-Filtering Mayfly (IIEPH03030)	1

Mustang Creek Watershed

Site Number: 95
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 7,836 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	7,836	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	1	11	9%

Red Creek Watershed

Site Number: 96
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 5,615 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	5,615	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	1	11	9%

Yellowstone Creek Watershed

Site Number: 97
State: OK/KS
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 40,905 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	40,905	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 2-13 (SYSTEM0150)	1	8	13%

Sand Creek Watershed

Site Number: 98
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 24,693 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	24,693	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	1	11	9%
• Arkansas River East Aquatic System 2-13 (SYSTEM0150)	1	8	13%

West Moccasin Creek Watershed

Site Number: 99
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 21,223 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	21,223	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	1	11	9%
• Arkansas River East Aquatic System 2-13 (SYSTEM0150)	1	8	13%

Cimarron River

Site Number: 100
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

This river is ephemeral. Salt springs along the river have marine diatoms. The salt flats along the river support ground nesting birds. The river is naturally intermittent in Oklahoma -permanent flow begins at Mead County line. This river was also identified as ecoregional site in Central Shortgrass Prairie plan. The Arkansas River shiner was found at Adams Ranch (XIT ranch) in 1983. Red River shiner invades the river.

KNOWN THREATS:

Landowners are conserned with groundwater pumping because of livestock needs (groundwater depletion is a statewide concern in Oklahoma). For more information, see Cross publication on dewaterring of the Cimarron River. Salinization is due to irrigation return flow. Hog farms lead to incompatible grazing practices and to groundwater withdrawl. Fire suppression causes red cedar invasions. Red River Shiner and salt cedar are invasive species.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 119 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 4-4 (SYSTEM0157)	1	1	100%
• Arkansas River East Aquatic System 5-7 (SYSTEM0160)	1	1	100%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas Darter (AFCQC02170)	1	7	14%
• Plains Killifish (AFCNB04210)	1	8	13%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Plains Minnow (AFCJB16050)	1

Sleeping Bear Creek Watershed

Site Number: 101
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 36,572 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	36,572	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 2-13 (SYSTEM0150)	1	8	13%

Long Creek Watershed

Site Number: 102
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 114,854 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	114,854	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	2	11	18%
• Arkansas River East Aquatic System 2-13 (SYSTEM0150)	2	8	25%
• Arkansas River East Aquatic System 3-3 (SYSTEM0154)	1	1	100%

Chimney Creek Watershed

Site Number: 103
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 19,525 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	19,525	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	1	11	9%
• Arkansas River East Aquatic System 2-13 (SYSTEM0150)	1	8	13%

Indian Creek Watershed

Site Number: 104
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 50,372 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	50,372	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	1	11	9%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Spring Invertebrate Assemblage (OTHER0011)	1	4	25%

TARGET OCCURRENCES WITH QUESTIONABLE VIABILITY:

Animals	Number THIS Area
• Headwater Fish Assemblage (OTHER0007)	1

Middle Griever Creek Watershed

Site Number: 105
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 58,582 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	58,582	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	1	11	9%

Barney Creek Watershed

Site Number: 106
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 27,433 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	27,433	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	1	11	9%

Bitter Creek Watershed

Site Number: 107
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 35,718 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	35,718	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Arkansas River East Aquatic System 1-2 (SYSTEM0145)	1	11	9%

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Spring Invertebrate Assemblage (OTHER0011)	1	4	25%

Canadian River Watershed East

Site Number: 108
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 6,327 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	6,327	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Canadian River Aquatic System 1-1 (SYSTEM0161)	1	4	25%

Canadian River Watershed West

Site Number: 109
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 10,380 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	10,380	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Canadian River Aquatic System 1-1 (SYSTEM0161)	1	4	25%

Burnt Creek Watershed

Site Number: 110
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 8,037 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	8,037	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Canadian River Aquatic System 1-1 (SYSTEM0161)	1	4	25%

Deer Creek Watershed

Site Number: 111
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 28,646 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	28,646	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Canadian River Aquatic System 1-1 (SYSTEM0161)	1	4	25%

Canadian River

Site Number: 112
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Large river, part of large untilled landscape. The floodplain is part of the terrestrial site.

KNOWN THREATS:

There is a dam in the panhandle - dewaters until the OK border. Salt cedar is the major invasive. Other threats include incompatible grazing practices, incompatible operation of dam, excessive groundwater withdrawl, and livestock feedlot.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 227 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Canadian River Aquatic System 5-7 (SYSTEM0167)	1	1	100%
Animals	**Number THIS Area**	**Number ALL Areas**	**Percent THIS Area**
• Arkansas River Shiner (AFCJB28490)	1	2	50%
• Conchas Crayfish (ICMAL11110)	1	1	100%
• Plains Killifish (AFCNB04210)	1	8	13%

Unnamed Red River Watershed Site E

Site Number: 113
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 27,456 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	27,456	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	3	28	11%

Unnamed Red River Watershed Site P

Site Number: 114
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 4,955 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	4,955	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	1	28	4%

Unnamed Red River Watershed Site F

Site Number: 115
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 17,462 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	17,462	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	3	28	11%

Unnamed Red River Watershed Site D

Site Number: 116
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 21,844 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	21,844	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	2	28	7%

Unnamed Red River Watershed Site Q

Site Number: 117
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 32,930 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	32,930	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	3	28	11%

Unnmaed Red River Watershed Site B

Site Number: 118
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 336,115 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	336,115	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	10	28	36%
• Red River Aquatic System 3-223 (SYSTEM0176)	1	1	100%
• Red River Aquatic System 3-3 (SYSTEM0175)	1	2	50%

Elm Fork of the Red River Watershed

Site Number: 119
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 4,030 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	4,030	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	1	28	4%

Root Creek Watershed

Site Number: 120
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 6,348 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	6,348	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	1	28	4%

Canary Creek Watershed

Site Number: 121
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 4,672 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	4,672	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	1	28	4%

Cave Creek Watershed

Site Number: 122
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 15,448 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	15,448	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	1	28	4%

Horse Creek Watershed

Site Number: 123
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 6,551 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	6,551	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-1 (SYSTEM0168)	2	28	7%

Medicane Creek Watershed

Site Number: 124
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Cherry County NE. Tributary to Niobrara. Flows through sandhills formation, some meadow-wetland complexes, lower portion in pine and cedar forest canyon.

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 14,331 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	14,331	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Headwater Fish Assemblage (OTHER0007)	1	3	33%

Jimmy Creek Watershed

Site Number: 125
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 7,694 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	7,694	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-158 (SYSTEM0169)	1	4	25%

Deer Creek Watershed East

Site Number: 126
State: OK
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

Unknown

KNOWN THREATS:

Unknown

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 6,318 acres

Ownership Composition	Acres Owned	Percent of Site
• PRIVATE	6,318	100.00%

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 1-158 (SYSTEM0169)	1	4	25%

Upper Red River and Tributaries

Site Number: 127
State: OK/TX
Site Type: Aquatic

DESCRIPTION OF THIS AREA:

This is a very unique area - matrix vegetation composed of redberry juniper woodlands, permian shale with gypsum outcrops, caves and salt srpings, karstic topography. Species are typical of southwestern United States (ringtails, ladderback woodpeckers). This area of OK and TX did not get homesteaded so it is not as fragmented. There are large ranching operations here.

KNOWN THREATS:

There is a proposed dam on the South Fork of the Red River. Salt cedar, russian olive and corbicula are major invaders. Incompatible management, fire suppression and grazing have all contributed to the mesquite problem in this area.

SIZE OF SITE/OWNERSHIP COMPOSITION OF THIS AREA:

Total Size of Site: 701 miles

TARGET OCCURRENCES DETERMINED TO BE VIABLE:

Aquatic Ecological Systems	Number THIS Area	Number ALL Areas	Percent THIS Area
• Red River Aquatic System 4-2 (SYSTEM0177)	1	1	100%
• Red River Aquatic System 4-4 (SYSTEM0178)	1	1	100%
• Red River Aquatic System 4-92 (SYSTEM0179)	1	1	100%
• Red River Aquatic System 5-7 (SYSTEM0180)	1	1	100%
Animals	Number THIS Area	Number ALL Areas	Percent THIS Area
• Plains Killifish (AFCNB04210)	1	8	13%
• Plains Minnow (AFCJB16050)	1	12	8%
• Red River Pupfish (AFCNB02100)	4	4	100%
• Red River Shiner (AFCJB28160)	4	4	100%
• Spring Invertebrate Assemblage (OTHER0011)	2	4	50%

TARGET OCCURRENCES DETERMINED TO BE NON-VIABLE:

Animals	Number THIS Area
• Flathead Chub (AFCJB57010)	1

Appendix 5. Target Occurrences and Analysis of Conservation Goals.

In ecoregional planning, conservation goals for targets are set with the hope of ensuring long-term viability, and maintaining genetic and ecological variation. The numberic goal for each target should consider the number and distribution of occurrences needed to conserve the element within the Central Mixed-Grass Prairie. Goals should reflect the best information known about a host of ecological variables: life history characteristics, threats to occurrences, key ecological processes and disturbance regimes (The Nature Conservancy 1997, Groves et al. 2000a). Regional and range-wide conservation is a concern. Goals and sites are chosen to protect the full range of biodiversity across the ecoregion. Targets endemic to the ecoregion recieve greater emphasis than those occurring in many regions. Thus, goals for the Central Mixed-grass Prairie ecoregion are informed by the conservation work in other ecoregions within the range of the target.

Section A of this Appendix lists terrestrial targets. Section B lists aquatic targets. Systems are listed first, followed by communities, then species. Under each category of targets (i.e. systems), there is a summary for all targets, listing the conservaiton goal, how many viable occurrences were captured in the conservation areas, and the percent of the goal met by the ecoregional portfolio of conservation areas. Following this summary, is a detailed report, by target, listing the conservation areas where the target is found and the viability information for that target in that area.

There was not sufficient time during this assessment to fully evaluate all target occurrences for viability. These species are marked with a "*" in this Appendix.. In future iterations of ecoregional planning, these targets should be adequately reviewed by a group of experts for viability.

Section A: Terrestrial Targets

Terrestrial Ecological Systems

Summary Information

	Conservation Goal	# Occ in ALL Areas	#Viable Occ. in ALL Aeas	Percent of Goal Met
Dakota Sandstone Tallgrass Prairie System (SYSTEM0013)	3	5	4	133%
Large and Medium River Floodplain System (SYSTEM0003)	6	10	6	100%
Mixed-grass Prairie System (SYSTEM0001)	6	23	11	183%
Saline Sandhills Wetland System (SYSTEM0011)	6	2	2	33%
Sand Prairie System (SYSTEM0002)	6	20	14	233%
Sandhills Wetland System (SYSTEM0010)	6	8	8	133%
Sandsage Shrubland System (SYSTEM0009)	6	7	2	33%
Southern Great Plains Mesquite Shrubland System (SYSTEM0004)	6	2	2	33%
Southern Great Plains Shin Oak Shrubland System (SYSTEM0005)	6	1	1	17%

Detail Information

Dakota Sandstone Tallgrass Prairie System (SYSTEM0013)	Viability of Occurrences	#Occ. in this Area
• Coronado Hills (site 35; KS)	viable	1
• Greenhorn Limestone (site 33; KS)	non-viable	1
• North-Central Dakota Hills (site 34; KS)	viable	1
• Northern Dakota Hills (site 32; KS)	viable	1
• Southern Dakota Hills (site 36; KS)	viable	1

Large and Medium River Floodplain System (SYSTEM0003)	Viability of Occurrences	#Occ. in this Area
• Canadian River Terrestrial (site 51; OK)	viable	1
• Central Platte River (site 26; NE)	viable	1
• Great Salt Plains (site 45; OK)	non-viable	1
• Kinsley Sandhills (site 42; KS)	viable	1
• Loup River Terrestrial (site 22; NE)	viable	1
• Middle Niobrara Sandhills (site 2; NE)	viable	1
• Niobrara/Snake Confluence (site 3; NE)	viable	1
• Washita National Wildlife Refuge (site 53; OK)	non-viable	1

Mixed-grass Prairie System (SYSTEM0001)	Viability of Occurrences	#Occ. in this Area
• Black Kettle (site 52; OK)	viable	1
• Cimarron River Terrestrial (site 46; OK)	viable	1
• Coronado Hills (site 35; KS)	non-viable	1
• Glass Mountains (site 49; OK)	viable	1
• Great Salt Plains (site 45; OK)	non-viable	1
• Greenhorn Limestone (site 33; KS)	viable	1
• Hackberry Flat (site 57; OK)	non-viable	1
• Loup River/Loess Hills (site 25; NE)	viable	1
• Lower Cimarron (site 48; OK)	viable	1
• North Solomon Breaks (site 30; KS)	viable	1
• North-Central Dakota Hills (site 34; KS)	non-viable	1
• Northern Dakota Hills (site 32; KS)	non-viable	1

• Plum Creek Canyons (site 27; NE)	viable	1
• Red Hills (site 44; KS/OK)	viable	1
• Salt Creek Canyon (site 50; OK)	non-viable	1
• South Solomon Breaks (site 31; KS)	viable	1
• Southern Dakota Hills (site 36; KS)	non-viable	1
• Washita National Wildlife Refuge (site 53; OK)	non-viable	1
• Wichita Mountains (site 56; OK)	viable	1
• Woodward Co. Phlox (site 47; OK)	non-viable	1

Saline Sandhills Wetland System (SYSTEM0011)	**Viability of Occurrences**	**#Occ. in this Area**
• Quivira (site 41; KS)	viable	1
• Sandhills Alkali Lakes (site 12; NE)	viable	1

Sand Prairie System (SYSTEM0002)	**Viability of Occurrences**	**#Occ. in this Area**
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Canadian River Terrestrial (site 51; OK)	non-viable	1
• Duff Sandhills Wetlands (site 10; NE)	viable	1
• Elm Fork Breaks (site 54; OK)	viable	1
• Great Salt Plains (site 45; OK)	non-viable	1
• Hutchison Dunes (site 40; KS)	viable	1
• Kinsley Sandhills (site 42; KS)	viable	1
• Minnechaduza Creek Sandhills (site 1; NE)	viable	1
• Quivira (site 41; KS)	viable	1
• Red Hills (site 44; KS/OK)	viable	1
• Sandhills Alkali Lakes (site 12; NE)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Sandhills Upland/Wetland Complex (site 4; NE)	viable	1
• Spring Valley (site 15; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	viable	1
• Upper North Loup River (site 7; NE)	viable	1
• Washita National Wildlife Refuge (site 53; OK)	non-viable	1
• Woodward Co. Phlox (site 47; OK)	non-viable	1

Sandhills Wetland System (SYSTEM0010)	**Viability of Occurrences**	**#Occ. in this Area**
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Duff Sandhills Wetlands (site 10; NE)	viable	1
• Sandhills Alkali Lakes (site 12; NE)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Sandhills Upland/Wetland Complex (site 4; NE)	viable	1
• Spring Valley (site 15; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	viable	1
• Upper North Loup River (site 7; NE)	viable	1

Sandsage Shrubland System (SYSTEM0009)	**Viability of Occurrences**	**#Occ. in this Area**
• Canadian River Terrestrial (site 51; OK)	non-viable	1
• Kinsley Sandhills (site 42; KS)	viable	1
• Lower Cimarron (site 48; OK)	viable	1

Southern Great Plains Mesquite Shrubland System (SYSTEM0004)	Viability of Occurrences	#Occ. in this Area
• Elm Fork Breaks (site 54; OK)	viable	1
• Wichita Mountains (site 56; OK)	viable	1

Southern Great Plains Shin Oak Shrubland System (SYSTEM0005)	Viability of Occurrences	#Occ. in this Area
• Black Kettle (site 52; OK)	viable	1

Community Associations

Summary Information

	Conservation Goal	# Occ in ALL Areas	#Viable Occ. in ALL Aeas	Percent of Goal Met
Alkali Bulrush Marsh (CEGL002226)	10	3	0	0%
American Elm - (Sugarberry, Northern Hackberry) - Green Ash Forest (CEGL002090)	6	0	0	0%
Black Willow Forest (CEGL002103)	4	0	0	0%
Blue Grama - Buffalograss Shortgrass Prairie (CEGL001756)	4	4	4	100%
Blue Grama - Hairy Grama Shortgrass Prairie (CEGL001755)	4	0	0	0%
Broad-leaved Cattail Marsh (CEGL002010)	2	3	1	50%
Bulrush - Cattail - Burreed Shallow Marsh (CEGL002026)	10	49	30	300%
Central Great Plains Little Bluestem Prairie (CEGL002246)	4	20	9	225%
Central Green Ash - Elm - Hackberry Forest (CEGL002014)	4	7	2	50%
Central Tallgrass Fen (CEGL002041)	6	0	0	0%
Central Wet-mesic Tallgrass Prairie (CEGL002024)	4	19	9	225%
Chairmaker's Bulrush - Sedge species Herbaceous Vegetation (CEGL004144)	4	1	0	0%
Chinquapin Oak - Shumard Oak Ozark Forest (CEGL004602)	4	0	0	0%
Cottonwood - Green Ash Floodplain Forest (CEGL000658)	4	21	9	225%
Cottonwood - Peach-leaf Willow Floodplain Woodland (CEGL000659)	4	6	3	75%
Cottonwood - Sycamore Forest (CEGL002095)	4	0	0	0%
Dakota Sandstone Tallgrass Prairie (CEGL005231)	2	5	5	250%
Dry Terrestrial Cave (CAVE000400)	4	0	0	0%
Eastern Cottonwood - American Elm - Sugarberry Forest (CEGL002096)	6	0	0	0%
Eastern Cottonwood / Black Willow Woodland (CEGL004919)	4	7	1	25%
Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	4	12	1	25%
Forb Playa Marsh (CEGL002279)	10	0	0	0%
Great Plains Neutral Seep (CEGL002033)	10	16	9	90%
Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	10	19	7	70%
Havard Shin Oak - Little Bluestem Shrubland (CEGL002171)	8	2	0	0%
Honey Mesquite - Lotebush Shrubland (CEGL004939)	10	0	0	0%
Hornwort Submergent Marsh (CEGL004528)	10	0	0	0%
Little Bluestem Chalkflat Mixedgrass Prairie (CEGL002247)	8	2	0	0%
Little Bluestem Loess Mixedgrass Prairie (CEGL002036)	4	4	3	75%
Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	4	13	2	50%
Northern Cordgrass Wet Prairie (CEGL002027)	4	27	19	475%
Nuttall's Stonecrop - Peruvian Spikemoss Granitic Outcrop Sparse Vegetation (CEGL004396)	10	1	0	0%
Oklahoma Arrowhead Marsh (CEGL004525)	10	0	0	0%
Oklahoma Blackjack Oak / Little Bluestem Woodland (CEGL004938)	6	1	0	0%
Oklahoma Bladderpod Glade (CEGL004917)	10	0	0	0%
One-seed Juniper - Fragrant Sumac Woodland (CEGL002121)	6	0	0	0%
Paper Birch Canyon Forest (CEGL002013)	16	0	0	0%

Pecan - Sugarberry Forest (CEGL002087)	4	0	0	0%
Pinchot Juniper / Sideoats Grama - Hairy Grama Woodland (CEGL004940)	6	1	1	17%
Plateau Live Oak - (Post Oak) / Little Bluestem Granite Woodland (CEGL004937)	10	1	0	0%
Playa Marsh (CEGL002039)	10	4	2	20%
Ponderosa Pine / Little Bluestem Woodland (CEGL000201)	6	1	1	17%
Post Oak - Blackjack Oak Cross Timbers Woodland (CEGL002147)	4	2	0	0%
Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	4	20	5	125%
Red Cedar / Little Bluestem Forest (CEGL003628)	2	0	0	0%
Red Hills Little Bluestem Mixedgrass Prairie (CEGL002248)	8	2	1	13%
Riverine Sand Flats (CEGL002049)	2	8	5	250%
Rocky Mountain Juniper / Little-seed Ricegrass Woodland (CEGL000747)	4	3	1	25%
Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	4	28	14	350%
Sand Sage / Sand Dropseed Shrubland (CEGL002179)	6	5	0	0%
Sand Sagebrush / Little Bluestem Shrubland (CEGL002178)	6	6	0	0%
Sandbar Willow Shrubland (CEGL001197)	4	8	6	150%
Sandhills Bulrush Marsh (CEGL002030)	4	16	8	200%
Sandhills Fen (CEGL002390)	10	51	12	120%
Sandhills Wet Prairie (CEGL002028)	10	43	9	90%
Sandhills Wet-mesic Prairie (CEGL002023)	8	22	11	138%
Smartweed - Water-pepper Pond (CEGL004699)	5	2	1	20%
Soapberry (Chinaberry) Woodland (CEGL004535)	4	0	0	0%
Southern Great Plains Cattail - Bulrush Marsh (CEGL002032)	4	9	5	125%
Southern Great Plains Cordgrass Wet Prairie (CEGL002223)	4	7	3	75%
Southern Great Plains Saline Meadow (CEGL002042)	10	18	12	120%
Spikerush Playa Lake (CEGL002259)	10	1	1	10%
Tailwater Playa Lake Vegetation (CEGL002277)	4	0	0	0%
Western Great Plains Alkaline Marsh (CEGL002040)	10	7	3	30%
Western Gypsum And Redbed Clay Prairie (CEGL002252)	10	10	1	10%
Western Oklahoma Maple Forest (CEGL004794)	10	0	0	0%
Western Reed Marsh (CEGL001475)	2	0	0	0%
Western Tallgrass Bur Oak Woodland (CEGL002053)	6	6	3	50%
Wheatgrass Playa Grassland (CEGL002038)	10	3	2	20%

Detail Information

Alkali Bulrush Marsh (CEGL002226)	**Viability of Occurrences**	**#Occ. in this Area**
• Red Hills (site 44; KS/OK)	non-viable	1

American Elm - (Sugarberry, Northern Hackberry) - Green Ash Forest (CEGL002090)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Black Willow Forest (CEGL002103)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Blue Grama - Buffalograss Shortgrass Prairie (CEGL001756)	Viability of Occurrences	#Occ. in this Area
• Ness/Hodgeman Counties Prairie Chicken Site (site 39; KS)	viable	3
• Red Hills (site 44; KS/OK)	viable	1

Blue Grama - Hairy Grama Shortgrass Prairie (CEGL001755)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Broad-leaved Cattail Marsh (CEGL002010)	Viability of Occurrences	#Occ. in this Area
• Cheyenne Bottoms (site 37; KS)	viable	1
• Red Hills (site 44; KS/OK)	non-viable	1

Bulrush - Cattail - Burreed Shallow Marsh (CEGL002026)	Viability of Occurrences	#Occ. in this Area
• Rainwater Basin (site 28; NE)	viable	30

Central Great Plains Little Bluestem Prairie (CEGL002246)	Viability of Occurrences	#Occ. in this Area
• Coronado Hills (site 35; KS)	viable	1
• Greenhorn Limestone (site 33; KS)	viable	1
• Ness/Hodgeman Counties Prairie Chicken Site (site 39; KS)	viable	1
• North Solomon Breaks (site 30; KS)	viable	1
• North-Central Dakota Hills (site 34; KS)	non-viable	1
• Northern Dakota Hills (site 32; KS)	non-viable	1
• Red Hills (site 44; KS/OK)	viable	3
• South Solomon Breaks (site 31; KS)	viable	1
• Southern Dakota Hills (site 36; KS)	viable	1

Central Green Ash - Elm - Hackberry Forest (CEGL002014)	Viability of Occurrences	#Occ. in this Area
• Red Hills (site 44; KS/OK)	viable	1
• South Solomon Breaks (site 31; KS)	viable	1

Central Tallgrass Fen (CEGL002041)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Central Wet-mesic Tallgrass Prairie (CEGL002024)	Viability of Occurrences	#Occ. in this Area
• Central Platte River (site 26; NE)	viable	4
• Kinsley Sandhills (site 42; KS)	non-viable	1
• Loup River Terrestrial (site 22; NE)	viable	4
• Loup River Terrestrial (site 22; NE)	non-viable	2
• Loup River/Loess Hills (site 25; NE)	non-viable	1
• Plum Creek Canyons (site 27; NE)	non-viable	1
• Quivira (site 41; KS)	viable	1

Chinquapin Oak - Shumard Oak Ozark Forest (CEGL004602)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Cottonwood - Green Ash Floodplain Forest (CEGL000658)	Viability of Occurrences	#Occ. in this Area
• Central Platte River (site 26; NE)	viable	1
• Coronado Hills (site 35; KS)	viable	1
• Greenhorn Limestone (site 33; KS)	non-viable	1
• Hutchison Dunes (site 40; KS)	non-viable	1
• Kinsley Sandhills (site 42; KS)	non-viable	1
• Loup River Terrestrial (site 22; NE)	viable	4
• Loup River/Loess Hills (site 25; NE)	viable	1
• Ness/Hodgeman Counties Prairie Chicken Site (site 39; KS)	non-viable	1
• Northern Dakota Hills (site 32; KS)	non-viable	1
• Red Hills (site 44; KS/OK)	viable	1
• Southern Dakota Hills (site 36; KS)	viable	1

Cottonwood - Peach-leaf Willow Floodplain Woodland (CEGL000659)	Viability of Occurrences	#Occ. in this Area
• Dismal River Terrestrial (site 18; NE)	non-viable	1
• Middle Niobrara Sandhills (site 2; NE)	viable	1
• Niobrara/Snake Confluence (site 3; NE)	non-viable	1
• Platte Confluence (site 24; NE)	viable	1
• Red Hills (site 44; KS/OK)	viable	1

Cottonwood - Sycamore Forest (CEGL002095)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Dakota Sandstone Tallgrass Prairie (CEGL005231)	Viability of Occurrences	#Occ. in this Area
• Coronado Hills (site 35; KS)	viable	1
• Greenhorn Limestone (site 33; KS)	viable	1
• North-Central Dakota Hills (site 34; KS)	viable	1
• Northern Dakota Hills (site 32; KS)	viable	1
• Southern Dakota Hills (site 36; KS)	viable	1

Dry Terrestrial Cave (CAVE000400)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Eastern Cottonwood - American Elm - Sugarberry Forest (CEGL002096)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Eastern Cottonwood / Black Willow Woodland (CEGL004919)	Viability of Occurrences	#Occ. in this Area
• Coronado Hills (site 35; KS)	non-viable	1
• Ness/Hodgeman Counties Prairie Chicken Site (site 39; KS)	non-viable	1
• Northern Dakota Hills (site 32; KS)	non-viable	1
• Quivira (site 41; KS)	non-viable	1
• Red Hills (site 44; KS/OK)	non-viable	1
• Southern Dakota Hills (site 36; KS)	viable	1

Eastern Great Plains Big Bluestem Loess Prairie (CEGL002025)	Viability of Occurrences	#Occ. in this Area
• Loup River Terrestrial (site 22; NE)	non-viable	1
• Loup River/Loess Hills (site 25; NE)	non-viable	1
• Plum Creek Canyons (site 27; NE)	viable	1
• Rainwater Basin (site 28; NE)	non-viable	1

Forb Playa Marsh (CEGL002279)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Great Plains Neutral Seep (CEGL002033)	Viability of Occurrences	#Occ. in this Area
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Central Platte River (site 26; NE)	non-viable	1
• Dismal River Terrestrial (site 18; NE)	viable	1
• Loup River/Loess Hills (site 25; NE)	non-viable	1
• Middle Niobrara Sandhills (site 2; NE)	viable	1
• Minnechaduza Creek Sandhills (site 1; NE)	viable	1
• Niobrara/Snake Confluence (site 3; NE)	viable	1
• Plum Creek Canyons (site 27; NE)	non-viable	1
• Sandhills Alkali Lakes (site 12; NE)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	viable	1
• Upper North Loup River (site 7; NE)	viable	1

Great Plains Pondweed Submerged Aquatic Wetland (CEGL002044)	Viability of Occurrences	#Occ. in this Area
• Central Platte River (site 26; NE)	non-viable	1
• Cheyenne Bottoms (site 37; KS)	viable	1
• Loup River/Loess Hills (site 25; NE)	non-viable	1
• Minnechaduza Creek Sandhills (site 1; NE)	viable	1
• Mule Shoe Bar Ranch (site 16; NE)	viable	1
• Platte Confluence (site 24; NE)	non-viable	1
• Plum Creek Canyons (site 27; NE)	non-viable	1
• Quivira (site 41; KS)	non-viable	1
• Sandhills Alkali Lakes (site 12; NE)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Spring Valley (site 15; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	non-viable	1
• Upper North Loup River (site 7; NE)	viable	1

Hornwort Submergent Marsh (CEGL004528)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Little Bluestem Loess Mixedgrass Prairie (CEGL002036)	Viability of Occurrences	#Occ. in this Area
• Central Table Playas (site 23; NE)	viable	1
• Greenhorn Limestone (site 33; KS)	non-viable	1
• Loup River/Loess Hills (site 25; NE)	viable	1
• Plum Creek Canyons (site 27; NE)	viable	1

Needle-and-thread - Blue Grama Mixedgrass Prairie (CEGL002037)	Viability of Occurrences	#Occ. in this Area
• Sandhills Prairie (site 13; NE)	viable	2

Northern Cordgrass Wet Prairie (CEGL002027)	Viability of Occurrences	#Occ. in this Area
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Central Platte River (site 26; NE)	viable	1
• Central Table Playas (site 23; NE)	non-viable	1
• Dismal River Terrestrial (site 18; NE)	non-viable	1
• Loup River Terrestrial (site 22; NE)	viable	10
• Loup River/Loess Hills (site 25; NE)	non-viable	1
• Minnechaduza Creek Sandhills (site 1; NE)	viable	1
• Niobrara/Snake Confluence (site 3; NE)	non-viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Sandhills Upland/Wetland Complex (site 4; NE)	viable	1
• Spring Valley (site 15; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	viable	1
• Upper North Loup River (site 7; NE)	viable	1
• Valentine NWR (site 5; NE)	viable	1

Oklahoma Arrowhead Marsh (CEGL004525)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Oklahoma Bladderpod Glade (CEGL004917)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

One-seed Juniper - Fragrant Sumac Woodland (CEGL002121)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Paper Birch Canyon Forest (CEGL002013)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Pecan - Sugarberry Forest (CEGL002087)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Pinchot Juniper / Sideoats Grama - Hairy Grama Woodland (CEGL004940)	Viability of Occurrences	#Occ. in this Area
• Elm Fork Breaks (site 54; OK)	viable	1

Playa Marsh (CEGL002039)	Viability of Occurrences	#Occ. in this Area
• Central Table Playas (site 23; NE)	non-viable	1
• Rainwater Basin (site 28; NE)	viable	2

Ponderosa Pine / Little Bluestem Woodland (CEGL000201)	Viability of Occurrences	#Occ. in this Area
• Niobrara/Snake Confluence (site 3; NE)	viable	1

Prairie Sandreed - Needle-and-thread Prairie (CEGL001473)	Viability of Occurrences	#Occ. in this Area
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Minnechaduza Creek Sandhills (site 1; NE)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Spring Valley (site 15; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	viable	1

Red Cedar / Little Bluestem Forest (CEGL003628)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Red Hills Little Bluestem Mixedgrass Prairie (CEGL002248)	Viability of Occurrences	#Occ. in this Area
• Red Hills (site 44; KS/OK)	viable	1

Riverine Sand Flats (CEGL002049)	Viability of Occurrences	#Occ. in this Area
• Central Platte River (site 26; NE)	non-viable	1
• Loup River Terrestrial (site 22; NE)	viable	1
• Loup River/Loess Hills (site 25; NE)	viable	2
• Sandhills Prairie (site 13; NE)	viable	2

Rocky Mountain Juniper / Little-seed Ricegrass Woodland (CEGL000747)	Viability of Occurrences	#Occ. in this Area
• Dismal River Terrestrial (site 18; NE)	viable	1

Sand Bluestem - Prairie Sandreed Sand Prairie (CEGL001467)	Viability of Occurrences	#Occ. in this Area
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Cheyenne Bottoms (site 37; KS)	viable	1
• Hutchison Dunes (site 40; KS)	viable	1
• Kinsley Sandhills (site 42; KS)	viable	2
• Mule Shoe Bar Ranch (site 16; NE)	viable	2
• Niobrara/Snake Confluence (site 3; NE)	non-viable	1
• Red Hills (site 44; KS/OK)	viable	1
• Sandhills Prairie (site 13; NE)	viable	3
• Spring Valley (site 15; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	viable	1
• Upper North Loup River (site 7; NE)	viable	1

Sand Sagebrush / Little Bluestem Shrubland (CEGL002178)	Viability of Occurrences	#Occ. in this Area
• Kinsley Sandhills (site 42; KS)	non-viable	1
• Red Hills (site 44; KS/OK)	non-viable	1

Sandbar Willow Shrubland (CEGL001197)	Viability of Occurrences	#Occ. in this Area
• Central Platte River (site 26; NE)	viable	1
• Dismal River Terrestrial (site 18; NE)	viable	1
• Loup River Terrestrial (site 22; NE)	viable	3
• Loup River/Loess Hills (site 25; NE)	viable	1
• Platte Confluence (site 24; NE)	non-viable	1

Sandhills Bulrush Marsh (CEGL002030)	Viability of Occurrences	#Occ. in this Area
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Dismal River Terrestrial (site 18; NE)	non-viable	1
• Duff Sandhills Wetlands (site 10; NE)	viable	1
• Minnechaduza Creek Sandhills (site 1; NE)	viable	1
• Sandhills Alkali Lakes (site 12; NE)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Sandhills Prairie (site 13; NE)	non-viable	1
• Sandhills Upland/Wetland Complex (site 4; NE)	viable	1
• Spring Valley (site 15; NE)	viable	1
• Upper North Loup River (site 7; NE)	viable	1

Sandhills Fen (CEGL002390)	Viability of Occurrences	#Occ. in this Area
• Calamus Headwater Wetlands (site 9; NE)	non-viable	1
• Duck Lake (site 6; NE)	non-viable	1
• Minnechaduza Creek Sandhills (site 1; NE)	non-viable	5
• Sandhills Prairie (site 13; NE)	viable	5
• Sandhills Prairie (site 13; NE)	non-viable	7
• Sandhills Upland/Wetland Complex (site 4; NE)	non-viable	4
• Sandhills Upland/Wetland Complex (site 4; NE)	viable	3
• Spring Valley (site 15; NE)	non-viable	2
• Upper Elkhorn River Watershed (site 8; NE)	non-viable	1
• Upper North Loup River (site 7; NE)	non-viable	8
• Upper North Loup River (site 7; NE)	viable	3
• Valentine NWR (site 5; NE)	viable	1

Sandhills Wet Prairie (CEGL002028)	Viability of Occurrences	#Occ. in this Area
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Duff Sandhills Wetlands (site 10; NE)	non-viable	1
• Hutchison Dunes (site 40; KS)	viable	1
• Middle Niobrara Sandhills (site 2; NE)	non-viable	1
• Minnechaduza Creek Sandhills (site 1; NE)	viable	1
• Quivira (site 41; KS)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Sandhills Prairie (site 13; NE)	non-viable	9
• Sandhills Upland/Wetland Complex (site 4; NE)	viable	1
• Sandhills Upland/Wetland Complex (site 4; NE)	non-viable	3
• Spring Valley (site 15; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	non-viable	8
• Upper North Loup River (site 7; NE)	non-viable	3
• Valentine NWR (site 5; NE)	viable	1

Sandhills Wet-mesic Prairie (CEGL002023)	Viability of Occurrences	#Occ. in this Area
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Duff Sandhills Wetlands (site 10; NE)	viable	1
• Hutchison Dunes (site 40; KS)	non-viable	1
• Middle Niobrara Sandhills (site 2; NE)	non-viable	1

• Sandhills Prairie (site 13; NE)	viable	6
• Sandhills Upland/Wetland Complex (site 4; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	viable	2
• Upper Elkhorn River Watershed (site 8; NE)	non-viable	2
• Upper North Loup River (site 7; NE)	non-viable	1

Smartweed - Water-pepper Pond (CEGL004699)	**Viability of Occurrences**	**#Occ. in this Area**
• Cheyenne Bottoms (site 37; KS)	viable	1

Soapberry (Chinaberry) Woodland (CEGL004535)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Southern Great Plains Cattail - Bulrush Marsh (CEGL002032)	**Viability of Occurrences**	**#Occ. in this Area**
• Cheyenne Bottoms (site 37; KS)	viable	1
• Kinsley Sandhills (site 42; KS)	non-viable	1
• Loup River Terrestrial (site 22; NE)	viable	1
• Quivira (site 41; KS)	viable	1
• Red Hills (site 44; KS/OK)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1

Southern Great Plains Cordgrass Wet Prairie (CEGL002223)	**Viability of Occurrences**	**#Occ. in this Area**
• Cheyenne Bottoms (site 37; KS)	viable	1
• Hutchison Dunes (site 40; KS)	viable	1
• Kinsley Sandhills (site 42; KS)	non-viable	1
• Quivira (site 41; KS)	viable	1
• Red Hills (site 44; KS/OK)	non-viable	1

Southern Great Plains Saline Meadow (CEGL002042)	**Viability of Occurrences**	**#Occ. in this Area**
• Cheyenne Bottoms (site 37; KS)	viable	1
• Mule Shoe Bar Ranch (site 16; NE)	viable	1
• Quivira (site 41; KS)	viable	1
• Red Hills (site 44; KS/OK)	viable	1
• Sandhills Alkali Lakes (site 12; NE)	viable	4
• Sandhills Alkali Lakes (site 12; NE)	non-viable	2
• Sandhills Prairie (site 13; NE)	viable	4

Spikerush Playa Lake (CEGL002259)	**Viability of Occurrences**	**#Occ. in this Area**
• Meade County Wetlands (site 43; KS)	viable	1

Tailwater Playa Lake Vegetation (CEGL002277)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Western Great Plains Alkaline Marsh (CEGL002040)	**Viability of Occurrences**	**#Occ. in this Area**
• Mule Shoe Bar Ranch (site 16; NE)	viable	3
• Red Hills (site 44; KS/OK)	non-viable	1

Western Gypsum And Redbed Clay Prairie (CEGL002252)	Viability of Occurrences	#Occ. in this Area
• Red Hills (site 44; KS/OK)	viable	1

Western Oklahoma Maple Forest (CEGL004794)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Western Reed Marsh (CEGL001475)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Western Tallgrass Bur Oak Woodland (CEGL002053)	Viability of Occurrences	#Occ. in this Area
• Loup River Terrestrial (site 22; NE)	viable	1
• Loup River/Loess Hills (site 25; NE)	viable	1
• Niobrara/Snake Confluence (site 3; NE)	non-viable	1
• Northern Dakota Hills (site 32; KS)	viable	1

Wheatgrass Playa Grassland (CEGL002038)	Viability of Occurrences	#Occ. in this Area
• Central Table Playas (site 23; NE)	non-viable	1
• Rainwater Basin (site 28; NE)	viable	2

Plants

Summary Information

	Conservation Goal	# Occ in ALL Areas	#Viable Occ. in ALL Aeas	Percent of Goal Met
A Wild-buckwheat (PDPGN081W2)*	10	0	0	0%
American Dwarf Burhead (PMALI02050)	2	1	0	0%
Blowout Penstemon (PDSCR1L300)	7	8	8	114%
Fremont Evening-primrose (PDONA0C1P1)*	10	0	0	0%
Hall's Bulrush (PMCYP0Q0R0)	2	7	7	350%
Long-hair Phlox (PDPLM0D160)	10	1	1	10%
Missouri Primrose subspecies incana (PDONA0C1P2)*	7	0	0	0%
Missouri Primrose subspecies oklahomensis (PDONA0C1P4)*	7	0	0	0%
Oklahoma Beardtongue (PDSCR1L4B0)	2	1	1	50%
Oklahoma Phlox (PDPLM0D1E0)	7	2	2	29%
Prairie Fame-flower (PDPOR080G0)	2	0	0	0%
Resin-dot Skullcap (PDLAM1U140)*	7	0	0	0%
Western Prairie Fringed Orchid (PMORC1Y0S0)	2	3	3	150%

Detail Information

A Wild-buckwheat (PDPGN081W2)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

American Dwarf Burhead (PMALI02050)	Viability of Occurrences	#Occ. in this Area
• Hutchison Dunes (site 40; KS)	non-viable	1

Blowout Penstemon (PDSCR1L300)	Viability of Occurrences	#Occ. in this Area
• Crescent Lake (site 21; NE)	viable	1
• Crouse Ranch Site (site 14; NE)	viable	1
• Dismal River South (site 20; NE)	viable	1
• Duck Lake (site 6; NE)	viable	1
• Graves' Ranch (site 19; NE)	viable	1
• Hill Haven Ranch Site (site 11; NE)	viable	1
• Mule Shoe Bar Ranch (site 16; NE)	viable	1
• Valentine NWR (site 5; NE)	viable	1

Fremont Evening-primrose (PDONA0C1P1)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Hall's Bulrush (PMCYP0Q0R0)	Viability of Occurrences	#Occ. in this Area
• Calamus Headwater Wetlands (site 9; NE)	viable	1
• Duff Sandhills Wetlands (site 10; NE)	viable	2
• Red Hills (site 44; KS/OK)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Upper Elkhorn River Watershed (site 8; NE)	viable	1
• Wichita Mountains (site 56; OK)	viable	1

Long-hair Phlox (PDPLM0D160)	Viability of Occurrences	#Occ. in this Area
• Quartz Mountain State Park (site 55; OK)	viable	1

Missouri Primrose subspecies incana (PDONA0C1P2)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Missouri Primrose subspecies oklahomensis (PDONA0C1P4)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Oklahoma Beardtongue (PDSCR1L4B0)	Viability of Occurrences	#Occ. in this Area
• Wichita Mountains (site 56; OK)	viable	1

Oklahoma Phlox (PDPLM0D1E0)	Viability of Occurrences	#Occ. in this Area
• Red Hills (site 44; KS/OK)	viable	1
• Woodward Co. Phlox (site 47; OK)	viable	1

Prairie Fame-flower (PDPOR080G0)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Resin-dot Skullcap (PDLAM1U140)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Western Prairie Fringed Orchid (PMORC1Y0S0)	Viability of Occurrences	#Occ. in this Area
• Platte River (site 84; NE)	viable	1
• Sandhills Prairie (site 13; NE)	viable	1
• Valentine NWR (site 5; NE)	viable	1

Animals

Summary Information

	Conservation Goal	# Occ in ALL Areas	#Viable Occ. in ALL Aeas	Percent of Goal Met
American Burying Beetle (IICOL42010)	4	3	3	75%
American White Pelican (ABNFC01010)*	4	1	0	0%
Arogos Skipper (IILEP70010)*	4	0	0	0%
Bald Eagle (ABNKC10010)*	4	3	2	50%
Bat Caves (OTHER00002)	4	9	9	225%
Bell's Vireo (ABPBW01110)*	4	1	0	0%
Black Rail (ABNME03040)*	2	3	1	50%
Black-capped Vireo (ABPBW01120)	1	2	2	200%
Cassin's Sparrow (ABPBX91070)*	2	0	0	0%
Dickcissel (ABPBX65010)*	4	0	0	0%
Dotted Skipper (IILEP65121)*	7	0	0	0%
Eastern Spotted Skunk (AMAJF05010)*	4	3	0	0%
Franklin's Ground Squirrel (AMAFB05120)*	2	1	0	0%
Greater Prairie Chicken (ABNLC13013)*	4	1	0	0%
Henslow's Sparrow (ABPBXA0030)*	2	0	0	0%
Interior Least Tern (ABNNM08102)	1	7	5	500%
Lesser Prairie Chicken (ABNLC13020)	2	5	4	200%
Loggerhead Shrike (ABPBR01030)*	4	3	0	0%
Long-billed Curlew (ABNNF07070)*	4	4	0	0%
Massasauga (ARADE03010)*	4	0	0	0%
Migratory Water Bird Areas (OTHER00001)	4	12	12	300%
Ottoe Skipper (IILEP65050)*	4	0	0	0%
Piping Plover (ABNNB03070)	1	4	2	200%
Prairie Dog Towns (OTHER00003)	4	15	1	25%
Prairie Mole Cricket (IIORT17010)	7	0	0	0%
Regal Fritillary (IILEPJ6040)	4	4	3	75%
Scissor-tailed Flycatcher (ABPAE52100)*	4	1	0	0%
Snowy Plover (ABNNB03030)	2	4	2	100%
Swift Fox (AMAJA03030)	4	1	0	0%
Texas Garter Snake (ARADB36131)	2	2	1	50%
Texas Horned Lizard (ARACF12010)*	7	4	1	14%
Townsend's Big-eared Bat (AMACC08010)*	4	4	0	0%
Trumpeter Swan (ABNJB02030)*	7	5	0	0%
Whooping Crane (ABNMK01030)	7	9	7	100%

Detail Information

American Burying Beetle (IICOL42010)	Viability of Occurrences	#Occ. in this Area
• American Burying Beetle Site (site 17; NE)	viable	1
• Plum Creek Canyons (site 27; NE)	viable	1
• Valentine NWR (site 5; NE)	viable	1

American White Pelican (ABNFC01010)	Viability of Occurrences	#Occ. in this Area
• Rainwater Basin (site 28; NE)	non-viable	1

Arogos Skipper (IILEP70010)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Bald Eagle (ABNKC10010)	Viability of Occurrences	#Occ. in this Area
• Central Platte River (site 26; NE)	viable	2
• Quartz Mountain State Park (site 55; OK)	non-viable	1

Bat Caves (OTHER00002)	Viability of Occurrences	#Occ. in this Area
• Elm Fork Breaks (site 54; OK)	viable	2
• Glass Mountains (site 49; OK)	viable	3
• Red Hills (site 44; KS/OK)	viable	4

Black Rail (ABNME03040)	Viability of Occurrences	#Occ. in this Area
• Cheyenne Bottoms (site 37; KS)	non-viable	1
• Quivira (site 41; KS)	viable	1
• Red Hills (site 44; KS/OK)	non-viable	1

Black-capped Vireo (ABPBW01120)	Viability of Occurrences	#Occ. in this Area
• Salt Creek Canyon (site 50; OK)	viable	1
• Wichita Mountains (site 56; OK)	viable	1

Cassin's Sparrow (ABPBX91070)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Dickcissel (ABPBX65010)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Dotted Skipper (IILEP65121)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Eastern Spotted Skunk (AMAJF05010)	Viability of Occurrences	#Occ. in this Area
• Cheyenne Bottoms (site 37; KS)	non-viable	1
• Sandhills Prairie (site 13; NE)	non-viable	1

Henslow's Sparrow (ABPBXA0030)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Interior Least Tern (ABNNM08102)	Viability of Occurrences	#Occ. in this Area
• Central Platte River (site 26; NE)	viable	1
• Cheyenne Bottoms (site 37; KS)	non-viable	1
• Cimarron River Terrestrial (site 46; OK)	non-viable	1
• Great Salt Plains (site 45; OK)	viable	2

• Loup River Terrestrial (site 22; NE)	viable	1
• Quivira (site 41; KS)	viable	1

Lesser Prairie Chicken (ABNLC13020)	**Viability of Occurrences**	**#Occ. in this Area**
• Kinsley Sandhills (site 42; KS)	viable	1
• Lower Cimarron (site 48; OK)	viable	1
• Ness/Hodgeman Counties Prairie Chicken Site (site 39; KS)	viable	1
• Red Hills (site 44; KS/OK)	non-viable	1
• Red Hills (site 44; KS/OK)	viable	1

Loggerhead Shrike (ABPBR01030)	**Viability of Occurrences**	**#Occ. in this Area**
• Black Kettle (site 52; OK)	non-viable	1
• Glass Mountains (site 49; OK)	non-viable	1
• Hackberry Flat (site 57; OK)	non-viable	1

Massasauga (ARADE03010)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Migratory Water Bird Areas (OTHER00001)	**Viability of Occurrences**	**#Occ. in this Area**
• Central Platte River (site 26; NE)	viable	1
• Cheyenne Bottoms (site 37; KS)	viable	1
• Great Salt Plains (site 45; OK)	viable	1
• Hackberry Flat (site 57; OK)	viable	1
• Jamestown Wildlife Area (site 29; KS)	viable	1
• Loup River Terrestrial (site 22; NE)	viable	1
• McPherson Valley Wetlands (site 38; KS)	viable	1
• Meade County Wetlands (site 43; KS)	viable	1
• Platte Confluence (site 24; NE)	viable	1
• Quivira (site 41; KS)	viable	1
• Rainwater Basin (site 28; NE)	viable	1
• Washita National Wildlife Refuge (site 53; OK)	viable	1

Ottoe Skipper (IILEP65050)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Piping Plover (ABNNB03070)	**Viability of Occurrences**	**#Occ. in this Area**
• Central Platte River (site 26; NE)	viable	1
• Cheyenne Bottoms (site 37; KS)	non-viable	1
• Loup River Terrestrial (site 22; NE)	viable	1
• Quivira (site 41; KS)	non-viable	1

Prairie Dog Towns (OTHER00003)	**Viability of Occurrences**	**#Occ. in this Area**
• Black Kettle (site 52; OK)	non-viable	1
• Cheyenne Bottoms (site 37; KS)	non-viable	1
• Coronado Hills (site 35; KS)	non-viable	1
• Greenhorn Limestone (site 33; KS)	non-viable	1
• Kinsley Sandhills (site 42; KS)	non-viable	1
• Loup River/Loess Hills (site 25; NE)	non-viable	1

• Ness/Hodgeman Counties Prairie Chicken Site (site 39; KS)	viable	1
• North Solomon Breaks (site 30; KS)	non-viable	1
• Quivira (site 41; KS)	non-viable	1
• Red Hills (site 44; KS/OK)	non-viable	1
• South Solomon Breaks (site 31; KS)	non-viable	1
• Southern Dakota Hills (site 36; KS)	non-viable	1

Prairie Mole Cricket (IIORT17010)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Regal Fritillary (IILEPJ6040)	**Viability of Occurrences**	**#Occ. in this Area**
• Central Platte River (site 26; NE)	viable	1
• Loup River Terrestrial (site 22; NE)	viable	1
• Quivira (site 41; KS)	viable	1
• Sandhills Prairie (site 13; NE)	non-viable	1

Scissor-tailed Flycatcher (ABPAE52100)	**Viability of Occurrences**	**#Occ. in this Area**
• Quartz Mountain State Park (site 55; OK)	non-viable	1

Snowy Plover (ABNNB03030)	**Viability of Occurrences**	**#Occ. in this Area**
• Cheyenne Bottoms (site 37; KS)	non-viable	2
• Great Salt Plains (site 45; OK)	viable	1
• Quivira (site 41; KS)	viable	1

Swift Fox (AMAJA03030)	**Viability of Occurrences**	**#Occ. in this Area**
• Sandhills Prairie (site 13; NE)	non-viable	1

Texas Garter Snake (ARADB36131)	**Viability of Occurrences**	**#Occ. in this Area**
• Black Kettle (site 52; OK)	viable	1
• Red Hills (site 44; KS/OK)	non-viable	1

Texas Horned Lizard (ARACF12010)	**Viability of Occurrences**	**#Occ. in this Area**
• Black Kettle (site 52; OK)	viable	1
• Elm Fork Breaks (site 54; OK)	non-viable	1
• Glass Mountains (site 49; OK)	non-viable	1
• Wichita Mountains (site 56; OK)	non-viable	1

Whooping Crane (ABNMK01030)	**Viability of Occurrences**	**#Occ. in this Area**
• Central Platte River (site 26; NE)	viable	1
• Central Table Playas (site 23; NE)	viable	1
• Cheyenne Bottoms (site 37; KS)	viable	1
• Great Salt Plains (site 45; OK)	viable	1
• Loup River Terrestrial (site 22; NE)	viable	1
• Quivira (site 41; KS)	viable	1
• Wichita Mountains (site 56; OK)	viable	1

Section B: Aquatic Targets

Aquatic Ecological Systems

Summary Information

	Conservation Goal	# Occ in ALL Areas	#Viable Occ. in ALL Aeas	Percent of Goal Met
Arkansas River East Aquatic System 1-1 (SYSTEM0144)	92	4	4	4%
Arkansas River East Aquatic System 1-2 (SYSTEM0145)	65	11	11	17%
Arkansas River East Aquatic System 1-6 (SYSTEM0146)	71	5	5	7%
Arkansas River East Aquatic System 1-673 (SYSTEM0147)	1	0	0	0%
Arkansas River East Aquatic System 2-11 (SYSTEM0148)	8	0	0	0%
Arkansas River East Aquatic System 2-12 (SYSTEM0149)	10	3	3	30%
Arkansas River East Aquatic System 2-13 (SYSTEM0150)	11	8	8	73%
Arkansas River East Aquatic System 2-41 (SYSTEM0151)	24	2	2	8%
Arkansas River East Aquatic System 3-1 (SYSTEM0152)	2	2	2	100%
Arkansas River East Aquatic System 3-2 (SYSTEM0153)	10	2	2	20%
Arkansas River East Aquatic System 3-224 (SYSTEM0155)	8	0	0	0%
Arkansas River East Aquatic System 3-3 (SYSTEM0154)	2	1	1	50%
Arkansas River East Aquatic System 4-1 (SYSTEM0156)	4	3	3	75%
Arkansas River East Aquatic System 4-4 (SYSTEM0157)	1	1	1	100%
Arkansas River East Aquatic System 4-92 (SYSTEM0158)	1	1	1	100%
Arkansas River East Aquatic System 5-2 (SYSTEM0159)	1	1	1	100%
Arkansas River East Aquatic System 5-7 (SYSTEM0160)	1	1	1	100%
Arkansas River West Aquatic System 1-1 (SYSTEM0132)	12	0	0	0%
Arkansas River West Aquatic System 1-2 (SYSTEM0133)	2	0	0	0%
Arkansas River West Aquatic System 1-6 (SYSTEM0134)	9	0	0	0%
Arkansas River West Aquatic System 2-1 (SYSTEM0135)	2	0	0	0%
Arkansas River West Aquatic System 2-224 (SYSTEM0137)	1	0	0	0%
Arkansas River West Aquatic System 2-41 (SYSTEM0136)	4	0	0	0%
Arkansas River West Aquatic System 3-2 (SYSTEM0138)	2	0	0	0%
Arkansas River West Aquatic System 3-223 (SYSTEM0139)	1	0	0	0%
Arkansas River West Aquatic System 4-1 (SYSTEM0140)	1	0	0	0%
Arkansas River West Aquatic System 4-92 (SYSTEM0141)	1	0	0	0%
Arkansas River West Aquatic System 5-2 (SYSTEM0142)	1	0	0	0%
Arkansas River West Aquatic System 5-7 (SYSTEM0143)	1	0	0	0%
Big Blue Aquatic System 1-1 (SYSTEM0126)	44	0	0	0%
Big Blue Aquatic System 2-12 (SYSTEM0128)	2	0	0	0%
Big Blue Aquatic System 2-3 (SYSTEM0127)	14	0	0	0%
Big Blue Aquatic System 3-2 (SYSTEM0129)	4	0	0	0%
Big Blue Aquatic System 4-1 (SYSTEM0130)	2	0	0	0%
Big Blue Aquatic System 4-3 (SYSTEM0187)	1	0	0	0%
Big Blue Aquatic System 5-4 (SYSTEM0131)	1	0	0	0%
Canadian River Aquatic System 1-1 (SYSTEM0161)	14	4	4	29%
Canadian River Aquatic System 2-1 (SYSTEM0162)	4	0	0	0%

Canadian River Aquatic System 2-2 (SYSTEM0163)	1	0	0	0%
Canadian River Aquatic System 3-1 (SYSTEM0164)	1	0	0	0%
Canadian River Aquatic System 3-3 (SYSTEM0165)	1	0	0	0%
Canadian River Aquatic System 5-1 (SYSTEM0166)	1	0	0	0%
Canadian River Aquatic System 5-7 (SYSTEM0167)	1	1	1	100%
Red River Aquatic System 1-1 (SYSTEM0168)	65	28	28	43%
Red River Aquatic System 1-158 (SYSTEM0169)	7	4	4	57%
Red River Aquatic System 1-550 (SYSTEM0170)	1	0	0	0%
Red River Aquatic System 1-626 (SYSTEM0171)	1	0	0	0%
Red River Aquatic System 2-1 (SYSTEM0172)	7	0	0	0%
Red River Aquatic System 2-2 (SYSTEM0173)	11	0	0	0%
Red River Aquatic System 2-224 (SYSTEM0174)	2	0	0	0%
Red River Aquatic System 3-223 (SYSTEM0176)	1	1	1	100%
Red River Aquatic System 3-3 (SYSTEM0175)	4	2	2	50%
Red River Aquatic System 4-2 (SYSTEM0177)	1	1	1	100%
Red River Aquatic System 4-4 (SYSTEM0178)	1	1	1	100%
Red River Aquatic System 4-92 (SYSTEM0179)	1	1	1	100%
Red River Aquatic System 5-11 (SYSTEM0181)	1	0	0	0%
Red River Aquatic System 5-7 (SYSTEM0180)	1	1	1	100%
Republican Aquatic System 1-1 (SYSTEM0122)	32	0	0	0%
Republican Aquatic System 2-3 (SYSTEM0124)	6	0	0	0%
Republican Aquatic System 4-1 (SYSTEM0125)	2	0	0	0%
Sandhills Aquatic System 1-1 (SYSTEM0100)	47	24	24	51%
Sandhills Aquatic System 1-11 (SYSTEM0101)	120	0	0	0%
Sandhills Aquatic System 2-1 (SYSTEM0102)	10	9	9	90%
Sandhills Aquatic System 2-12 (SYSTEM0104)	5	0	0	0%
Sandhills Aquatic System 2-3 (SYSTEM0103)	32	0	0	0%
Sandhills Aquatic System 3-1 (SYSTEM0105)	2	4	4	200%
Sandhills Aquatic System 3-2 (SYSTEM0106)	6	5	5	83%
Sandhills Aquatic System 3-3 (SYSTEM0107)	1	0	0	0%
Sandhills Aquatic System 4-1 (SYSTEM0108)	4	5	5	125%
Sandhills Aquatic System 4-2 (SYSTEM0182)	1	1	1	100%
Sandhills Aquatic System 5-1 (SYSTEM0109)	1	3	3	300%
Sandhills Aquatic System 5-2 (SYSTEM0110)	1	3	3	300%
Smoky Hills Aquatic System 1-1 (SYSTEM0111)	277	0	0	0%
Smoky Hills Aquatic System 1-62 (SYSTEM0112)	8	0	0	0%
Smoky Hills Aquatic System 2-1 (SYSTEM0113)	1	0	0	0%
Smoky Hills Aquatic System 2-12 (SYSTEM0115)	14	0	0	0%
Smoky Hills Aquatic System 2-14 (SYSTEM0116)	7	0	0	0%
Smoky Hills Aquatic System 2-3 (SYSTEM0114)	51	0	0	0%
Smoky Hills Aquatic System 3-2 (SYSTEM0117)	9	0	0	0%
Smoky Hills Aquatic System 3-3 (SYSTEM0118)	4	0	0	0%
Smoky Hills Aquatic System 4-1 (SYSTEM0183)	4	0	0	0%
Smoky Hills Aquatic System 4-11 (SYSTEM0119)	1	0	0	0%

Smoky Hills Aquatic System 4-3 (SYSTEM0184)	1	0	0	0%
Smoky Hills Aquatic System 5-1 (SYSTEM0185)	1	1	1	100%
Smoky Hills Aquatic System 5-3 (SYSTEM0186)	1	0	0	0%
South Platte Aquatic System 2-1 (SYSTEM0121)	1	0	0	0%

Detail Information

Arkansas River East Aquatic System 1-1 (SYSTEM0144)	**Viability of Occurrences**	**#Occ. in this Area**
• Medicine Lodge River and Tributaries (site 93; NE/KS)	viable	3
• South Fork of the Ninnescah River Waters (site 90; KS)	viable	1

Arkansas River East Aquatic System 1-2 (SYSTEM0145)	**Viability of Occurrences**	**#Occ. in this Area**
• Barney Creek Watershed (site 106; OK)	viable	1
• Bitter Creek Watershed (site 107; OK)	viable	1
• Chimney Creek Watershed (site 103; OK)	viable	1
• Indian Creek Watershed (site 104; OK)	viable	1
• Long Creek Watershed (site 102; OK)	viable	2
• Middle Griever Creek Watershed (site 105; OK)	viable	1
• Mustang Creek Watershed (site 95; OK)	viable	1
• Red Creek Watershed (site 96; OK)	viable	1
• Sand Creek Watershed (site 98; OK)	viable	1
• West Moccasin Creek Watershed (site 99; OK)	viable	1

Arkansas River East Aquatic System 1-6 (SYSTEM0146)	**Viability of Occurrences**	**#Occ. in this Area**
• Chikaskia River Watershed (site 92; KS)	viable	2
• North Fork of the Ninnescah River Waters (site 87; KS)	viable	2
• Smoots Creek Watershed (site 89; KS)	viable	1

Arkansas River East Aquatic System 1-673 (SYSTEM0147)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Arkansas River East Aquatic System 2-11 (SYSTEM0148)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Arkansas River East Aquatic System 2-12 (SYSTEM0149)	**Viability of Occurrences**	**#Occ. in this Area**
• Chikaskia River Watershed (site 92; KS)	viable	1
• North Fork of the Ninnescah River Waters (site 87; KS)	viable	1
• Smoots Creek Watershed (site 89; KS)	viable	1

Arkansas River East Aquatic System 2-13 (SYSTEM0150)	**Viability of Occurrences**	**#Occ. in this Area**
• Chimney Creek Watershed (site 103; OK)	viable	1
• Long Creek Watershed (site 102; OK)	viable	2
• North Fork of the Ninnescah River Waters (site 87; KS)	viable	1
• Sand Creek Watershed (site 98; OK)	viable	1
• Sleeping Bear Creek Watershed (site 101; OK)	viable	1
• West Moccasin Creek Watershed (site 99; OK)	viable	1
• Yellowstone Creek Watershed (site 97; OK/KS)	viable	1

Arkansas River East Aquatic System 2-41 (SYSTEM0151)	Viability of Occurrences	#Occ. in this Area
• Medicine Lodge River and Tributaries (site 93; NE/KS)	viable	1
• South Fork of the Ninnescah River Waters (site 90; KS)	viable	1

Arkansas River East Aquatic System 3-1 (SYSTEM0152)	Viability of Occurrences	#Occ. in this Area
• Chikaskia River Watershed (site 92; KS)	viable	1
• North Fork of the Ninnescah River Waters (site 87; KS)	viable	1

Arkansas River East Aquatic System 3-2 (SYSTEM0153)	Viability of Occurrences	#Occ. in this Area
• Smoots Creek Watershed (site 89; KS)	viable	1
• South Fork of the Ninnescah River Waters (site 90; KS)	viable	1

Arkansas River East Aquatic System 3-224 (SYSTEM0155)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River East Aquatic System 3-3 (SYSTEM0154)	Viability of Occurrences	#Occ. in this Area
• Long Creek Watershed (site 102; OK)	viable	1

Arkansas River East Aquatic System 4-1 (SYSTEM0156)	Viability of Occurrences	#Occ. in this Area
• Chikaskia River (site 94; KS/OK)	viable	1
• North Fork of Ninnescah River (site 88; KS)	viable	1
• South Fork of Ninnescah River (site 91; KS)	viable	1

Arkansas River East Aquatic System 4-4 (SYSTEM0157)	Viability of Occurrences	#Occ. in this Area
• Cimarron River (site 100; OK)	viable	1

Arkansas River East Aquatic System 4-92 (SYSTEM0158)	Viability of Occurrences	#Occ. in this Area
• Medicine Lodge River and Tributaries (site 93; NE/KS)	viable	1

Arkansas River East Aquatic System 5-2 (SYSTEM0159)	Viability of Occurrences	#Occ. in this Area
• Chikaskia River (site 94; KS/OK)	viable	1

Arkansas River East Aquatic System 5-7 (SYSTEM0160)	Viability of Occurrences	#Occ. in this Area
• Cimarron River (site 100; OK)	viable	1

Arkansas River West Aquatic System 1-1 (SYSTEM0132)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 1-2 (SYSTEM0133)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 1-6 (SYSTEM0134)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 2-1 (SYSTEM0135)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 2-224 (SYSTEM0137)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 2-41 (SYSTEM0136)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 3-2 (SYSTEM0138)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 3-223 (SYSTEM0139)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 4-1 (SYSTEM0140)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 4-92 (SYSTEM0141)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 5-2 (SYSTEM0142)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Arkansas River West Aquatic System 5-7 (SYSTEM0143)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Big Blue Aquatic System 1-1 (SYSTEM0126)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Big Blue Aquatic System 2-12 (SYSTEM0128)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Big Blue Aquatic System 2-3 (SYSTEM0127)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Big Blue Aquatic System 3-2 (SYSTEM0129)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Big Blue Aquatic System 4-1 (SYSTEM0130)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Big Blue Aquatic System 4-3 (SYSTEM0187)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Big Blue Aquatic System 5-4 (SYSTEM0131)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Canadian River Aquatic System 1-1 (SYSTEM0161)	Viability of Occurrences	#Occ. in this Area
• Burnt Creek Watershed (site 110; OK)	viable	1
• Canadian River Watershed East (site 108; OK)	viable	1
• Canadian River Watershed West (site 109; OK)	viable	1
• Deer Creek Watershed (site 111; OK)	viable	1

Canadian River Aquatic System 2-1 (SYSTEM0162)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Canadian River Aquatic System 2-2 (SYSTEM0163)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Canadian River Aquatic System 3-1 (SYSTEM0164)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Canadian River Aquatic System 3-3 (SYSTEM0165)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Canadian River Aquatic System 5-1 (SYSTEM0166)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Canadian River Aquatic System 5-7 (SYSTEM0167)	Viability of Occurrences	#Occ. in this Area
• Canadian River (site 112; OK)	viable	1

Red River Aquatic System 1-1 (SYSTEM0168)	Viability of Occurrences	#Occ. in this Area
• Canary Creek Watershed (site 121; OK)	viable	1
• Cave Creek Watershed (site 122; OK)	viable	1
• Elm Fork of the Red River Watershed (site 119; OK)	viable	1
• Horse Creek Watershed (site 123; OK)	viable	2
• Root Creek Watershed (site 120; OK)	viable	1
• Unnamed Red River Watershed Site D (site 116; OK)	viable	2
• Unnamed Red River Watershed Site E (site 113; OK)	viable	3
• Unnamed Red River Watershed Site F (site 115; OK)	viable	3
• Unnamed Red River Watershed Site P (site 114; OK)	viable	1
• Unnamed Red River Watershed Site Q (site 117; OK)	viable	3
• Unnmaed Red River Watershed Site B (site 118; OK)	viable	10

Red River Aquatic System 1-158 (SYSTEM0169)	Viability of Occurrences	#Occ. in this Area
• Deer Creek Watershed East (site 126; OK)	viable	1

• Jimmy Creek Watershed (site 125; OK)	viable	1
• Unnamed Red River Watershed Site A (site 128; OK)	viable	2

Red River Aquatic System 1-550 (SYSTEM0170)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Red River Aquatic System 1-626 (SYSTEM0171)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Red River Aquatic System 2-1 (SYSTEM0172)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Red River Aquatic System 2-2 (SYSTEM0173)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Red River Aquatic System 2-224 (SYSTEM0174)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Red River Aquatic System 3-223 (SYSTEM0176)	**Viability of Occurrences**	**#Occ. in this Area**
• Unnmaed Red River Watershed Site B (site 118; OK)	viable	1

Red River Aquatic System 3-3 (SYSTEM0175)	**Viability of Occurrences**	**#Occ. in this Area**
• Unnamed Red River Watershed Site A (site 128; OK)	viable	1
• Unnmaed Red River Watershed Site B (site 118; OK)	viable	1

Red River Aquatic System 4-2 (SYSTEM0177)	**Viability of Occurrences**	**#Occ. in this Area**
• Upper Red River and Tributaries (site 127; OK/TX)	viable	1

Red River Aquatic System 4-4 (SYSTEM0178)	**Viability of Occurrences**	**#Occ. in this Area**
• Upper Red River and Tributaries (site 127; OK/TX)	viable	1

Red River Aquatic System 4-92 (SYSTEM0179)	**Viability of Occurrences**	**#Occ. in this Area**
• Upper Red River and Tributaries (site 127; OK/TX)	viable	1

Red River Aquatic System 5-11 (SYSTEM0181)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Red River Aquatic System 5-7 (SYSTEM0180)	**Viability of Occurrences**	**#Occ. in this Area**
• Upper Red River and Tributaries (site 127; OK/TX)	viable	1

Republican Aquatic System 1-1 (SYSTEM0122)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Republican Aquatic System 2-3 (SYSTEM0124)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Republican Aquatic System 4-1 (SYSTEM0125)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Sandhills Aquatic System 1-1 (SYSTEM0100)	Viability of Occurrences	#Occ. in this Area
• Dismal River - Middle Loup Watershed (site 75; NE)	viable	2
• Elkhorn River (site 71; NE)	viable	1
• Elkhorn River Watershed (site 72; NE)	viable	2
• Evergreen Creek - Cedar Creek Watershed (site 66; NE)	viable	1
• Fairfield Creek Watershed (site 63; NE)	viable	1
• Leander Creek Watershed (site 62; NE)	viable	1
• Niobrara River (site 64; NE)	viable	4
• North Loup River Watershed (site 73; NE)	viable	3
• Sand Draw Creek Watershed (site 70; NE)	viable	2
• Snake River Watershed (site 69; NE)	viable	1
• South Loup River Watershed (site 81; NE)	viable	4
• Upper Cedar River Watershed (site 76; NE)	viable	2

Sandhills Aquatic System 1-11 (SYSTEM0101)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Sandhills Aquatic System 2-1 (SYSTEM0102)	Viability of Occurrences	#Occ. in this Area
• Dismal River - Middle Loup Watershed (site 75; NE)	viable	1
• Elkhorn River Watershed (site 72; NE)	viable	1
• Evergreen Creek - Cedar Creek Watershed (site 66; NE)	viable	2
• North Loup River Watershed (site 73; NE)	viable	1
• Sand Draw Creek Watershed (site 70; NE)	viable	1
• Snake River Watershed (site 69; NE)	viable	1
• South Loup River Watershed (site 81; NE)	viable	1
• Upper Cedar River Watershed (site 76; NE)	viable	1

Sandhills Aquatic System 2-3 (SYSTEM0103)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Sandhills Aquatic System 3-1 (SYSTEM0105)	Viability of Occurrences	#Occ. in this Area
• Dismal River - Middle Loup Watershed (site 75; NE)	viable	1
• Elkhorn River Watershed (site 72; NE)	viable	1
• North Loup River Watershed (site 73; NE)	viable	1
• Upper Cedar River Watershed (site 76; NE)	viable	1

Sandhills Aquatic System 3-2 (SYSTEM0106)	Viability of Occurrences	#Occ. in this Area
• Lower Cedar River Watershed (site 80; NE)	viable	2
• South Loup River Watershed (site 81; NE)	viable	2
• Unnamed Sandhills Watershed Site A (site 78; NE)	viable	1

Sandhills Aquatic System 3-3 (SYSTEM0107)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Sandhills Aquatic System 4-1 (SYSTEM0108)	Viability of Occurrences	#Occ. in this Area
• Cedar River (site 77; NE)	viable	1
• Dismal River - Middle Loup River (site 79; NE)	viable	1
• Elkhorn River (site 71; NE)	viable	1
• North Loup River and Tributaries (site 74; NE)	viable	1
• South Loup River (site 83; NE)	viable	1

Sandhills Aquatic System 4-2 (SYSTEM0182)	Viability of Occurrences	#Occ. in this Area
• Niobrara River (site 64; NE)	viable	1

Sandhills Aquatic System 5-1 (SYSTEM0109)	Viability of Occurrences	#Occ. in this Area
• Evergreen Creek - Cedar Creek (site 65; NE)	viable	1
• Niobrara River (site 64; NE)	viable	2

Sandhills Aquatic System 5-2 (SYSTEM0110)	Viability of Occurrences	#Occ. in this Area
• Loup River (site 82; NE)	viable	1
• Platte River (site 84; NE)	viable	1
• South Loup River (site 83; NE)	viable	1

Smoky Hills Aquatic System 1-1 (SYSTEM0111)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 1-62 (SYSTEM0112)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 2-1 (SYSTEM0113)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 2-12 (SYSTEM0115)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 2-14 (SYSTEM0116)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 2-3 (SYSTEM0114)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 3-2 (SYSTEM0117)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 3-3 (SYSTEM0118)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 4-1 (SYSTEM0183)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 4-11 (SYSTEM0119)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 4-3 (SYSTEM0184)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Smoky Hills Aquatic System 5-1 (SYSTEM0185)	Viability of Occurrences	#Occ. in this Area
• Republican River (site 86; NE/KS)	viable	1

Smoky Hills Aquatic System 5-3 (SYSTEM0186)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

South Platte Aquatic System 2-1 (SYSTEM0121)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Animals

Summary Information

	Conservation Goal	# Occ in ALL Areas	#Viable Occ. in ALL Aeas	Percent of Goal Met
A Crayfish (ICMAL11240)	4	2	0	0%
A Sand-Filtering Mayfly (IIEPH03030)	7	3	1	14%
Arkansas Darter (AFCQC02170)	7	7	7	100%
Arkansas River Shiner (AFCJB28490)	7	3	2	29%
Arkansas River Speckled Chub (AFCJB53070)	7	0	0	0%
Big River Fish Assemblage (OTHER0009)	7	7	5	71%
Blanding's Turtle (ARAAD04010)	4	0	0	0%
Conchas Crayfish (ICMAL11110)	2	1	1	50%
Cylindrical Papershell (IMBIV05010)	10	6	0	0%
Flathead Chub (AFCJB57010)	2	9	6	300%
Gill-breathing Snails (OTHER0006)	10	1	0	0%
Gravel Bottom Mussel Assemblage (OTHER0005)	10	0	0	0%
Headwater Fish Assemblage (OTHER0007)	7	4	3	43%
Plains Killifish (AFCNB04210)	7	10	8	114%
Plains Minnow (AFCJB16050)	4	15	12	300%
Platte River Caddisfly (NOCODE0001)	7	1	0	0%
Red River Pupfish (AFCNB02100)	7	4	4	57%
Red River Shiner (AFCJB28160)	2	4	4	200%
Sandhills Headwater Stream Community (OTHER0010)	10	11	11	110%
Sandy Plains Stream Mussel Assemblage (OTHER0004)	10	1	0	0%
Shovelnose Sturgeon (AFCAA02020)	4	4	1	25%
Spring Fish Assemblage (OTHER0008)	7	2	0	0%
Spring Invertebrate Assemblage (OTHER0011)	10	4	4	40%
Sturgeon Chub (AFCJB53020)	2	0	0	0%
Topeka Shiner (AFCJB28960)	2	0	0	0%
Western Silvery Minnow (AFCJB16010)	4	10	8	200%
Yellow Mud Turtle (ARAAE01020)	2	0	0	0%

Detail Information

A Sand-Filtering Mayfly (IIEPH03030)	Viability of Occurrences	#Occ. in this Area
• Republican River (site 86; NE/KS)	viable	1

Arkansas Darter (AFCQC02170)	Viability of Occurrences	#Occ. in this Area
• Chikaskia River (site 94; KS/OK)	viable	1
• Cimarron River (site 100; OK)	viable	1
• Medicine Lodge River and Tributaries (site 93; NE/KS)	viable	1
• North Fork of Ninnescah River (site 88; KS)	viable	2
• Red Hills (site 44; KS/OK)	viable	1
• South Fork of Ninnescah River (site 91; KS)	viable	1

Arkansas River Shiner (AFCJB28490)	Viability of Occurrences	#Occ. in this Area
• Canadian River (site 112; OK)	viable	1
• Cimarron River Terrestrial (site 46; OK)	viable	1

Arkansas River Speckled Chub (AFCJB53070)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Big River Fish Assemblage (OTHER0009)	Viability of Occurrences	#Occ. in this Area
• Elkhorn River (site 71; NE)	viable	1
• Little Blue River (site 85; NE)	viable	1
• Loup River (site 82; NE)	viable	1
• Platte River (site 84; NE)	viable	2
• Republican River (site 86; NE/KS)	non-viable	1

Blanding's Turtle (ARAAD04010)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Conchas Crayfish (ICMAL11110)	Viability of Occurrences	#Occ. in this Area
• Canadian River (site 112; OK)	viable	1

Cylindrical Papershell (IMBIV05010)	Viability of Occurrences	#Occ. in this Area
• Loup River (site 82; NE)	non-viable	1
• Republican River (site 86; NE/KS)	non-viable	1

Flathead Chub (AFCJB57010)	Viability of Occurrences	#Occ. in this Area
• Cedar River (site 77; NE)	viable	1
• Dismal River - Middle Loup River (site 79; NE)	viable	1
• Elkhorn River (site 71; NE)	non-viable	1
• Loup River (site 82; NE)	viable	1
• Niobrara River (site 64; NE)	viable	1
• North Loup River and Tributaries (site 74; NE)	viable	1
• Platte River (site 84; NE)	non-viable	1
• South Loup River (site 83; NE)	viable	1
• Upper Red River and Tributaries (site 127; OK/TX)	non-viable	1

Gravel Bottom Mussel Assemblage (OTHER0005)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Headwater Fish Assemblage (OTHER0007)	Viability of Occurrences	#Occ. in this Area
• Medicane Creek Watershed (site 124; OK)	viable	1
• Niobrara River (site 64; NE)	viable	1
• Sand Draw Creek Watershed (site 70; NE)	viable	1

Plains Killifish (AFCNB04210)	Viability of Occurrences	#Occ. in this Area
• Canadian River (site 112; OK)	viable	1

• Cimarron River (site 100; OK)	viable	1
• Dismal River - Middle Loup River (site 79; NE)	viable	1
• Little Blue River (site 85; NE)	viable	1
• Platte River (site 84; NE)	viable	2
• Republican River (site 86; NE/KS)	non-viable	1
• Republican River (site 86; NE/KS)	viable	1
• South Loup River (site 83; NE)	non-viable	1
• Upper Red River and Tributaries (site 127; OK/TX)	viable	1

Plains Minnow (AFCJB16050)	**Viability of Occurrences**	**#Occ. in this Area**
• Cedar River (site 77; NE)	viable	1
• Cimarron River (site 100; OK)	non-viable	1
• Dismal River - Middle Loup River (site 79; NE)	viable	1
• Little Blue River (site 85; NE)	non-viable	1
• Loup River (site 82; NE)	viable	1
• Medicine Lodge River and Tributaries (site 93; NE/KS)	viable	1
• North Loup River and Tributaries (site 74; NE)	viable	1
• Platte River (site 84; NE)	viable	2
• Republican River (site 86; NE/KS)	viable	2
• Republican River (site 86; NE/KS)	non-viable	1
• South Fork of Ninnescah River (site 91; KS)	viable	1
• South Loup River (site 83; NE)	viable	1
• Upper Red River and Tributaries (site 127; OK/TX)	viable	1

Red River Pupfish (AFCNB02100)	**Viability of Occurrences**	**#Occ. in this Area**
• Upper Red River and Tributaries (site 127; OK/TX)	viable	4

Red River Shiner (AFCJB28160)	**Viability of Occurrences**	**#Occ. in this Area**
• Upper Red River and Tributaries (site 127; OK/TX)	viable	4

Sandhills Headwater Stream Community (OTHER0010)	**Viability of Occurrences**	**#Occ. in this Area**
• Dismal River - Middle Loup River (site 79; NE)	viable	1
• Evergreen Creek - Cedar Creek (site 65; NE)	viable	1
• Niobrara River (site 64; NE)	viable	3
• North Loup River and Tributaries (site 74; NE)	viable	5
• Upper Snake River (site 67; NE)	viable	1

Shovelnose Sturgeon (AFCAA02020)	**Viability of Occurrences**	**#Occ. in this Area**
• Platte River (site 84; NE)	non-viable	2
• Republican River (site 86; NE/KS)	viable	1

Spring Invertebrate Assemblage (OTHER0011)	**Viability of Occurrences**	**#Occ. in this Area**
• Bitter Creek Watershed (site 107; OK)	viable	1
• Indian Creek Watershed (site 104; OK)	viable	1
• Upper Red River and Tributaries (site 127; OK/TX)	viable	2

Sturgeon Chub (AFCJB53020)	**Viability of Occurrences**	**#Occ. in this Area**
• No areas selected for this target	n/a	0

Topeka Shiner (AFCJB28960)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Western Silvery Minnow (AFCJB16010)	Viability of Occurrences	#Occ. in this Area
• Cedar River (site 77; NE)	viable	1
• Dismal River - Middle Loup River (site 79; NE)	viable	1
• Little Blue River (site 85; NE)	non-viable	1
• Loup River (site 82; NE)	viable	1
• North Loup River and Tributaries (site 74; NE)	viable	1
• Platte River (site 84; NE)	viable	2
• Republican River (site 86; NE/KS)	viable	1
• Republican River (site 86; NE/KS)	non-viable	1
• South Loup River (site 83; NE)	viable	1

Yellow Mud Turtle (ARAAE01020)	Viability of Occurrences	#Occ. in this Area
• No areas selected for this target	n/a	0

Appendix 6. Terrestrial Threats Assessment for the Central Mixed-Grass Prairie Ecoregion.

An assessment of the critical threats facing each terrestrial conservation area aids conservation planners in the prioritization of conservation activity. In addition, examining threats at the ecoregional scale can provide information about threats common across the entire planning area.

Other ecoregional planning efforts have lacked a systematic, data driven approach for the assessment of threats. In some cases, teams have relied solely on individual opinion regarding the level of threat within each conservation area. These opinions are often solicited from individuals with only state-specific knowledge. Sites identified as highly threatened using this approach may not be comparable across state lines. The end result, consequently, is the identification of the most highly threatened sites within each state, rather than the most highly threatened sites across the region.

To assess region-wide terrestrial threats and to objectify the threat assessment across all states in the Central Mixed-Grass Prairie region, we created a systematic approach using available GIS databases. Land use, vegetation cover type, and other indicators of threat were assessed across the entire region to illustrate current threat status. Available GIS data included:

- land uses and land type;
- invasive woody vegetation (as an indicator of fire suppression);
- center pivot irrigation wells;
- superfund sites;
- active mine operations (in this region tended to be grave);
- concentrated agricultural feedlot operations; and
- road density.

In this conceptual model, **indicators of threat** are translated into numeric scores (Table 1) which are applied in a GIS to develop a map indicating high, medium, and low threat status. The ecoregion was first divided into a grid composed of 100-acre cells. Each grid cell accumulates a **numeric score** from 0-9 based on points assigned to each of the indicators of threat. The sum of these scores for each grid cell determines a numeric **threat score**. For example, if a cell contained converted land uses, high road density, and an irrigation well, it would earn a threat score of 4 (2 for converted land uses + 2 for high road density + 1 for irrigation well = 4). The frequency of threat scores was examined for natural breaks in order to translate the threat scores into three descriptive categories of **threat status**: high, medium, and low. Figure 1 illustrates the threat status for all grid cells across the ecoregion.

Relative threat status within each conservation area was summarized to indicate the overall **threat rank** of each conservation area. If a conservation area contained 25% or more high threat status grid cells OR 10% or more high threat status grid cells and 65% or more medium grid cells – then the overall threat rank for the site was determined to be high. If a site contained between 40-65% of cells with medium threat status, the overall threat rank for the site was determined to be medium. All other conservation areas received a low threat rank. Overall threat ranks for each terrestrial site can be found in Appendix 4.

Since completing this assessment, it has been suggested that there are additional data that could be added to the model. Wind power resource maps could indicate potential energy development projects and subsequent threats to avian conservation targets. In addition, there are more accurate data depicting woody encroachment in Oklahoma. Due to time constraints in this planning process, these data were not incorporated into the model. The planning team will work on refinements in future iterations of planning.

Table 1. Threat scores and definitions.

indicators of threat	numeric score	data sources/methodology
1-50% of cell is made up of converted land uses	2	converted land uses derived from state GAP programs: NE – 12: agricultural fields NE – 14: fallow agricultural fields NE – 19: low intensity residential NE – 20: commercial/industrial/transport. KS – 44: cultivated land KS – 81: urban areas OK – 145: agriculture OK – 147: crop – warm season OK – 153: residential/industrial
51-100% of cell is made up of converted land uses	3	definitions same as above
51-100% of cell is made up of low quality/non-native grasslands	1	low quality/non-native grasslands derived from state GAP programs: NE – no classification for non-native grass KS – 40: non-native grassland KS – 41: CRP KS – 60: mixed prairie – disturbed OK – 149: improved/introduced pasture
51-100% of cell is made up of invasive woody vegetation (indicator of fire suppression) for Nebraska and Kansas	1	invasive woody vegetation derived from state GAP programs: NE – 3: juniper woodland KS – 42: salt cedar or tamarisk shrubland
51-100% of cell is made up of invasive woody vegetation (indicator of fire suppression) for Oklahoma	3	invasive woody vegetation derived from state GAP programs: OK – 51: eastern red cedar woodland OK – 52: eastern red cedar-oak woodland OK – 80: mesquite shrubland OK – 116: shrub layer of deciduous thorny shrub OK – 162: tallgrass cedar savanna
presence of at least 1 center pivot irrigation well within the cell	1	point data from The Nature Conservancy's Freshwater Initiative (origin unknown)
presence of a superfund site within the cell	1	point data from Environmental Protection Agency Basins CD
presence of at least one mine within the cell	1	point data from Environmental Protection Agency Basins CD
presence of concentrated agricultural feedlot operations (CAFOs)	1	CAFOs are regulated by the Nebraska Dept of Environmental Quality, the Kansas Dept of Health and Environment and the Oklahoma Dept of Environmental Quality. The departments would only provide information regarding the mailing address for each permit. We incorporated this information into our spatial model as follows: ▪ if a town had 1 CAFO permit, that town was buffered by 1 km and all cells within the buffer earned a score of 1 ▪ if a town had 2-25 CAFO permits, that town was buffered by 5 km and all cells within the buffer earned a score of 1 ▪ if a town had more than 26 CAFO permits, that town was buffered by 10 kim and all cells within the buffer earned a score of 1

medium road density within cell	1-3	Road data was obtained from Tiger. We incorporated this information into our spatial model as follows: ▪ if a grid cell contained a road, it received a score of 1 ▪ a proximity analysis was run to create another grid showing the density of roads. The proximity analysis adds the values from all adjacent neighboring cells. (For example, a value of 8 means a cell is surrounded roads on all sides while a value of 1 is a dead-end road with only one connection. ▪ the proximity values were then grouped to assign a threat value: 1-2 = low, threat value of 1 3-7 = med, threat value of 2 8-9 = high, threat value of 3
oil threat	1	point data from TNC data archives, unknown origin

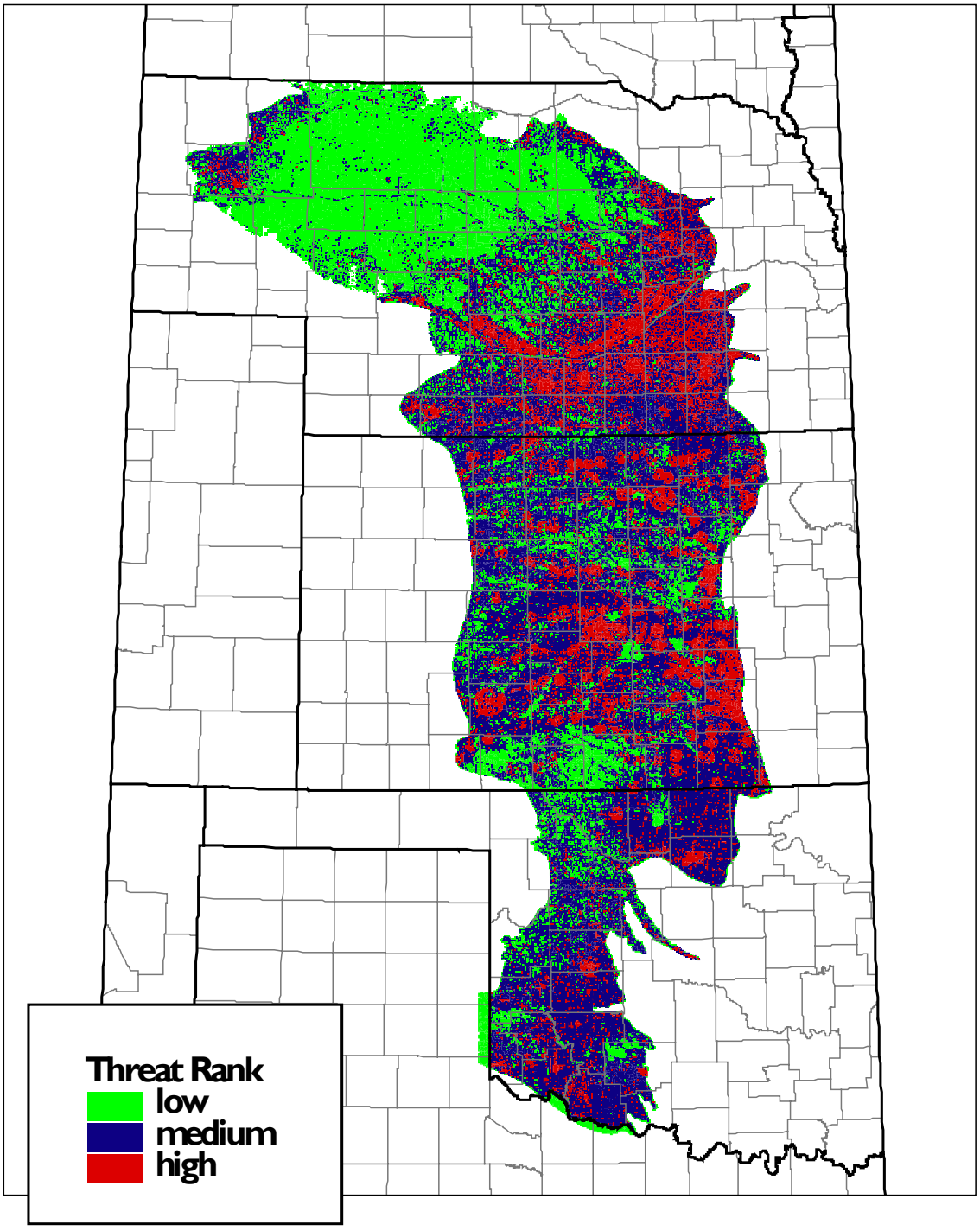

Figure 1. Threat rankings for Central Mixed-Grass Prairie Ecoregion.