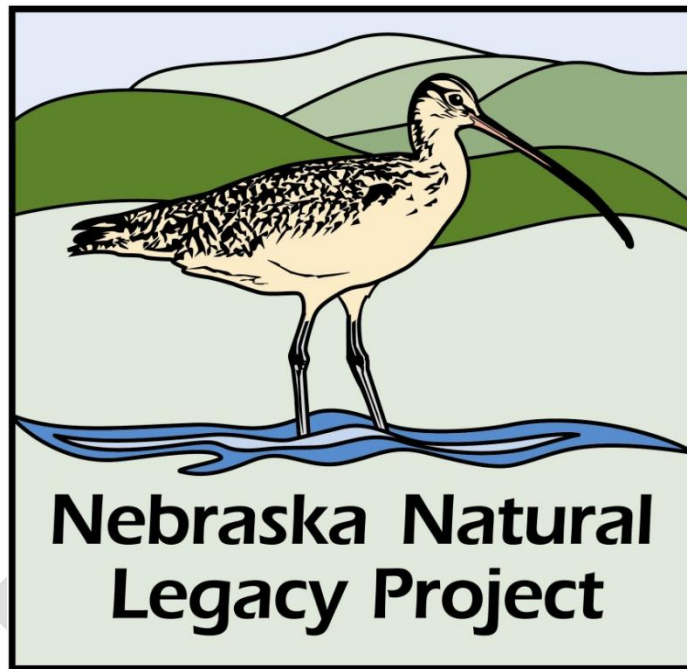


The Nebraska Natural Legacy Project



State Wildlife Action Plan

3rd edition

2025

DRAFT

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3rd Edition

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The Nebraska Game and Parks Commission

Lincoln, NE

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Numerous individuals contributed to the success of this endeavor. This edition builds on the efforts of previous editions and authors. Appendix 1 lists the members of the various teams that worked on this edition of the Nebraska Natural Legacy Project.

DRAFT

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Chapter 1

Introduction and Purpose

Mission Statement

The mission of the Nebraska Natural Legacy Project is to implement a blueprint for conserving Nebraska's flora, fauna and natural habitats through the proactive, voluntary conservation actions of partners, communities and individuals.

To facilitate the development and implementation of a state wildlife action plan for Nebraska, the following guiding principles were developed by the Partnership Team.

Guiding Principles

Through the process of development, the Nebraska Natural Legacy Project shall...

- ... be open, transparent and inclusive.
- ... be built on a foundation of sound economic and scientific principles.
- ... keep the public informed and involved.

The blueprint produced by the Nebraska Natural Legacy Project shall...

- ...recognize private landowner participation is critical to the project's success.
- ...recognize and respect property rights and address property issues.
- ...have opportunities for conservation actions and partnerships across the state.
- ...ensure all participating are respected and treated fairly.
- ...encourage involvement through consistent and thorough information exchange.
- ...provide opportunities for developing conservation partnerships regardless of ownership.

Conservation actions as a result of the Nebraska Natural Legacy Project shall...

- ... be voluntary and incentive based.
- ... minimize the use of land acquisition as the primary tool for habitat conservation and instead principally use actions directed toward collaborative conservation on public and private lands.

Purpose and Need

In Nebraska, our connection with nature is deeply rooted in the state's history, culture, and economy. Nebraskans have depended on the land for their livelihoods, especially through farming, ranching and outdoor recreational activities like hunting, fishing, camping, and birdwatching, which are traditions that have been passed from generation to generation. This close relationship with the land and appreciation for nature has fostered a deep respect for our state's natural resources, reinforcing a strong sense of stewardship and responsibility for its care

Stewardship of the land is not only important for the livelihoods of many Nebraskans, but also for the rich biological diversity of our state. Thousands of plant and animal species, from the buttes of the high plains across the rolling prairies to the oak woodland savannas along the Missouri River, coexist to form complex relationships that together create healthy lands. These species along with the habitats they occupy, form Nebraska's natural heritage – a legacy to be treasured.

Unfortunately, our state, as is the planet, is experiencing a biodiversity crisis. Numerous stressors, including habitat loss and degradation, disease, pollution, extreme weather events, and the introduction and spread of non-native and invasive species, have compounded to cause the declines of our native species. More than half of all bird species in the United States are declining, including grassland species that have lost 34% of their population since 1970. Over half of the known bat species in North America face a high risk of decline in the next 15 years. Nearly a quarter of all native North American pollinators, including the monarch butterfly, are at an elevated risk of extinction. Freshwater fish and mussels, with over 40% and 70% affected, respectively, are experiencing declines, and many face extinction. Landownership patterns in Nebraska present unique challenges and opportunities to address threats to biodiversity. But due to these declines, a comprehensive, systematic, and proactive approach to conserve Nebraska's natural heritage — that leverages the partnerships described in this plan to achieve success on private and public lands — was developed.

Conservation Funding

Conservation efforts have proven to be successful if federal funding is provided to state fish and wildlife agencies to manage their natural resources. The Federal Aid in Wildlife Restoration Act (Pittman-Robertson) and the Federal Aid in Sport Fisheries Restoration Act (Dingell Johnson, Wallop-Breaux), which mandate federal excise taxes on hunting and fishing equipment, respectively, have sent over a billion dollars to states each year to implement conservation efforts. These dollars have resulted in the long-term conservation planning and successful recovery of numerous game species, such as white-tailed deer, pronghorn antelope, elk, Canada geese, turkey, and walleye that were in low numbers or extirpated from the state in the early 1900s; each has shown significant population recoveries. Additionally, the Cooperative Endangered Species Conservation Fund (Section 6 of the Endangered Species Act; ESA) has provided millions of dollars to states and territories to conserve threatened and endangered species. The most notable recovery from these funds is the Bald Eagle, once on the brink of extinction, delisted from the ESA in 2007. Despite conservation successes, the distribution of

federal assistance to conserve species experiencing population declines, (even among species that have not met federal requirements for ESA listing), has not matched the urgency necessitated by the biodiversity crisis.

In the mid-1990s, more than 6,000 organizations representing a diverse array of conservation organizations and wildlife enthusiasts created one of the largest grassroots coalitions in our nation's history, known as Teaming with Wildlife. This coalition demonstrated the importance and need for conservation funding to address the biodiversity crisis. In response, Congress established the Wildlife Conservation and Restoration program and the State Wildlife Grants program in 2001. To be eligible for funding, states developed State Wildlife Action Plans (SWAPs) containing eight required elements (listed below). These plans gave authority to the states to spend federal funding to conserve declining fish and wildlife species and aimed to provide voluntary and proactive conservation efforts to reverse their declines. While this was a necessary first measure in implementing these conservation actions, the roughly \$65 million provided annually fell far short of the estimated \$1.3 billion needed annually to successfully implement SWAPs. Efforts continue to be made to provide dedicated funding for the implementation of SWAPs; until those efforts are successful, states like Nebraska will continue to maximize the funding available and seek alternative funding sources to aid in implementing conservation actions.

Nebraska's State Wildlife Action Plan

Nebraska's first SWAP was published in 2005. This edition became the foundation for all future Nebraska SWAPs. The goal was to create a guidance document that was scientifically based and supported. Additionally, rather than focus on an individual species approach, Nebraska took the perspective that prioritizing conservation efforts in key habitats (defined as Biologically Unique Landscapes; Chapter 4) would conserve the greatest diversity of species in the state. Because our state is more than 97% privately-owned, successful conservation cannot be accomplished on remaining public lands within state borders. Thus, working cooperatively and collaboratively with private landowners was integral to successful implementation of the plan. Since the SWAP is intended to be a guidance document and not a regulatory one, a primary focus during the drafting of the first plan was to gather the input and subsequent support from private landowners and landowner organizations. Listening sessions were hosted across the state to gather insight and perspectives from interested parties and create a plan with actions that landowners were invested in.

The resulting document established the mission statement, guiding principles (defined at the beginning of this chapter), methodology (chapter 3), and overall format that has been retained through all three editions. It also established four goals:

- 1 – Reverse the decline of at-risk species — and avoid the need for state or federal listing as threatened or endangered:** As mentioned above, this was the intent of the Wildlife Conservation and Restoration program, the State Wildlife Grants program, and SWAPs. Nebraska has identified these at-risk species as Species of Greatest Conservation Need (SGCN).

2 – Recover currently listed species and allow for their de-listing: While the main objective of the SWAP is to reverse the decline of at-risk species, those listed as state or federally threatened or endangered are the highest priority for conservation.

3 – Keep common species common: At one point, many of the SGCN were common species in Nebraska. While the focus is on at-risk species, attention also should be placed on species that are currently common in the state and ensure they remain abundant.

4 – Conserve natural communities: With more than 600 species identified in each edition of the SWAP, conserving one species at a time is not feasible. Thus, conserving the natural communities they occur in provides the greatest opportunity to maximize conservation efforts in the state.

Because the first edition was developed off a foundation of gathering and incorporating feedback from partner organizations and the public, a proactive comprehensive review of the SWAP was initiated after five years to revisit the plan. The five-year comprehensive review used a similar process to the plan's initial development, and a second edition was published in 2011, which revised the SGCN and the Biologically Unique Landscape boundaries.

Given the annual update of available data on abundance, distribution, and population trends of SGCN, a minor revision was completed in 2018 to update the list of SGCN. In this supplement, 51 species were added, and 84 species were removed. The decision to remove species included improved conservation status, presumed extirpation following 25 years with no documented occurrences, infrequent occurrence in the state, questionable taxonomy, and uncertainty of the species' origin (i.e., introduced).

This third edition builds upon the success of the previous editions. In addition to updating the content within the plan and meeting the eight required elements (described below), the major additions to this edition were the inclusion of an aquatic conservation chapter and improving the relevancy of the plan. In previous editions, the focus has typically been placed on terrestrial systems; however, at-risk aquatic species conservation in recent years highlighted that aquatic systems, if conserved, could lead to the persistence or recovery of a large number of species. To improve the relevancy of the plan, this edition significantly enhances the actions and resources available for wildlife education and wildlife-related recreation. This addition should create new opportunities for a broader audience to access and use the SWAP.

Value of Conserving Nebraska's Natural Legacy

Conservation of our natural world is vital for preserving Nebraska's natural heritage, supporting healthy ecosystems, sustaining agricultural practices, and fostering outdoor traditions. In a state where the economy is dependent on the land, it is easy to quantify the value of sustainable agricultural practices, and the revenue generated from hunting, fishing, wildlife viewing, and tourism. It can, however, be difficult to associate a monetary value of a healthy ecosystem or the state's biodiversity. Clean air, soil, and water are all staples of a functioning

ecosystem and provide clear intrinsic values to our physical and mental health. Meanwhile, the health of these ecosystems is dependent upon the complex networks of relationships among plant and animal species. The removal of any one species creates a void with unknown effects to the system. That niche may be filled by another species, or it may start a cascading effect whereby other species begin to disappear from that system as well. Whether the benefits of a single species maybe realized, their disappearance may have unintended consequences resulting in complete ecosystem collapse.

Over the past 20 years, SWAPs have served as blueprints for conserving at-risk species and habitats. However, in Nebraska, the plan has become so much more than that. The original authors of this plan recognized the unique opportunities this plan presented and used it as an opportunity to foster new partnerships and relationships in the name of at-risk species conservation. At the species level, this plan has recovered species like the North American River Otter, it has collected and incorporated valuable data on at-risk species for the Natural Heritage database, and it has been used as a means to bring awareness to the biodiversity crisis we are facing in our own state.

Perhaps the most important success of this plan to date is how it has fostered a stewardship of the land focused on conserving at-risk species and habitats while also improving the quality of private working lands in our state. Our SWAP has showcased how conservation and agriculture do not have to be mutually exclusive for both to be successful. From the plan's development to its implementation, private landowners have been integral to the creation and adoption of wildlife-friendly farming and ranching practices that have allowed the state's biodiversity to persist and recover. Since 2005, over 500,000 acres of working lands have been directly affected by state wildlife grant dollars from prescribed burning and tree removal to the spraying of noxious weeds and deferred grazing. Going forward, we intend to continue using at-risk species funding to support landowners interested in adopting these practices.

As a whole, Nebraska's SWAP has evolved beyond the conservation of at-risk species. Any single action will have minimal impacts to at-risk species recovery; however, the collective efforts through collaboration and investment by state and federal agencies, nongovernment organizations, Tribal Nations, private landowners, and the public have made this plan successful and can continue to make it a success. Our goal should be to leave behind a natural legacy future generations can be proud of. As the first edition of our SWAP, it was fittingly renamed "the Nebraska Natural Legacy Project." It is now our responsibility to carry that natural legacy into the future.

Eight Required Elements of the State Wildlife Action Plan

Congress identified eight required elements to be addressed in these wildlife conservation plans (see below). Further, the plan must identify and be focused on the "species in greatest need of conservation," yet address the "full array of wildlife" and wildlife-related issues. They must provide and make use of:

Element 1. Species: Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife; and,

Element 2. Habitats: Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in (1); and,

Element 3. Threats/stressors: Descriptions of problems that may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors that may assist in restoration and improved conservation of these species and habitats; and,

Element 4. Actions: Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions; and,

Element 5. Monitoring: Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions; and,

Element 6. Review and revision: Descriptions of procedures to review the plan at intervals not to exceed ten years; and,

Element 7. Partner involvement: Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and with Tribal Nations that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.

Element 8. Public involvement: Congress also affirmed through legislation that broad public participation is an essential element of: (1) developing and implementing these plans, (2) the projects that are carried out while these plans are developed, and (3) the Species in Greatest Need of Conservation that Congress has indicated such programs and projects are intended to emphasize.

Below, we provide a summary of how each of the eight elements was addressed in this third edition of the plan:

Element 1 – Seven species expert work groups meetings were completed in early 2025. Taxonomic experts from across the state (Appendix 1) were identified to review the lists of SGCN, which was last updated in 2018, to suggest species for considered addition. These work groups included birds, fish, reptiles and amphibians, invertebrates, mammals, mollusks, and plants. These suggestions were reviewed by the Science Team and approved by the Partnership Team. In total, 686 species were classified as SGCN; this includes 123 Tier I species and 563 Tier II species. Compared to the 2018 supplement, 53 species were removed. Seventeen species were added, including seven

Tier I species and 10 Tier II species. See appendix 8 for the complete list of SGCN. See Chapter 3 for details on Tier I and Tier II designations.

Element 2 – In the fall of 2024, a call for proposals was made to add, remove, or revise boundaries of our state’s Biologically Unique Landscapes (BULs). Feedback on the proposals was provided by the Habitat Implementation Team to evaluate the ability to complete conservation actions in those areas; the Science Team then considered these comments along with their own feedback to determine whether proposals would be approved or rejected. Finally, the Partnership Team approved the recommendations from the Science Team. Of the ten proposals received, seven changes were approved. These included the creation of new Biologically Unique Landscapes (BULs): Running Water combined the former Lower Niobrara and Verdigris-Bazile BULs and added new areas, and Missouri River and Bluffs combined the former Missouri River BUL with the Indian Cave, Ponca, Rulo, and Thurston-Dakota Bluffs BULs and added new areas. Revisions also were made to the boundaries of the Elkhorn Confluence, Keya Paha, Middle Niobrara, and Willow Creek BULs. In addition, the entirety of the Nebraska Sandhills was recognized as a Biologically Unique Ecoregion. These changes added nine million acres to conservation priority.

Priority Watersheds also were identified for conservation (Chapter 9). Priority watersheds were proposed using criteria suggested at an aquatic conservation workshop in February 2024 and selected by the Aquatics Team following feedback gathered from attendees of a separate workshop in early 2025. These recommendations were presented to the Science Team and approved by the Partnership Team. Twenty priority watersheds, consisting of 63 Hydrologic Unit Code (HUC) 10s and three HUC 12s, were identified to prioritize conservation of aquatic SGCN.

Element 3 – Implementation input meetings were hosted at 11 locations (Omaha, Lincoln, Norfolk, Ord, Valentine, North Platte, Kearney, Chadron, Scottsbluff, Beatrice and O’Neill) across Nebraska between the fall of 2023 and spring of 2024 to review the existing threats and stressors to ecoregions and BULs. At these workshops, local conservation groups provided suggestions to update the language, remove irrelevant threats, and add novel threats. For new BULs and watersheds, proposals were encouraged to include threats, which were reviewed by the Habitat Implementation and Aquatic Teams, respectively. In the Species Expert Workgroup Meetings, taxonomic experts revised the threats to tier 1 SGCN.

Element 4 –The core team attempted to ensure actions for BULs and Priority Watersheds were identified to address each threat or stressor within that system. These actions were gathered from the implementation input meetings and watershed feedback surveys, respectively.

Element 5 – The expansion of the fine-filter framework in this edition included a category that seeks to prioritize inventory and monitoring on species for which we lack data. The Species of Greatest Information Need (SGIN) designation was applied to 29 species across the taxa. Along with this designation, the information needed to remove

the species from the list and therefore calculate a subnational rank is also listed (see Appendix 8). The SWAP continues to outline the need for species and natural communities' inventory and monitoring. This edition will use the populations of common species to help assess the effectiveness of conservation actions to inform conservation management in real time.

Element 6 – The SWAP is intended to be a living and working document using the best science available; thus, it requires periodic review and revision. Within the next 10 years, a comprehensive review of the plan will be conducted. Retaining a similar process to the initial drafting of the plan, the two revisions, and the supplement, the incorporation of feedback and ideas from other conservation partners and members of the public will be integral to the successful development and revision of the plan. The Commission's Natural Heritage database will continue to be promoted and serve as a repository for information on at-risk species, habitats, and Biologically Unique Landscapes. As inventory and monitoring surveys and other research projects are completed, pertinent data will be integrated into the database.

Element 7 – The involvement of partner organizations, through their feedback and expertise, helped make this SWAP revision possible. In addition to the partnership team, which helped promote participation in the revision process and review contents of the plan, representatives from partner organizations were members of the Aquatics, Habitat Implementation, Science, Wildlife Education, and Wildlife Recreation teams, and participants in the implementation input meetings, the aquatic conservation workshop, the species expert work groups, and the Wildlife Education workshops.

Element 8 – Public input meetings were hosted at 11 locations across the state in fall 2022 into early 2023. Presentations also were given at various events to share information about the SWAP revision process. In late July 2025, a draft of the third edition was made available for public comment and an informational meeting occurred in August 2025 to introduce the public to the third edition of the plan and the proposed changes. A primary objective of the 2025 edition was to improve the relevancy of the plan. Thus, feedback was gathered on wildlife education and wildlife-related recreation to significantly bolster these areas of the plan and allow for a larger contingency of Nebraskans to contribute to at-risk species conservation through the SWAP.

Chapter 2

Plan Development Process

Organizational Structure

The Nebraska Natural Legacy Project is designed to be a blueprint for biological diversity conservation in Nebraska. Its development has been contingent on the input of many agencies, organizations, and individuals. The successful implementation of the Natural Legacy Project is dependent on the collaboration and coordination of these entities. Seven teams were established to oversee the completion of this third edition of the plan. The entirety of this edition's development, built off the foundation of two prior editions (and one supplement), was accomplished by a Core Team consisting of four biologists from the Nebraska Game and Parks Commission. The remaining six teams, consisting of leadership and experts from various organizations across the state, assisted in this process by gathering content, providing expertise for their respective areas, and helping to write and/or review drafts of the plan. See Appendix 1 for a list of the members of each team.

Partnership Team

The partnership team includes representatives from federal and state agencies, nongovernmental organizations, and Indigenous Nations (see box). The team played a key role in developing guiding principles for plan. Its responsibilities included ensuring the plan was effective and useful to a variety of entities, assisting with planning efforts and participating in input meetings, reviewing initial drafts of the plan, and providing guidance during plan implementation. The partnership team represents many of the entities and individuals that have been involved in implementing this blueprint.

Partnership Team

Audubon Great Plains
Natural Resources Conservation Service
Nebraska Alliance for Conservation and Environment Education
Nebraska Association of Resources Districts
Nebraska Cattlemen
Nebraska Chapter of The Wildlife Society
Nebraska Cooperative Fish and Wildlife Research Unit
Nebraska Corn Board
Nebraska Department of Agriculture
Nebraska Department of Transportation
Nebraska Department of Water, Energy, and Environment
Nebraska Ducks Unlimited
Nebraska Farmers Union
Nebraska Forest Service
Nebraska Game and Parks Commission
Nebraska Grazing Lands Coalition
Nebraska Land Trust
Nemaha Natural Resources District
Pheasants Forever
Ponca Tribe of Nebraska
Rainwater Basin Joint Venture
Sandhills Task Force
Santee Sioux Nation
The Nature Conservancy
U.S. Fish and Wildlife Service
U.S. Forest Service

Aquatics Team

A new addition to the third edition of the Natural Legacy Project, this team consisted of 10 members, including Commission staff from three divisions, as well as representatives from the Nebraska Department of Water, Energy, and Environment, University of Nebraska—Lincoln, The Nature Conservancy, and the U.S. Fish and Wildlife Service. The team was responsible for the creation of the Aquatic Conservation chapter (Chapter 9). Their primary role was to develop criteria for priority watersheds, review feedback from aquatic professionals across the state, and develop strategies for the conservation of aquatic species in Nebraska.

Core Team

This team was composed of four Commission staff including the Natural Heritage Program Manager, the Natural Heritage Data Manager, the Wildlife Diversity Program Manager, and the Wildlife Diversity Biologist. They served in a planning and facilitation role to coordinate all team, implementation, and public input meetings. They also oversaw the development and writing of the plan.

Habitat Implementation Team

This team was a new addition for the third edition of the plan and consisted of 27 members, including Commission staff, other government agencies, nongovernmental organizations, and the University of Nebraska—Lincoln. This team was responsible for promoting local attendance at the implementation and public input meetings, providing input on Biologically Unique Landscapes and conservation actions from an implementation perspective, and suggesting new Legacy Demonstration Sites.

Internal Support Team

The internal support team consisted of administrative and long-tenured Commission staff who provided guidance and technical support to the core team through the revision process. Given that the core team consisted of staff who were not with the Commission during the previous iterations of the plan, the internal support team was able to share knowledge of the plan's history, including its contents and the methodology used.

Science Team

This team was composed of science staff from the Game and Parks' Wildlife and Fisheries Divisions, faculty from the University of Nebraska—Lincoln School of Natural Resources, and representatives from nongovernmental organizations in the state. The team was charged with developing the scientific approach of the plan (see Chapter 3) and approving changes to the Tier I, Tier II, and Species of Greatest Information Need (SGIN) lists, and the Biologically Unique Landscapes. Since these were major changes to the prioritization framework of coarse and fine filters, the Science Team was integral to guiding the revision process and innovation in this third edition. These changes included the new designations of Priority Watersheds, Biologically Unique Ecoregion, and SGIN.

Wildlife Education Team

This team was composed of naturalists, formal educators, Project WILD, Project WET and Learning Tree Coordinators and administration staff from the Nebraska Department of Education. The role of this team was to identify the needs for both formal and nonformal conservation and environmental education and develop statewide strategies to address these needs.

Wildlife Recreation Team

This team included recreation planners and specialists from across the state, including Commission staff, and representatives from municipal parks and recreation departments,

International Mountain Bicycling Association, Kearney Whitewater Association, Nebraska Horse Trails Committee, Northwest Nebraska Trails Association, West Point Trails Network, and Nebraska Natural Resources Districts. The team identified opportunities where nature-based recreation can strengthen people's connection to nature and build broader public support for wildlife conservation. Recognizing growing interest in diverse outdoor activities, the team emphasized sustainable recreation planning that balances access with conservation, ensuring long-term ecological health and thriving outdoor experiences statewide.

Public Involvement

The Partnership and Habitat Implementation Teams actively assisted with the public input process. These teams assisted in developing the structure of these meetings by determining what input would be valuable to gather, sponsoring or aiding in facilitating public meetings, and promoting the events to the public. These teams determined it would be best to carry on the tradition of hosting in-person meetings across the state representing each of the four ecoregions (Tallgrass Prairie, Mixed-grass Prairie, Sandhills, and Shortgrass Prairie). After evaluating the meeting locations for the previous editions of the plan, some locations were moved, and one additional location was added. These meetings were hosted during the fall of 2023 and early 2024 at 11 locations (Scottsbluff–October 11, Chadron–October 12, Omaha–October 17, Ord–October 19, Valentine–October 24, Lincoln–November 1, Beatrice–January 10, North Platte–January 17, O'Neill–January 23, and Norfolk–January 24, and Kearney–February 28).

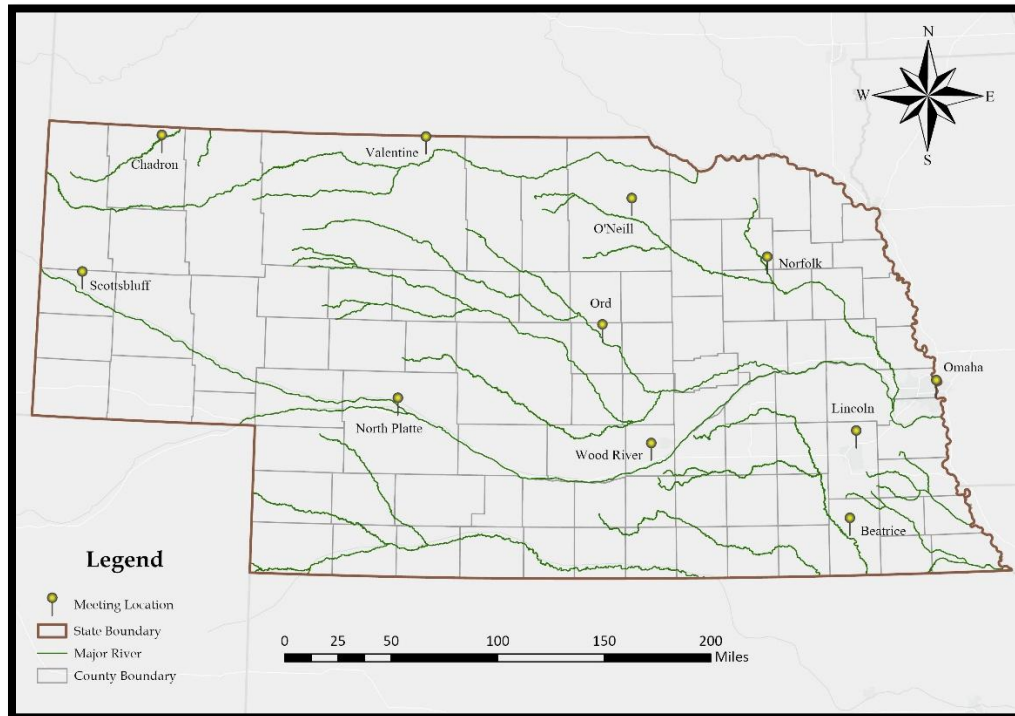
At these meetings, members of the public were introduced to the previous edition of the plan and learned about the process being used to revise it. Following the presentation, attendees were encouraged to share thoughts and feedback on the process or concerns regarding the current edition. Following the Q&A portion of the meeting, attendees were provided print conservation materials including the second edition of the plan and had the opportunity to meet and talk to local conservation practitioners from the Commission and other conservation organizations about the plan.

In the summer of 2025, a complete draft of the third edition was made available for public comment on July 28 and an online meeting occurred on August 6 to introduce the changes made in this edition. Comments were received through August 15 and were used to finalize the third edition of the plan.

Conservation Practitioner Involvement

Because this edition of the plan was a revision of the 2011 edition, the goal of the implementation input meetings was to review the existing information on strategies and stressors and update them accordingly. Corresponding with the public input meetings, 11 daylong workshops were hosted across the state in the fall of 2023 and early 2024 (Scottsbluff–October 11, Chadron–October 12, Omaha–October 17, Ord–October 19, Valentine–October 24,

Lincoln–November 1, Beatrice–January 10, North Platte–January 17, Wood River–January 18, O’Neill–January 23, and Norfolk–January 24).



Map showing meeting locations for conservation professional input and public input

At these meetings, conservation professionals were presented with the purpose of the Nebraska Natural Legacy Project, the process of the revision, and instructions for the workshop. The attendees were then broken into small groups to network and review the stressors to the ecoregions and the stressors to and actions within the Biologically Unique Landscapes relevant to the local area. For each stressor or action, the small groups were asked whether that topic was still applicable and whether any changes needed to be made. Once the stressors and actions were reviewed, participants had the opportunity to suggest any novel threats or stressors not identified in the previous edition of the plan. Across the 11 meetings, 192 individuals representing 44 organizations provided their expertise to inform the plan.

At the conclusion of these meetings, an online survey was also distributed to gather feedback from those unable to attend the implementation input meetings, for those wanting to provide comments on areas that were not covered in the meeting they attended, or for those that had additional feedback following the workshop. The survey was completed by 30 people representing 18 organizations.

Aquatics Professionals

The Aquatics Team developed questions to address aspects of the eight required elements of the Natural Legacy Project with regards to aquatic conservation. An in-person workshop was

hosted in Aurora at the conclusion of the Nebraska Chapter of the American Fisheries Society meeting on February 14, 2024. This meeting was attended by 27 individuals representing six organizations. Questions ranged from criteria to consider when identifying priority watersheds to threats that aquatic systems are facing and actions to counteract those threats. After the meeting, an online survey was made available for those unable to attend the workshop or those who wanted to provide more feedback. In total, input was received from 51 aquatics experts representing 14 organizations.

Education Professionals

To gather input on improving education and outreach, the core team hosted a workshop during the Nebraska Alliance for Conservation and Environmental Education (NACEE) conference at Ponca State Park on February 28, 2024; it was attended by 20 educators. The Fish and Wildlife Education Division also hosted five in-person workshops in the summer of 2024 to gather input for the plan revision (Gretna—two sessions—June 6, Scottsbluff—June 25, North Platte—June 26, and Hastings—June 28). These meetings were attended by 44 educators from across the state.

Species Expert Work Groups

One-day workshops were conducted with experts on birds, fishes, mammals, insects, mollusks, reptiles/amphibians, and plants in Nebraska. The goals of the workshops were to review and revise the Natural Legacy Project list of at-risk species and gather information on Tier 1 at-risk species, including habitat requirements, stresses, research and inventory needs, and locations of populations not already in the Natural Heritage database. A wealth of information was gathered, much of which is included in Appendix 8. Information on locations of at-risk species was used to help select the Biologically Unique Landscapes (see Chapter 3). The meeting groups also assigned the SGIN designation to 29 species to highlight the need for more information on likely imperiled species.

Chapter 3

Methodology: Identifying Natural Communities, At-risk Species and Biologically Unique Landscapes

A Systematic Approach to Biological Diversity Conservation

The task of conserving the biological diversity of Nebraska is daunting. Loss of habitat continues to occur, and the list of species that are declining and becoming at-risk is growing, while human and financial resources for conducting conservation work remain limited. Because of competing societal demands and limited funds, it is not feasible to conserve every tract of undeveloped land and certainly, in a given year, only a small fraction of the land may be conserved. While opportunistic or ad hoc approaches to conservation in the past have done good work, they do not appear to have stemmed the tide of species decline. Therefore, we need to improve the efficiency and effectiveness of conservation action by taking a more systematic approach to identifying and prioritizing what components of biological diversity we are trying to conserve and where in the state we should focus conservation efforts. (See Margules and Pressey 2000, Groves 2003 for excellent overviews of systematic approaches to conservation planning).

A Systematic Approach to Conservation

- Identify which components of biological diversity to focus conservation actions on (e.g. species, natural communities)
- Identify where to focus conservation actions
 - Select sites based on known occurrences of target species and natural communities
 - Select sites where there is a high probability that the target species and communities will persist over the long term
 - Select sites from across the range of distribution of the species or community to capture important variation
- Set quantitative conservation goals so multiple populations of each target species and occurrences of each natural community are conserved

There are estimated to be more than 30,000 species in the state, the majority of which are insects. There is simply not enough time, personnel, knowledge, or money to work on all these species individually. Fortunately, these species do not occur randomly but co-occur in assemblages (natural communities or habitats) that are repeated across the landscape. The challenge is to focus on a subset of species and communities that will have a high likelihood of conserving the full array of biological diversity. One approach that has been used is known as the coarse filter/fine filter approach (Noss 1987, Hunter 1991). The coarse filter focuses at the scale of natural communities (habitats), both aquatic and terrestrial. Conserving and managing multiple, high-quality examples of each of the various community types in the state (e.g., types

of prairies, wetlands, forests, etc.) should conserve viable populations of most species. For those species that fall through the pores in the coarse filter (primarily rare, imperiled, or wide-ranging species), a species by species (fine filter) approach is needed. For this planning process, we identified a set of natural communities to use as the coarse filter and a set of at-risk species to use as the fine filter.

While we want to increase conservation throughout the state, there is a need to focus scarce resources on areas that offer the best opportunities to conserve the full array of biological diversity and the best chances for success. To utilize the coarse filter/fine filter approach, we have selected as priorities those sites that have known occurrences of natural communities and populations of at-risk species. For many species that have low mobility or high site fidelity, it is important to conserve sites with known populations rather than sites with potential habitat for the species.

Example of the Coarse Filter/ Fine Filter Approach

Conserving multiple examples of headwater streams should conserve most, but not all, of the species that occur in that habitat. The blacknose shiner is a rare, state-listed fish species that occurs in headwater streams in the northern portions of the Sandhills, Shortgrass Prairie, and Mixed-grass Prairie ecoregions in Nebraska. If one were to conserve 20 randomly selected, high-quality examples of headwater streams across this range, there is a high probability that none of them would contain blacknose shiner. Thus, to conserve this species we must focus on this species individually and conserve headwater streams that contain blacknose shiner populations.

To be most effective at conserving biological diversity, we need to focus on sites where there is the highest likelihood that populations and communities will persist over the long term. For individual species, this would include sites with a large population size, good age-class structure, and evidence of successful reproduction. For natural communities, this would include sites with a good representation of expected native species, few invasive exotics, and relatively intact ecological processes that maintain these communities (e.g., fire, grazing, flooding). Unfortunately, for some community types, such as saline or playa wetlands, few high-quality examples remain, and for other types, such as tallgrass prairie, no examples remain that are of a size similar to what historically would have been found here. In these cases, habitat restoration will play an important role in conservation.

Another factor that affects viability is the landscape context within which the population or community exists. Species and communities do not occur in isolation but are part of a landscape mosaic. A number of species, particularly birds and mammals, utilize more than one habitat type during their life cycle and these habitats need to co-occur in close enough proximity to be useful. Species and communities are inextricably linked to the landscapes in which they occur and thus may not persist over the long term without adequate conservation of the larger system. Functional landscapes can be defined as those in which the mosaic of native community types is relatively intact and the ecological processes that sustain the species and communities

are still functioning or can be simulated through management (Poiani et al. 2000). We need to identify not only high-quality examples of at-risk species populations and natural communities but also those that are nested together and exist within functional landscapes. Seeking landscapes with clusters of at-risk species and high-quality communities also increases the efficiency of our conservation efforts.

A strategic approach to conservation also needs to take into account the distribution of species and communities when selecting sites. Species vary genetically across their range of distribution. This variation may be important to the long-term survival of the species in the face of environmental change. In similar fashion, the species composition of individual community types can vary across the range of that type. For example, tallgrass prairie in the southeast portion of Nebraska can have a somewhat different assemblage of plants and animals than tallgrass prairie in the northeast part of the state. For the coarse filter to be effective, this variation needs to be captured in the planning process. While it is not practical to conduct detailed genetic analyses of all at-risk species or inventory all community types, a prudent alternative is to try and conserve examples of populations and communities from across their range.

One of the most difficult questions facing conservation planners is: How much is enough? How many populations of a species or examples of a community do we need to conserve in order to ensure long-term survival? We know that conserving just one example is likely inadequate and that we need to conserve multiple, high-quality examples of each species and community type to provide redundancy and ensure persistence in the face of environmental and human-induced change. In addition to identifying “how much,” conservation goals should have a geographic component so that examples are selected from across the range of the species or communities. This will help capture the variation and ensure that “not all your eggs are in one basket.”

Although principles from genetics, conservation biology and ecology can offer guidance in setting quantitative conservation goals, our knowledge of the life history requirements of species and how ecosystems function is too incomplete to provide definitive answers. Groves (2003) suggests four reasons why it is important to set quantitative conservation goals, even with the uncertainties involved:

1. Goals allow an evaluation of how effective a proposed system of conservation areas will be in representing the conservation targets.
2. Setting goals allows planners and managers to better understand and account for the trade-offs that often must be made in trying to sustain human communities and natural communities.
3. Goals will have a strong influence in determining the number of conservation areas that are needed.
4. Goals provide a vision for conservation success.

For the Nebraska Natural Legacy Project (NNLP), we have set quantitative conservation goals using the best guidance currently available with the realization these goals are an approximation and will change as new knowledge becomes available. Our conservation goals

were set for the number of populations of a given species to be conserved rather than an overall population size and for the number of occurrences of a given natural community type rather than an overall number of acres of that type. These goals facilitate a conservation strategy that focuses on sites with known occurrences of species populations and high-quality examples of natural communities.

Another goal of the Nebraska Natural Legacy Project is to identify a set of priority landscapes and watersheds (see Chapter 9 for description of Priority Watersheds) that, if properly managed, would conserve the majority of Nebraska's biological diversity. These landscapes, which we call Biologically Unique Landscapes (BULs), were selected based on known occurrences of at-risk species and natural communities. In addition to at-risk species, these landscapes support a broad array of common species. In the case of one of our state's ecoregions, the BUL framework alone allowed some of the most connected and resilient lands to fall through the prioritization cracks. The Sandhills ecoregion is now being designated as a Biologically Unique Ecoregion (BUE; see below). The following sections describe the approach we used to identify the at-risk species, natural communities, BULs, and the Sandhills BUE.

Natural Communities: A Coarse Filter

A variety of entities have been used as a coarse filter in conservation planning, including natural communities (Anderson et al. 1999), ecological systems (Comer et al. 2003), physical features, and landscapes. We have chosen to use natural communities as described in Natural Communities of Nebraska (Rolfsmeier and Steinauer 2010). Since the development of the initial Natural Legacy Project in 2005, the Natural Community classification has been revised. Appendix 7 includes the communities from the revised classification. The 84 terrestrial community types described here cover wetland and upland types (any habitat with rooted vegetation) and are part of the National Vegetation Classification system (Grossman et al. 1998), which is the standard classification used by federal agencies. Unfortunately, there currently is no statewide classification system for open water habitats (lakes, rivers, streams), and there is an urgent need for the development of such a system. Despite this, priority watersheds have been selected in an attempt to apply the coarse filter approach to conservation of the state's aquatic species in addition to its terrestrial diversity (see Chapter 9).

We have chosen to use natural communities because of the fine scale of resolution of this system, which is effective at "capturing" the full array of species and ecological processes. For example, the upland hardwood forests along the Missouri River bluffs harbor an almost completely different suite of plants and animals than the shortgrass prairies in the panhandle, and both of these species assemblages would be distinct from the saline marshes in Lancaster County. To conserve the full array of species, we need to conserve examples of each of the community types.

For natural communities to be an effective coarse filter in capturing biological diversity, we need to select examples of communities that contain as much of the representative habitat as possible and the full complement of species one would expect in that type. For example, a

never-plowed prairie that is used as pasture and has been treated with a broadleaf herbicide will harbor far fewer species than a similar prairie that has not been so treated. Broadleaf species (forbs) typically make up 80-90% of the plant species diversity in a prairie, and numerous insects utilize those forbs. Therefore, the conservation of the pasture would be less effective at capturing biological diversity than conservation of the untreated prairie.

Examples of communities selected for conservation should also be part of an intact landscape and have more ecological processes intact or be able to be simulated with management (e.g., fire, grazing). These examples have higher ecological integrity and are more likely to persist over the long term.

The Nebraska Natural Heritage Program has been collecting and maintaining information on natural communities since 1987. Field surveys record not only the location of occurrences and species present but also rate the overall condition of the habitat. The Element Occurrence Ranking (EORanking) uses a four-level scale (A-D) to rank the habitat based on its size, condition and landscape context. For example, an “A” quality occurrence of a prairie would be of relatively large size, containing most of the native species one would expect in that prairie type and few invasive exotic species, and be surrounded by relatively intact landscape. Data from the Heritage database on the location and condition of natural communities were used in selecting the Biologically Unique Landscapes (see below) in the first and second editions of coarse filter framework.

Setting Conservation Goals

Conservation goals for natural communities were set following the guidance in Anderson et al. (1999). Under these guidelines, the distribution of the community type in Nebraska relative to the rest of its range is a factor in setting goals. For example, a community type that occurs only in Nebraska (e.g., Sandhills fen, paper birch springbranch canyon forest) would have the highest quantitative goal since its conservation is entirely dependent on actions taken in Nebraska. Those community types whose distribution is mostly outside of Nebraska (peripheral) would have the lowest goals since they will be conserved primarily by actions that occur outside of the state.

In addition to the distribution of the community, the patch type of the community was used in setting goals. Communities can be classified into three main types: matrix, large patch, and small patch. A few community types are dominant (matrix-forming) and historically covered thousands to millions of acres. In Nebraska, these would include the main prairie types (e.g., tallgrass, mixed-grass, sandsage). Most community types are patch types and nest within the matrix types, covering only a small portion of the landscape. Large patch communities may form extensive cover over some areas but usually their boundaries are correlated with a dominant local process such as hydrology, landform, soil-type, or fire pattern. These large patch types typically occur in patches of less than 1,000 acres. Examples in Nebraska include many of the forest and woodland communities. Small patch communities are even smaller and more restricted, requiring specific natural conditions. They typically occur in patches of 100 acres or less. Examples in Nebraska include many of the wetland and shrubland types.

Anderson et al. (1999) noted that, as a general rule, conservation planners need to include more examples of patch communities to buffer against the higher probability of attrition over time because of environmental change. Patch communities are smaller in extent and multiple examples may be needed to add up to substantial area and viable populations for specialist component species. In addition, individual examples may be less likely to contain the full complement of component species than a large example of a matrix community and thus more examples are needed to capture the full complement of species.

We developed the following criteria for setting goals for the number of occurrences of natural communities to conserve. Goals for each of the community types (e.g., tallgrass prairie) can be found in Appendix 7.

Goals for Natural Communities: Number of Occurrences to be Conserved

Distribution	Matrix	Large Patch	Small Patch
Endemic/Restricted	8	14	20
Limited	3	5	10
Widespread	1	2	5
Peripheral	1	2	5

Endemic/Restricted: communities that only occur within NE or generally have more than 90% of their range within the state.

Limited: communities that occur primarily within one region (e.g., Great Plains).

Widespread: communities that are common in a number of regions and widespread in NE.

Peripheral: communities that are found mainly in other regions, generally less than 10% of the range is within NE.

At-risk Species: The Fine Filter

To prioritize which species to focus scarce resources on during the development of the first edition of the Nebraska Natural Legacy Project, the Science Team developed a two-tiered approach to identifying species that may be at-risk of extinction or extirpation from the state. The Tier I species are those that are globally or nationally at-risk. The Tier II list contains those species that are at-risk within Nebraska while apparently doing well in other parts of their range. The rationale for the two-tiered list was to focus attention and resources first on those species that may be headed for global extinction (and federal listing as Threatened or Endangered) and secondarily focus on those species that may be facing extirpation from Nebraska but appear to be stable globally. The Tier I list includes species that are currently state or federally listed as well as those that may be headed for listing. One goal of the Nebraska Natural Legacy Project is to prevent imperilment of species and the need for listing, and

another goal is to recover currently listed species to allow for their de-listing. Additionally, a goal is to keep common species common, and the coarse filter (described in the previous section) should ensure this goal is met.

Species were chosen from a variety of taxa including mammals, birds, reptiles, amphibians, fishes, mollusks, insects, and plants. We did not have adequate information to evaluate certain taxa (e.g., fungi, bryophytes), and only certain types of invertebrates (e.g., mollusks, some groups of insects) had adequate information to allow evaluation of their imperilment status.

For the initial development of the Nebraska Natural Legacy Project in 2005, the Science Team developed criteria for selecting the Tier I and II species (see boxes below) and selected an initial set of species that fit the Tier I criteria. This list was sent to experts on the various taxa for review. These reviews were used to revise the list. Toward the end of the process to develop the Natural Legacy Project, we conducted a series of expert workshops (mammals, birds, reptiles, fish, insects), and the list was reviewed again and revised.

For the 2011 revision, the Science Team reviewed and revised the selection criteria, and the taxa experts reviewed and revised the Tier I and Tier II lists in a series of workshops covering mammals, birds, reptiles, fish, insects, mollusks, and plants.

In 2018, the Tier I and Tier II lists were reviewed and revised as part of a minor revision of the Natural Legacy Project. This revision process resembled the processes carried out in 2005 and 2011. Criteria for Tier designation were kept the same, taxa experts were asked to suggest changes (additions, deletions, or Tier shifts), workshops were held to review changes, and the Science and Partnership Teams reviewed the expert recommendations.

For the third edition of the Natural Legacy Project, the fine filter revision process was similar to the previous editions. The Science Team reviewed the criteria for selecting Tier I and Tier II species and developed criteria for a new, third designation: Species of Greatest Information Need (SGIN). SGIN were species for which the experts could not answer the minimum number of ranking factor questions (see Appendix 5) to produce a subnational rank (S-Rank). Since all but one of the criteria for Tier I species are directly tied to S-Rank, this designation was devised to be used sparingly and only when accompanied by the ranking factor information that would allow for a more confident ranking in the next revision.

Groups of taxa experts were assembled (see Appendix 1) and asked to suggest priorities for review. Since the process of using NatureServe's ranking calculator for a species can be time consuming, consensus among experts about which species to review prior to the daylong workshop meetings were achieved via email correspondence. In early 2025, daylong, hybrid (in-person and virtual attendance accommodated) meetings were hosted for bird, fish, insect, mammal, mollusk, plant, and herpetofauna experts. In total, 186 species were reviewed over the course of the seven meetings. While NatureServe's ranking calculator was used as the guiding framework to determine the level of imperilment, expert opinions during the workshops were used to make the final ranking determinations.

Criteria for Selecting Tier I At-risk Species

Species were included in the Tier I list that met one or more of the following criteria:

State- and Federally Listed Species: Species listed as Threatened or Endangered under the federal Endangered Species Act or the Nebraska Nongame and Endangered Species Conservation Act. Recovery and delisting of these species is a goal of the plan.

Heritage-Ranked Species: Species ranked by NatureServe and the Natural Heritage Network as globally critically imperiled (G1), imperiled (G2) or vulnerable (G3). Or species ranked as either state critically imperiled (S1), imperiled (S2) or vulnerable (S3) in all or nearly all states in their range.

Declining species: Species whose abundance and/or distribution has been declining across much of their entire range. For land birds, the Partners in Flight national watch list was used as a guide.

Endemic Species (or nearly so): Species whose entire range of distribution occurs within or primarily within Nebraska. Conservation actions in Nebraska would be critical to the conservation of the species.

Disjunct Species: Species whose populations in Nebraska are widely disjunct (200+ miles) from the species' main range of distribution. Such populations may contain genetic variations that could be important to the long-term survival of the species. Species must be ranked as critically imperiled (S1) or imperiled (S2) within Nebraska.

Criteria for Selecting Tier II At-risk Species

Tier II species were those that did not meet the Tier I criteria but were ranked by the Nebraska Natural Heritage Program as either State Critically Imperiled (S1), State Imperiled (S2) or State Vulnerable (S3) (see Appendix 4 for explanation of ranks). For plant species, only species ranked S1 or S2 were selected.

One hundred and twenty-three species were identified as meeting the Tier I criteria; the list of Tier I species is found in Appendix 8. Each tier I species profile includes information about its conservation status, range in Nebraska, stresses, inventory and research needs, and a list of the Biologically Unique Landscapes and additional Priority Watersheds where they are known to occur. We identified 563 species as meeting the Tier II criteria; the list is found in Appendix 9. During the development of the Nebraska Natural Legacy Project, the Heritage state ranks were reviewed and revised for amphibians, reptiles, mammals, fish, birds and a limited number of insects.

We have identified 687 species in Nebraska as at-risk (i.e., having met Tier I or Tier II criteria). Because this list is far too extensive to address in a detailed manner in conservation planning, we will focus most of our effort on the Tier I species. These are the species for which we are setting quantitative goals and identifying sites important to the conservation of the species. Tier II species were also used in identifying biologically unique landscapes but did not have specific goals set for them.

The species expert workgroups also identified 29 species across several taxa that are SGIN. For each species, the experts identified the information or data that needs to be collected to answer questions about the species vital to their conservation. While there are many species for which more information would aid in targeted conservation, the goal for this designation is to keep a manageable number of SGIN with data gaps that can be addressed within 10 years.

The Tier I, Tier II, and SGIN species lists will be periodically reviewed and updated by taxon experts. As new information on abundance, distribution, and population trends becomes available, species will be added or removed from the lists. These lists were developed to help prioritize conservation planning/action and do not have legal or regulatory ramifications.

Setting Conservation Goals

Population viability analyses (PVAs) have been used for setting conservation goals for a limited number of species. These analyses are a quantitative method used to predict the future status of a population or collection of populations. During conservation planning in Florida (Cox et al 1994, Kautz and Cox 2001), population viability analyses were conducted on 11 focal species (birds, reptiles, mammals). Their results suggested that an appropriate goal for all target species was to conserve a minimum of 10 populations. While detailed PVAs have been conducted for only a small number of species, the thought processes behind PVAs can be used in setting goals for other species. Using a simple equation (Morris et al. 1999), one can calculate the probability that all populations of a species will go extinct over a period of time given the probability of extinction of any given population. This model assumes that the fates of the individual populations are not correlated and that there is little movement among the populations.

We set an initial goal of 10 populations as a minimum for conserving a species. Using the equation from Morris et al. (1999) and assuming moderate viability of each population (40% chance of survival over a 100-year period), conservation of 10 populations gave a greater than 99% probability of at least one population surviving over that time period. This goal was then modified based on the proportion of the species' total distribution that was contained within Nebraska. For species that were endemic to Nebraska (or found also within a limited range outside the state), the goal was set at 10. These are species whose long-term protection will depend primarily on conservation actions taken in Nebraska. The goals were then reduced as the proportion of the species range outside of the state increased (see box below for goals). These species will be conserved by actions in a number of states, not just action in Nebraska. Regardless of distribution patterns, we set a minimum goal of 10 populations for state-listed threatened and endangered species. This was to ensure the long-term survival of the species within Nebraska and enable delisting.

Goals were also occasionally modified on a case-by-case basis. For example, the Ute ladies'-tresses orchid (state and federally listed), after extensive surveys, has only two known populations in Nebraska. Populations of this species are sparsely distributed across its entire range, and it is likely that the current distribution in the state represents its pre-Euro-American settlement distribution. The goal for this species was set at two. Goals for all Tier I species are listed in Appendix 8.

Goals for Tier I Species: Number of Populations to be Conserved

Endemic/Restricted/State Listed	10
Limited	7
Widespread	4
Peripheral	1
Disjunct	1

Endemic/Restricted/State Listed: Species that only occur within Nebraska or generally have more than 90% of their range within the state.

Limited: Species that occur primarily within one region (e.g., Great Plains).

Widespread: Species that are common in a number of regions and widespread in Nebraska.

Peripheral: Species that are found mainly in other regions, generally less than 10% of the range is within Nebraska.

Disjunct: Species whose populations in Nebraska are widely disjunct (200+ miles) from the species' main range of distribution.

Selecting Biologically Unique Landscapes

The goal of this process was to identify a set of landscapes that offer some of the best opportunities for conserving the full array of biological diversity in Nebraska. This process began with the first edition of the Natural Legacy Project in 2005. Landscapes were selected based on known occurrences of natural communities and at-risk species and were selected to meet the goals we had set for each community type and Tier I species.

While the Heritage Database represents the most comprehensive, statewide data on at-risk species and natural communities in the state, inventory work is far from complete in Nebraska. During initial development of the BUL framework, supplemental expert information was used to help delineate the landscapes. In addition to the above spatial data, conservation professionals developed a GIS layer in which the Commission's District field staff had delineated areas that contain relatively intact and high-quality habitat. They also conducted a series of workshops with species experts (bird, fish, insect, mammal, mollusk, plant, and herpetofauna).

Participants in these workshops delineated areas in the state with high concentrations of at-risk species. In the case of the fish expert workshop, they also identified areas with high quality streams with a good overall diversity of species. And finally, they utilized the National Land Cover Data (1993) to help identify relatively intact landscapes.

The additional layers were used to expand the boundaries of the landscapes so there were clusters of community and at-risk species occurrences within a relatively intact landscape. There was no prioritization among landscapes, each contains a somewhat different assemblage of communities and species, and therefore, each is needed to complete the conservation of Nebraska's biological diversity.

BUL Boundary Changes (2025)

Since 2005, local biologists have focused their work in Biologically Unique Landscapes (BULs) and have collected more information about species and natural communities. The Nebraska Natural Legacy Science Team developed a set of criteria for evaluating proposed changes to the BUL system (see Appendix 11). A request for boundary change proposals was sent out to conservation practitioners who have been working in the BULs. The Science and Habitat Implementation Teams reviewed the initial proposals and made suggestions for changes to the proposals. This review process was facilitated with supplementary information from sources, such as the Midwest Landscape Initiative's Conservation Blueprint, The Nature Conservancy's Resilient Lands Mapping Tool, and USGS's Land Cover Dataset. The Science Team then reviewed the final proposals and made recommendations for each proposal to the Natural Legacy Partnership Team for final approval.

Two minor BUL boundary adjustments were approved: Keya Paha and Middle Niobrara. The minor changes were approved to match Hydrologic Unit Code (HUC) watershed boundaries and to eliminate previously omitted areas between these two bordering BULs.

There were four major BUL boundary adjustments: Elkhorn Confluence, Missouri River and Bluffs, Running Water, and Willow Creek.

Elkhorn Confluence – A portion near the city of Norfolk has been removed from the BUL as it has become increasingly industrialized and developed as home sites. A portion was added in the southeastern corner containing intact grasslands, riparian woodlands, and wetlands.

Missouri River and Bluffs – This change resulted from the combination of the Missouri River, Rulo Bluffs, Indian Cave Bluffs, Thurston-Dakota Bluffs, and Ponca Bluffs BULs. Previously unincorporated oak woodlands throughout this corridor were added.

Running Water – This change resulted from the combination of the Lower Niobrara River and the Verdigris-Bazile BULs. Additional land area includes areas of grasslands and oak woodlands.

Willow Creek – An area was added with wet meadows and wetlands that provide habitat for several Tier I and II species.

Biologically Unique Ecoregion

Throughout the previous two decades, the system of BULs has offered opportunities to work toward the conservation goals outlined in the Nebraska Natural Legacy Project. One shortcoming of the plan has been the lack of interconnection among the BULs within specific regions. While the BULs highlight the best habitats, the land between them is much more limited in conservation opportunities. However, they still play an important role in at-risk species recovery as the connection of populations presents opportunities for gene flow. This genetic diversity can make populations more resilient to changing conditions. If the long-term goal of the Nebraska Natural Legacy project is to restore populations of at-risk species and natural communities, then the long-term viability of these populations should be assessed.

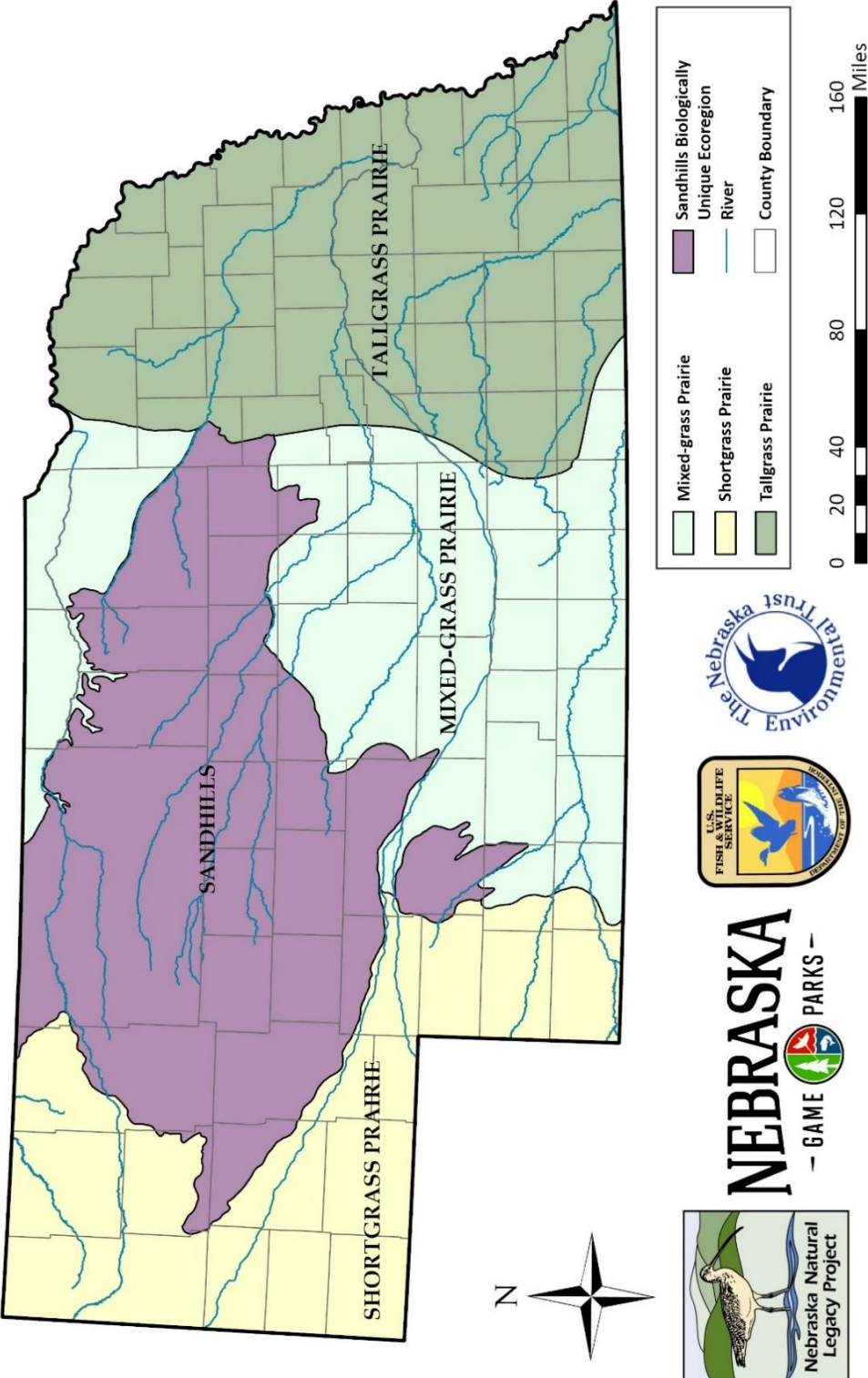
For the purposes of the Nebraska Natural Legacy Project, the Biologically Unique Ecoregion (BUE) will function as follows: an ecoregion that is largely intact and provides connectivity among BULs over a large geographic area. The stability and functionality of this ecoregion represents a continentally important area of biodiversity. It is unique on a continental scale in its resilience to habitat loss and fragmentation, and it contains multiple populations of at-risk species and natural communities. During Euro-American settlement, much of the tallgrass, mixed-grass, and shortgrass prairie ecoregions had been converted for agriculture and development; the Sandhills ecoregion, on the other hand, has remained largely intact due to the area's land-use practices and limited urban development. Among the four ecoregions, the Sandhills represented the only ecoregion warranting BUE designation (see Chapter 7 for more information).

Natural Legacy Demonstration Sites

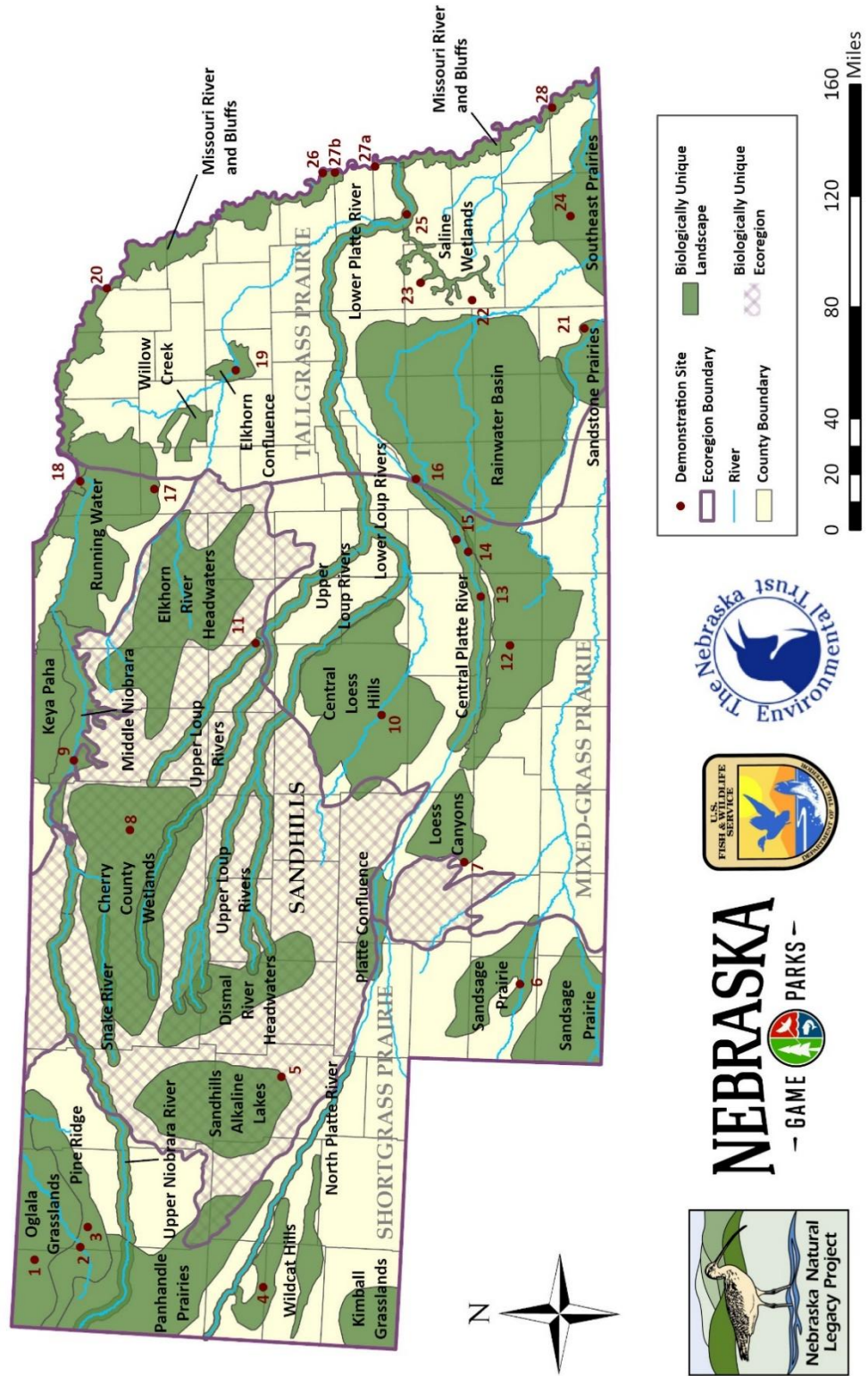
A set of demonstration sites was selected to represent examples of habitat conservation and outreach opportunities across the state that either demonstrate or have great potential to demonstrate the mission of the Nebraska Natural Legacy Project. In the third edition, prioritization was given to recognizing sites where ongoing conservation efforts were taking place or sites that occurred in BULs that did not previously have Demonstration Sites. The proposed sites were reviewed and selected by the Habitat Implementation Team. For more information on Natural Legacy Demonstration Sites, see Chapter 4.

Ten new Demonstration Sites were recognized in the third edition: Cedar Valley Wildlife Management Area (WMA), Crane Trust, Fontenelle Forest and Neale Woods, Funk Waterfowl Production Area (WPA), Gjerloff Prairie, Grove Lake WMA, Oglala National Grasslands, Pressey WMA, Valentine National Wildlife Refuge (NWR), and Wood Duck WMA. Two sites were removed: Kissinger Basin WMA was replaced by Funk WPA as the latter has more representative habitat and outreach materials; and Lake McConaughy was removed as it does not occur within a BUL nor does it have representative habitat for a BUL or Ecoregion.

Nebraska Natural Legacy Project: Ecoregions



Nebraska Natural Legacy Project: Biologically Unique Landscapes, Ecoregions, and Demonstration Sites



Natural Legacy Demonstration Sites:

1. Oglala National Grasslands
2. Fort Robinson State Park
3. Ponderosa Wildlife Management Area
4. Wildcat Hills
5. Crescent Lake National Wildlife Refuge
6. Enders Reservoir
7. Cedar Valley Wildlife Management Area
8. Valentine National Wildlife Refuge
9. Niobrara Valley Preserve
10. Pressey Wildlife Management Area
11. Calamus Wildlife Management Area and State Recreation Area
12. Funk Waterfowl Protection Area
13. Rowe Sanctuary
14. Platte River Prairies
15. Crane Trust
16. Gjerloff Prairie
17. Grove Lake Wildlife Management Area
18. Niobrara State Park
19. Wood Duck Wildlife Management Area
20. Ponca State Park
21. Rock Glen Wildlife Management Area and Rock Creek Station State Historical Park
22. Spring Creek Prairie Audubon Center
23. Saline Wetland Complex
24. Burchard Wildlife Management Area
25. Schramm Park State Recreation Area
26. Boyer Chute National Wildlife Refuge
27. Fontenelle Forest (a) and Neale Woods (b)
28. Indian Cave State Park

Chapter 4

Conservation Actions to Address Barriers to Conservation and Stresses Affecting Species and Habitats

During the planning phase of the Nebraska Natural Legacy Project (NNLP), conservation practitioners were asked to help identify new and review the current barriers that limit or preclude conservation, key stresses to species and habitats, and actions needed to overcome barriers and stresses to species and habitats. Barriers, stresses and actions were identified by (1) the public at input meetings conservation practitioners who participated in workshops, regional meetings, and online surveys, (2) species experts who attended a series of workshops, and (3) members of the public and conservation practitioners who provided comments during the review of the plan. Existing conservation plans were also reviewed and appropriate stresses, barriers and actions were incorporated into this plan.

Conservation actions were reviewed by conservation professionals to ensure they were biologically sound, economically feasible and sensitive to private landowner needs. Although most input was gathered on an ecoregion basis and specific barriers, stresses and conservation actions have differing levels of importance in each of Nebraska's four ecoregions, most have statewide relevance. Therefore, issues were incorporated into a single chapter to reduce redundancy. Key barriers, stresses and actions in each ecoregion and Biologically Unique Landscape are identified in ecoregion chapters.

The Natural Legacy Project uses voluntary, incentive-based approaches to conservation. It does not evaluate existing state or federal regulatory programs that affect biological diversity (e.g., water- or air-quality regulatory programs, at-risk species protection laws). This strategy therefore does not provide recommendations for changes to regulatory programs that have been initiated already nor the need for additional such programs.

Because 97% of the state is in private ownership (principally farms and ranches), conservation of the state's flora and fauna is largely dependent upon support and participation by private landowners. Extensive input helped ensure that proposed conservation actions were reasonable and practical. Economic feasibility should take into account the cost of conservation actions and direct impacts on local economies. Conservation actions should be evaluated considering costs and benefits for meeting conservation goals. With full implementation, the partnership and perspective of landowners is invaluable. Input from private landowners is sought continually throughout implementation.

The stresses and actions identified in the following section, along with the at-risk species, communities, and priority landscapes identified in Chapters 5-8, comprise the nucleus of the conservation blueprint. Implementation of the conservation actions on a statewide level will help ensure that a significant number of opportunities for conservation of biological diversity in Nebraska are acted upon.

Actions Needed to Overcome Barriers and Threats

- Continue to advance collaboration and communication
- Increase environmental education
- Improve conservation programs and incentives
- Facilitate species and ecosystem adaptation and resiliency to environmental changes
- Promote biodiversity-compatible land management
- Focus conservation on the best opportunities
- Maintain and expand the network of public and private conservation lands
- Demonstrate success
- Strengthen connections between people and nature through nature-based recreation

Continue to Advance Collaboration and Communication

No single government agency or private organization has the authority, financial resources, or staff to assume the entire responsibility for conserving Nebraska's biological diversity. Effective implementation of a state wildlife action plan (SWAP) requires the cooperative efforts of governmental entities, private organizations and residents. Partnerships and cooperative arrangements can continue to be used to promote collaboration and communication. This approach should help reduce duplication, increase information sharing, establish and maintain trust, and promote more efficient allocation of resources to conservation priorities.

Conservation partners involved in the Natural Legacy Project have worked through past issues, including lack of communication and collaboration that created tension and conflict at times. They have built a foundation of trust over the past 20 years that have set the stage for continued growth and development of conservation partnerships. There are still efforts underway to increase the availability of information about conservation opportunities and to make it easier for landowners and others to access that information.

82% of Nebraskan's feel that "at-risk" species would be conserved most effectively by a partnership of governmental and private organizations.

Source 2004 NASIS Survey

While it is still true many individuals who are interested in conservation programs may not be aware of conservation opportunities or know whom to contact, those that have been involved with implementation of the Natural Legacy Project have made great progress and should strive to continue to build upon that.

Actions Needed to Advance Collaboration and Communication

Continue to develop and support existing locally-based conservation partnerships in each of Nebraska's ecoregions that include a diversity of stakeholders (e.g., farmers, ranchers, community leaders, public and private conservation organizations). When possible, any new

partnerships should be modeled after existing successful partnerships (e.g., Sandhills Taskforce, Rainwater Basin Joint Venture, Playa Lakes Joint Venture, Loess Canyons Rangeland Alliance, Central Platte Rangeland Alliance, Verdigris-Bazile Rangeland Cooperative).

- Support existing and develop new regional conservation communities that include diverse representation from landowners, agencies, private organizations and others who participate in the exchange of ideas, networking, and collectively engage in problem-solving to address issues related to at-risk species management, public lands ownership and management, landowner confidentiality, private property rights, etc. Present Natural Legacy information at various community meetings. Work with local conservation partners' staff and landowners to conduct workshops, field tours and social events that promote communication, cooperation and the exchange of ideas.
- Develop clear and concise sources of information about conservation programs and opportunities, stresses to biological diversity, and actions needed to conserve biological diversity. Make this information widely available in printed and online formats.
- Regularly inform the public of proposed initiatives, management actions, policy changes, and conservation successes and failures through public meetings, workshops, field trips, one-on-one meetings, seminars, presentations at stakeholder meetings, media, and other effective venues.
- Develop and implement recognition and appreciation programs to acknowledge the efforts of farmers, ranchers, acreage owners, organizations, community leaders, and others who demonstrate meritorious achievement in the conservation of biological diversity.
- Design and conduct training programs that instruct conservation practitioners and others in effective public participation techniques.
- Strive for shared responsibility between landowners, agencies, organizations, and communities when implementing the Nebraska Natural Legacy Project.
- Institute a community science and education initiative that draws on volunteers of all ages to assist with monitoring, research, stewardship, and education of natural habitats and wildlife. Opportunities are available with existing programs (e.g., Master Naturalist, Nebraska Bumble Bee Watch) and should be supported.
- Continue to enhance existing and develop new communication channels among conservation practitioners and their agencies/organizations to improve coordination, conflict resolution and message consistency to the public, ultimately refining the existing and developing new shared visions for conserving biological diversity.

- Continue to facilitate conservation projects by providing information about possible funding sources, contractors, and resources, while striving to ensure that conservation efforts result in win-win outcomes or, at minimum, cause no net loss to profit margins for producers. Seek opportunities to facilitate understanding and collaboration between the rural and urban publics.
- Continue to establish and build upon existing relationships between public land managers and neighboring private landowners to further improve communication, establish and grow respect, and develop trust, while working toward mutually-beneficial shared public and private conservation opportunities.
- Continue to seek out and develop opportunities with neighboring states to implement conservation strategies for at-risk species across state lines and regionally.

Increase Environmental Education

Environmental Education (EE) is an essential tool for conservation. It helps people learn about the environment, gain new science knowledge, and develop skills to address environmental challenges (NAAEE 2024). For the Nebraska Natural Legacy Project to succeed, Nebraskans need to cultivate ecological literacy about the state's rich biological diversity and the threats it faces. As individuals spend time outdoors and participate in EE programming, they are apt to appreciate, understand, advocate, and take action to conserve biological diversity and maintain ecological integrity.

An environmentally literate population has broad social, ecological, and economic benefits. These include informed decision-making, learning from the past to direct the future, improving physical and mental health, developing stewardship skills, fostering community connections, and creating appreciation for Nebraska's dynamic landscapes. EE includes various disciplines, such as environmental education, interpretation, science communication, conservation education, recreation, outdoor skills, cultural education, formal education, and historical education.

However, several challenges hinder interaction with nature, such as urbanization, dependence on technology, limited access to outdoor spaces, fear of nature, and competition for unscheduled time. In education, additional hurdles include finite resources, evolving audience needs, limited administrative capacity, and a lack of inclusive spaces and programming. These challenges can be addressed through collaboration among organizations and the implementation of targeted strategies.

Curriculum and standards, training and professional learning, EE programming, mass communication, place-based EE, educational resources, and community science are methods for developing an environmentally literate population. By using a variety of strategies, EE addresses barriers while creating opportunities to engage with nature. Collaborating with educators, government agencies, community organizations, and conservation organizations

allows us to better understand the needs and interests of various communities. The North American Association for Environmental Education recognizes that high-quality EE is “a continuous process ... learner-centered, equitable, inclusive, and culturally relevant and responsive, providing all participants with opportunities for minds-on, developmentally appropriate experiences and investigations” (NAAEE Guidelines for Excellence in Environmental Education Programs, 2022). Ultimately, this will help Nebraskans connect with nature and gain the knowledge, skills, and motivation to make responsible environmental decisions.

The content of this section was developed and revised through a collaborative input process involving many people across Nebraska. The Education Team determined the seven areas of EE to focus on and incorporated the actions found in the previous Natural Legacy Project EE section. Input was gathered through digital surveys, in-person discussions, virtual meetings, and requests for comment to educators, administrators, natural resource professionals, and naturalist volunteers. A writing team drafted and revised the text for final public review. This collaborative engagement has raised awareness of the Natural Legacy Project, connected and engaged educators, and resulted in a relevant guide for Nebraska’s EE community.

Curriculum & Standards

EE providers should work with school decision-makers (e.g., teachers, administrators, school boards, community college Board of Governors, and the Department of Education) to integrate environmental literacy and outdoor learning into school-based curricula and co-curricular activities at all levels. EE benefits students in core disciplines, helps educators meet key standards, and prepares students for further education or careers.

- Work with the state Department of Education and Educational Service Units to include topics related to biological diversity, conservation, and environmental sustainability in state standards.
- Develop a system to support teachers in implementing interdisciplinary EE programs during school hours. This includes developing storylines that run through units of study and approach standards through a lens of EE, creating digital and physical materials that highlight local ecosystems, and developing ways for teachers to access information about Nebraska Connections.
- Provide pathways for educational programs to integrate field trips to local nature preserves, parks, and museums, enabling students to connect with nature and apply classroom knowledge to real-world environments.
- Provide direction to help educators address complex topics like biodiversity loss.
- Support early childhood providers in incorporating EE into their programs to meet Nebraska Early Learning Guidelines.

Training and Professional Learning

Ongoing training is essential for educators and professionals to deepen their knowledge of local ecosystems and biological diversity, as well as to improve their ability to communicate these concepts effectively.

- Work with universities and colleges to provide pre-service teachers with Nebraska-specific science and EE before they graduate.
- Collaborate with universities and colleges to ensure students in science and natural resource fields are equipped with science communication skills.
- Provide professional development for biological scientists and natural resource management professionals in public communication and EE.
- Develop and support volunteer networks of educators who can lead EE programming and stewardship efforts across Nebraska utilizing best practices.
- Collaborate with diverse community organizations to offer environmental education training and activities within local communities.
- Offer professional development on topics such as biological diversity, local ecology, and best practices for incorporating EE into the curriculum.

Environmental Education Programming

Offer a variety of inclusive and accessible EE programming that engages Nebraskans with the natural world while fostering a connection to biological diversity.

- Expand opportunities for students and the public to explore Nebraska's ecosystems through field trips, tours, service learning, environmental festivals, and presentations.
- Create and promote stewardship initiatives that empower people to improve their local environments.
- Strengthen professional collaborations that support the delivery of EE programming.
- Provide programming about land-use practices in urban, suburban, or rural settings that can positively affect biological diversity.
- Collaborate with diverse community groups to design better programs that address specific interests and barriers to outdoor engagement.
- Create guidelines for metrics to gather audience feedback and data to shape the future direction of EE programming and ensure it remains relevant and impactful.

Mass Communication

Environmental education organizations should leverage mass communication to raise awareness and build public support for Nebraska's biological diversity.

- Curate an EE media toolkit that includes best practices for communicating science, developing calls to action, addressing misconceptions, and celebrating conservation progress.
- Use traditional media outlets (e.g., television, radio, print) and new media (e.g., social media, webinars, videos, podcasts) to reach diverse audiences.
- Create engaging signage and exhibits at EE sites to communicate with visitors.
- Provide educators and professionals with access to both print and online resources for teaching biological diversity and conservation.

Place-based Environmental Education

Nature centers, parks, and other place-based environmental education providers play a crucial role in connecting people with the natural world. Access to outdoor spaces is essential for fostering a sense of place, leading to greater appreciation, understanding, and conservation efforts.

- Continue to expand and support existing place-based EE sites across Nebraska.
- Work to enhance or develop new outdoor spaces for place-based learning in areas where public access is limited, such as schools, parks, businesses, and community spaces.
- Design, maintain, and update facilities to be environmentally sustainable, welcoming, and accessible to diverse audiences.

Resources: Materials, Programs & Grants

Resources are vital for delivering high-quality EE. Nebraska-specific curricula, activity guides, kits, scholarships, and grant opportunities increase the capacity for environmental education by addressing barriers such as time, transportation, and access to materials.

- Support funding and grant opportunities that enhance existing EE programs or launch new initiatives.
- Provide financial assistance to cover transportation and admission costs for educational field trips for educators and childcare providers.
- Create public transportation options to improve access to nature for all Nebraskans.
- Develop and promote Nebraska-specific educational resources, including kits, trunks, and videos.

- Offer scholarships for students pursuing degrees, certifications, or workshops in environmental education or conservation.
- Provide meaningful volunteer and internship opportunities for high school and college students in EE and conservation.
- Collaborate with and support individuals and groups that can overcome barriers to increasing Nebraskan's awareness, knowledge, and conservation of biological diversity, such as leaders from conservation groups, educational institutions, communities, and private landowners.
- Gather data to assess resource needs for future programming.

Community Science

Community science — where members of the public actively participate in research — can be a valuable tool for both education and conservation. These programs help people develop scientific skills, foster a connection to nature, and contribute data for conservation research.

- Offer community science projects and programs that support the goals of the Natural Legacy Project.
- Support a network of conservation-minded volunteers to assist community science initiatives.
- Provide learning opportunities through community science initiatives accessible to people of various ages, abilities, backgrounds, time constraints, and locations.
- Help Nebraska educators incorporate community science into their lessons, activities, and programming.
- Collaborate with networks and organizations across Nebraska to promote community science opportunities.

All Nebraskans benefit from the outcomes of EE as do the plants and animals that are a focus of the Natural Legacy Project. EE helps people understand the environment, develop the skills to address ecological challenges, and take action to conserve natural resources. Collaborative efforts among stakeholders and the strategic use of resources will enable EE providers to meet these challenges effectively.

The EE community in Nebraska should celebrate past successes while continuously evaluating its efforts and adapting to future needs. Together, government agencies, nonprofits, schools, and community organizations provide the knowledge, inspiration, and action necessary to conserve Nebraska's natural ecosystems for generations to come.

Improve Conservation Programs and Incentives

Most conservation practitioners and many private landowners can attest to the large number and complexity of conservation programs. In some cases, landowners with an interest in conservation often have to sort through a lot of paperwork and long lists of options in order to enroll in conservation programs. This can be overwhelming for landowners at times, especially as they try to weigh decisions related to conservation and business decisions. While there will always be multiple programs across agencies and organizations, better collaboration and information-sharing between agencies and organizations is needed to make the process more landowner-friendly.

The demand for technical advice and financial assistance by landowners to do conservation work continues to grow and, in some areas, outpaces our collective ability to meet demand. Resources need to be increased and efficiency of conservation delivery needs to be improved to meet the demand. Some landowners simply need technical guidance provided from a best management practice guide, while others need direct assistance through one-on-one consultation by a wildlife biologist. Many landowners also require financial incentives to help with the feasibility of land management such as cost-share for implementing habitat improvements, infrastructure to change management, or direct payments to set aside habitat or to enroll in conservation easements.

To be effective, resource professionals providing technical and financial assistance must have a familiarity and understanding of conservation programs offered by their entity, and by other conservation agencies/organizations. Although different resource professionals are unlikely to give identical advice to a landowner, it's important that management recommendations are based on the best available science and information. Landowners may become frustrated and lose confidence in the conservation community when resource professionals fail to communicate with each other or provide contradictory advice. When possible, conservation agencies and organizations should strive for consistency to maximize biological diversity conservation throughout the state.

Conservation programs and financial incentives need to be voluntary, uncomplicated, flexible, and to the extent possible make economic sense in order for them to be acceptable and appealing to landowners. Conservation programs should not be overly rigid or take away decision-making authority of the landowners, and they should allow for adaptive management. While many landowners are willing to incur some financial loss to improve overall landscape condition, increase wildlife populations, and increase recreational opportunities, their bottom line should always be taken into consideration by resource professionals.

Local economics play a significant role in conservation program participation. This includes property taxes, which are a significant barrier to conservation program participation. One issue is that changes in land use or policies that result in lower property taxes are often not desirable because the revenues available for schools and roads are reduced. Another issue is that many landowners, including recreational landowners, typically need their property to generate at least sufficient income to offset property taxes. This leads many landowners to seek management alternatives that provide fewer benefits for "at-risk" species. Additionally, in

recent years, the value of high-quality wildlife recreation lands has risen at a higher rate than other lands, causing property values and associated property taxes to increase on lands managed for wildlife habitat.

Actions Needed to Improve Conservation Programs and Incentives

- Seek private landowner and multi-organizational input when developing conservation incentive programs to 1) help ensure they are landowner-friendly (voluntary, incentive-based, adaptable, economically feasible, confidential, etc.), 2) support the missions of a broad array of conservation organizations, and 3) effectively conserve biological diversity. When possible, model new programs after successful programs used elsewhere and keep the overall process relatively simplified.
- Assess the barriers (e.g., permit processes) to landowner participation in conservation programs and use that information to improve existing programs and in developing new programs.
- Explore opportunities to provide private landowners with incentives/income for assisting with restoration projects (e.g., native seed harvest), engaging in activities that support biological diversity (e.g., providing nature-based recreation opportunities, marketing of biological diversity-sustainable products), or being willing to tolerate wildlife-associated economic losses.
- Continue to seek and develop opportunities to expand the focus of existing conservation programs and funding sources to better conserve biological diversity and natural communities.
- Explore new funding sources that provide sustainable and equitable compensation for landowners who participate in programs that conserve biological diversity. Continue to regularly review and adjust incentive rates to reflect changing economic conditions.
- Continue working to increase capacity across agencies and organizations to provide high-quality technical assistance to private landowners interested in conserving biological diversity. Collaborate across the partnerships of organizations to provide the best opportunities for programs and technical assistance to landowners. Build upon new and existing partnerships where missions overlap on private lands.
- Enhance onboarding and training for private lands conservationists by including foundational knowledge in agricultural economics and industry practices, helping them better relate to farmers and ranchers and increasing the likelihood of successful implementation of conservation actions.
- Consider local economic impacts of conservation projects. Consider costs and benefits of

actions to meet conservation goals, including needs for further conservation actions when goals have been met.

- Seek out and promote innovative solutions to economic constraints on landowners interested in conserving biological diversity. These could include, but are not limited to, tax deferments, capital gains tax relief, and conservation buyer programs.
- Continue to develop and promote voluntary projects/programs aimed at conserving threatened and endangered species on private land and provide assurances to participating landowners that no additional future regulatory restrictions will be imposed (e.g., Safe Harbor Agreements).
- Develop partnerships with community planning leaders, business leaders, and private organizations to develop best management practices (e.g., cluster housing) that can help ensure residential and commercial developments minimize the impacts to natural communities and biological diversity.
- Collaborate with the Nebraska Department of Water, Energy, and Environment, and Nebraska's Natural Resources Districts to discuss the impacts of watershed planning decisions made under LB962 on fish, wildlife, and related resources in those watersheds. Undertake a watershed-by-watershed assessment of the impacts of changing streamflow conditions on biological diversity, starting with the watersheds under the most threat from increased water use.

Facilitate Species and Ecosystem Adaptation and Resiliency to Environmental Changes

Some species distributions and abundance are shifting in response to changing environmental conditions. These shifts may alter fundamental interactions with other species and the physical environment, which could lead to a cascade of impacts throughout ecosystems. Managing for resilient populations and ensuring ecological connectivity will be essential for conserving biodiversity in the coming decades.

Documented effects of a changing environment include: shifts in species distributions, changes in phenology of species, and decoupling of co-evolved interactions. In addition, these changes are expected to alter ecological processes such as fire regimes and hydrology, and exacerbate a number of existing stressors, such as habitat loss and fragmentation, pollution, and the spread of invasive species, pests, and pathogens.

One way that species have historically responded to major environmental shifts, such as those following the last ice age, has been to shift their distribution to higher elevations or latitudes. Similar range shifts are already occurring and are expected to continue. However, these shifts are now complicated by significant habitat fragmentation and barriers to movement, as well as

the accelerated pace of environmental change. Unlike in the past, species today are migrating at different rates and along different routes, rather than as intact natural communities. Thus, we are likely to see natural communities disaggregate, depending on intrinsic response rates, and reconfigure in potentially novel combinations, upslope or further north.

Phenology refers to the timing of annual and seasonal natural events, particularly those related to the life cycles of plants, animals, and other organisms. Changing environmental conditions can shift phenology, disrupting important ecological relationships. Earlier onset of spring, for instance, has altered the timing of breeding, hibernation, migration, and insect emergence, sometimes decoupling interdependent species like pollinators and their host plants. Because species do not respond uniformly to environmental shifts, each may exhibit distinct changes in distribution or phenology. These mismatches can result in local extirpations and broader disruptions to ecosystem functions and services. This individualistic response may be one of the greatest challenges for many wildlife species, which might otherwise be able to adapt by shifting their ranges. For further discussion on how habitat fragmentation intensifies these challenges, see the *Habitat Fragmentation* section below. Additionally, potential effects of shifting environmental conditions on fire, hydrology, habitat fragmentation, pollution, and invasive species are discussed in subsequent sections of this chapter.

Given uncertainties in how species and communities will interact with other ecological stressors, the Natural Legacy Project emphasizes broad, flexible strategies designed to provide conservation benefits under a range of future conditions. These approaches will be refined as new information becomes available.

Adaptation Strategies to Increase Species Resilience

- **Reduce the impacts of stressors**
Addressing existing stressors like invasive species, pests, pathogens, pollution, and habitat loss, degradation, and fragmentation remains a low-risk and effective resiliency strategy. These stressors are often amplified by changing environmental conditions and can limit the ability of the species or ecosystems to remain resilient.
- **Restore and maintain ecological processes and ecosystem function**
Natural systems are dependent on a variety of ecological processes including disturbance and hydrologic regimes (e.g., fire, flooding), energy and nutrient flows, and species dispersal. Past human alteration of these ecological processes has been a stressor on natural systems. Restoration and maintenance of these processes can increase the resiliency of a system. Restoring and maintaining biological diversity can also increase the ecological resilience of ecosystems, and thus increase their adaptive capacity.
- **Protect and maintain a network of conservation areas**
Increase the extent and quality of protected terrestrial and aquatic habitats. This supports species movement and dispersal under changing environmental conditions. See *Habitat Fragmentation* section for additional corridor considerations.
- **Restore and maintain habitat and landscape connectivity**
Conservation planning must prioritize connectivity to enable species relocation. For specific actions to reduce habitat fragmentation and enhance movement corridors, refer

to the *Habitat Fragmentation* section.

- **Enhance understanding of environmental shifts and ecological responses**
Uncertainty remains about how species and ecosystems will respond to ongoing environmental shifts. Improving our understanding of these dynamics is essential for developing effective conservation strategies. Filling these knowledge gaps through vulnerability assessments, monitoring, experiments, and modeling is important for improving conservation effectiveness.
- **Utilize an adaptive management approach in implementing adaptation strategies**
Any strategy for conserving species and ecosystems should be implemented within an adaptive management framework. This allows managers to learn from outcomes and adjust tactics in response to new information and changing conditions.

Promote Biodiversity-Compatible Land Management

Nebraska's 48,000 farms and ranches cover nearly 46 million acres (93% of the state's total land area) making landowners some of the primary stewards of Nebraska's biological diversity. Management of these lands directly impacts individual species, natural communities, and larger ecosystem processes, such as hydrology, stream quality, and nutrient cycling. According to the 2004 Nebraska Annual Social Indicators Survey (NASIS), over 90% of Nebraskans felt that farmers and ranchers should have a major or moderate role in conserving "at-risk" species in the state (Bureau of Sociological Research, 2004). To meet this public expectation, the state's private landowners and conservation organizations need to work together and share responsibility for conserving biological diversity.

Nebraska has nearly 1,600 square miles of public conservation lands, including national wildlife refuges (NWRs), national forests, national monuments, state parks, and wildlife management areas (WMAs). These areas play a critical role in conserving habitat that supports our biological diversity. Expanding management activities for natural communities can increase the benefits for the full array of native species... For example, more public lands could be enhanced for native plants by using tools like prescribed fire and grazing practices, such as intense spring grazing, to better manage native prairies. Public opinion supports these ideas. According to the 2004 NASIS survey, 90% of Nebraskans feel that improving management on existing public lands is very or moderately important for reversing the decline of at-risk species (Bureau of Sociological Research, 2004).

Nebraska's urban and rural residents also want to take part in conserving the state's native flora and fauna. Biological diversity cannot be conserved solely on public lands. To be effective, conservation efforts should combine improved management on current public lands, protection of some additional lands through acquisition or conservation programs, and voluntary, incentive-based actions on private lands.

Over the past 150 years, land use and management practices have significantly altered Nebraska's biological landscape and the natural processes that sustain the plants and animals.

Prior to settlement, the primary forces shaping prairies, woodlands, and wetlands were climate (e.g., droughts, floods), fire, and grazing. Today, additional factors including manmade changes to hydrology, invasive species, habitat fragmentation, and pollution directly affect species and disrupt ecological processes, leading to habitat degradation.

Conservationists identified six key stresses that affect biodiversity in Nebraska:

- Altered natural fire frequency
- Altered natural grazing patterns
- Altered hydrology
- Invasive species and pathogens
- Habitat fragmentation
- Pollution

Fire Management Systems

Prior to European settlement, fires likely occurred every one to five years in eastern Nebraska and every 10 to 20 years in the western part of the state. Suppression of fire has had negative impacts on native prairies, woodlands, and wetlands, and currently less than one percent of these communities are burned annually. Fire suppression has led to the rapid spread of eastern red-cedars and other woody species in prairies and woodlands, leading to habitat fragmentation, the shading out of native plants, and reduced forage for livestock. The use of prescribed fire can help reverse these negative effects. Areas with tall, dense trees, may require mechanical thinning prior to prescribed burning to reduce fuel loads and prevent stand-replacement fires. Prescribed fire can also be used in combination with livestock grazing to enhance prairies and wetlands.

In the past few decades, the wildfire season has lengthened, and the number of acres burned has significantly increased. In the Great Plains, the total acreage burned by large wildfires increased by 400% from 1985 to 2014. In addition, the average number of large wildfire events in the region rose significantly, from approximately 33 per year between 1985 and 1994 to nearly 117 per year from 2005 to 2014 (Donovan et al., 2017). In Nebraska, an increase in wildfires will likely have a major impact on ponderosa pine woodlands in the Pine Ridge and Wildcat Hills, where years of fire suppression have increased fuel loads. Before settlement, wildfires in these areas were mostly low-intensity ground fires burning through open pine woodlands. Today, they are often high-intensity crown fires that have devastating, long-term impacts to these woodlands. Fire suppression has also reduced the frequency of fire in native grasslands, and prescribed fire would also benefit these systems.

Although more Nebraska landowners are showing interest in prescribed fire, many lack the capacity (e.g., equipment, trained burn crews) or expertise to safely implement fire. Conservationists also face a shortage of resources needed to implement prescribed fires at the necessary scale. Many private landowners are hesitant to burn because of liability concerns. However, several efforts are in place to increase awareness and use of prescribed fire in Nebraska, including the Prescribed Burn Task Force, Prescribed Burn Associations, and the Great Plains Fire Learning Network, which hold workshops and demonstration burns for private

landowners. Significant progress has been made in education, outreach, and landowner adoption of prescribed fire. In some regions, interest has outpaced the ability to meet the demand for both training and equipment.

Actions Related to Prescribed Fire

- Continue to promote the safe use of prescribed fire for grassland, woodland and wetland enhancement through public outreach. Conduct demonstration burns as a means to further the understanding and acceptance of burning.
- Continue to increase the capacity of private landowners to burn by providing technical and financial assistance, equipment, fire-training workshops and how-to guides.
- Identify and continue to work toward overcoming barriers that limit the ability to conduct prescribed burning on private and public lands.
- Continue to develop and refine a prescribed fire implementation guide for enhancement of natural communities for biodiversity as well as production.
- For select grasslands, evaluate the use of patch-burn grazing and other grazing systems that combine the interaction of fire and grazing to mimic pre-settlement disturbances.
- Promote the practice of pre- and post-burn evaluations to minimize impacts to species that lack the ability to re-colonize a site following a burn.
- Continue to promote and support the establishment of prescribed burn associations and cooperatives composed of local landowners, agencies and other partners. Identify opportunities to strengthen and expand existing landowner-led burn cooperatives.
- In western Nebraska, promote the use of tree thinning and prescribed fire to reduce the damage to pine woodlands from intense wildfires.
- Promote the use of prescribed fire, following mechanical thinning if necessary, to remove eastern red-cedar and restore native prairie and woodland ecosystems.

Grazing Management Systems

Nebraska contains approximately 22 million acres of rangeland and pastureland. Most prairie plants have evolved with and adapted to grazing. Proper grazing can promote structural heterogeneity, native plant diversity, and can help control invasive species. However, timing and intensity of grazing is critical to achieving plant community health and diversity, maximizing benefits to the widest variety of species while maintaining livestock production.

Historically, bison and other large ungulate grazing patterns were driven by fire and weather. Today, most grazing occurs in the absence of fire and with relatively little variation in timing and intensity. As a result, large areas of prairie have shifted from diverse mixes of native grasses and

wildflowers to grasslands dominated by less diverse plant communities, including non-native species such as Kentucky bluegrass and smooth brome, and less palatable weedy species (e.g., western ragweed). The widespread application of herbicides and inter-seeding of non-native grasses further degraded rangelands. Enhancement of degraded prairies is generally a long-term process.

Both overgrazing and a lack of grazing can be detrimental to biological diversity. Consistently overgrazing can change the plant species composition of grasslands, favoring disturbance-tolerant plants adapted to heavy grazing. Heavy grazing near streams and wetlands can cause erosion and increase sedimentation and pollutants entering water bodies. Conversely, the lack of fire and grazing can lead to a loss in plant diversity due to thatch accumulation, competition from non-native plants, and loss of microhabitats necessary for plant reproduction. A lack of grazing in wetlands can favor monocultures of the non-native cattails, common reed and reed canary grass.

Haying and mowing can serve as alternatives to grazing and provide benefits to plant communities and species. These practices help control woody encroachment and thatch accumulation, but they lack some benefits of grazing such as selective herbivory, soil disturbance from hoof action, and nutrient cycling through animal waste. Continual annual haying, however, can reduce plant composition and structural diversity.

Actions Related to Grazing/Haying

- Promote and support the use of diverse grazing/haying systems on private and public lands that enhance biological diversity and natural communities. Initiate research to evaluate the effectiveness and profitability of biological diversity-friendly grazing/haying systems, such as intense spring or winter grazing.
- Promote and support the development of locally-based grazing cooperatives and incentive programs that facilitate grazing of playa wetlands, small and disjunct prairies and other sites with minimal grazing income potential or limited grazing infrastructure.
- Promote and incentivize the utilization of annual forage crops on cropland near existing rangelands to facilitate rest of rangelands, with or without prescribed fire afterwards.
- Promote haying methods on wet meadows and prairies that diversify the timing and height of haying, promote increased plant and animal diversity, and avoid peak nesting periods for grassland birds.
- Promote the use and availability of local-ecotype seed for prairie restoration and grassland inter-seeding.
- Promote livestock grazing/haying systems that have built-in drought management contingencies (e.g., grass banking).

- Promote legislation and programs that help reduce the conversion of grasslands to cropland.

Altered Hydrology

The Sandhills ecoregion stands out as containing some of the most unaltered rivers and streams remaining in the Great Plains. These aquatic systems are critical to Nebraska's biodiversity. Nearly half of the state's Tier I at-risk species depend on wetland or riverine habitats. Historically, Nebraska had approximately 3 million acres of wetlands and nearly 24,000 miles of rivers and streams. Unfortunately, 35% of these wetlands have been lost, including nearly 90% of some playas, saline wetlands, and wet meadows (LaGrange, 2022). Many rivers and streams have also been significantly modified due to reduced flows and channelization. Thus, continued conservation and restoration of the state's wetlands, rivers, and streams are critically important for sustaining biological diversity.

Wetland loss has largely resulted from practices, such as tiling and field leveling, which eliminate natural pooling areas. This has drastically reduced habitat for many resident wildlife including amphibians and migratory species, such as shorebirds and waterfowl resulting in severe overcrowding for spring migrating waterbirds. The lack of management or disturbance of existing wetlands has led to the spread of invasive species, which are outcompeting native vegetation and further diminishing biodiversity. Although past governmental programs facilitated wetland drainage, a shift in public attitudes in the 1970's have spurred greater interest in wetland conservation by agencies, landowners, and communities.

Although, droughts are a natural phenomenon in the Great Plains, prolonged dry periods can intensify competition and conflicts over limited water resources. Healthy wildlife and plant communities are well adapted to withstanding long periods of drought, but biological diversity is threatened as rivers and streams reach or exceed full appropriations. Water diversions from streams and rivers during droughts can greatly reduce the deep-water habitat available to fish and can raise water temperatures, increasing the risk of mortality for fish and aquatic invertebrates. Groundwater pumping for irrigation, municipal, and other uses lowers water table levels that would otherwise sustain grassland plants through hot and dry periods. Additionally, dams and other barriers on rivers and streams restrict fish and wildlife movements, leaving large expanses of potential habitat uninhabited or suppressing gene flow among populations.

Beyond these local pressures, broader shifts in hydrological patterns across the region are expected to influence water availability and flow timing. Prolonged droughts, increased evapotranspiration rates, and more frequent heavy precipitation events are expected to persist, potentially leading to reduced base flows and more intense flooding events. In the Rocky Mountains, more winter precipitation is falling as rain rather than snow, reducing the overall snowpack. Coupled with an earlier onset of spring, this results in premature snowmelt. These changes affect the timing and amount of Platte River flows, and the species and habitats that depend on them, particularly in late summer.

Nebraska's rivers have undergone substantial changes over the past two centuries. Historically,

the state's largest rivers experienced large fluctuations in flows, particularly in the spring when snowmelt and spring rains scoured sandbars and moved sediment, creating treeless expanses favored by migratory birds and other species. Today, earlier snowmelt in winter has reduced the occurrence of traditional spring pulse flows. At the same time, direct diversion of surface flows and pumping from alluvial wells for irrigation and municipal uses have substantially reduced the base flows in many rivers, caused others to dry up completely, and impacted native aquatic and terrestrial communities.

As public awareness of the value of wetlands and natural flowing rivers has changed, efforts to restore these important habitats on both private and public lands have increased. Across the state, hundreds of wetlands have been voluntarily restored and countless other restoration projects are planned in the future. The ability of landowners to use wetlands for grazing and hay production after restoration helps meet landowner needs for income and maintains some level of disturbance that promotes wetland health. We need to protect floodplains from development and allow the rivers to naturally migrate their pathways. Naturally meandering rivers and streams play a vital role in shaping diverse and dynamic habitats, while intact floodplains help absorb floodwaters, filter pollutants, and provide critical refuge for wildlife. Maintaining or closely simulating the natural hydrograph of rivers and streams is essential for sustaining the biological diversity of aquatic and riparian ecosystems.

The conservation of Nebraska's streams, rivers, and their associated aquatic habitats will require hard work, compromise, and a shared vision for conserving Nebraska's biological diversity and sustaining an agricultural economy. Much is to be gained by conserving both, but change will be necessary. It is recognized that in some instances in the state, irrigation may augment habitat. Pools of water are generated in areas that would otherwise be dry. These water sources can be useful to wildlife. Innovative solutions are required to ensure there is enough water to meet the needs of people and wildlife and that effective measures are taken to maintain water quality.

Actions Related to Hydrology

- Seek to maintain or restore the natural hydrology of rivers, streams, and wetlands to sustain biological diversity and ecosystem function. Accomplish this through the use of voluntary incentives, sound bio-engineering solutions, and through collaborative decision-making.
- Establish an interdisciplinary working group that can develop a shared vision for the judicious use of limited water resources by developing drought mitigation strategies, alternative cropping/irrigation methods, etc. that conserve and enhance biological diversity and lead to increased economic sustainability.
- Assess where current stream flows are inadequate and flow appropriations would most effectively contribute to the maintenance of biological diversity in Nebraska.
- Promote the development of an integrated water management plan for all water uses throughout the state.

- Promote and provide incentives for the use of wildlife-friendly conservation buffers, grassed waterways, sediment traps, etc., on lands adjacent to wetlands, rivers, streams, reservoirs, and lakes to prevent siltation and protect water quality.
- Strengthen existing or establish new statewide partnerships responsible for promoting wetland, river, and stream conservation.
- Promote the value of naturally meandering rivers and streams, role of floodplains as habitat, and the need to maintain or closely simulate the natural hydrograph of rivers and streams to benefit biological diversity.
- Evaluate the impacts of new dams, additional groundwater and surface water withdrawals, channelization, and levy/dike construction on biological diversity.
- Promote the development and use of water conservation measures such as more water-efficient irrigation systems, xeriscape landscaping, water-conserving appliances, etc.
- Promote the importance of periodic pulse flow events (e.g., flooding) to accomplish necessary system functions such as sediment transport, channel formation, and the creation of deep-water refugia for aquatic species during drought conditions.

Introduction of Invasive Species and Pathogens

Nebraska's native prairies, woodlands and wetlands have been highly degraded by non-native plants that were deliberately or accidentally introduced to America. Other non-native plants and animals, such as the common dandelion and ring-necked pheasant, appear to have little impact on our state's biodiversity.

Aggressive non-natives negatively impact native species through competition, direct predation, disruption of food chains, or by altering habitat or ecological processes. Nationally, invasive species are considered the second leading threat to biological diversity, second only to direct habitat loss. Invasive species cost the U.S. more than \$26 billion annually by damaging crops, reducing available grazing land, clogging waterways, and limiting nature-based recreation like fishing, boating, and hiking. In Nebraska alone, 600,000 acres of grasslands have been degraded by woody plant encroachment from 2000-2017 (Fogarty et al. 2020). Additionally, 63 waterbodies are now infested with aquatic invasive species in the state. According to the 2004 NASIS survey, 58% of Nebraskans think that non-native species are very or moderately likely to threaten at-risk species in the state (Bureau of Sociological Research, 2004).

Unfortunately, the vast majority of our native plant communities are now composed of a mix of native and non-native species. Non-native grasses such as smooth brome, Kentucky bluegrass and cheatgrass flourish under annual-mid-summer haying and long-term heavy grazing. Noxious weeds, such as Canada thistle and sericea lespedeza, impact both the biodiversity and production of grazing lands, and control efforts are often expensive. According to the Nebraska Invasive Species Council (NISC), each year, more than \$2 million is spent on monitoring,

mapping, managing, surveying, and controlling terrestrial and aquatic invasive species in Nebraska (NISC 2024 Annual Report). Non-native wetland species, such as common reed and saltcedar, impact the hydrology of wetlands, streams, and rivers through increased water consumption, severely reducing water flow and supply for Nebraska and its neighboring states.

Introduced, non-native animal species are also impacting Nebraska's biological diversity. In streams, the western mosquitofish, for example, competes with and often excludes the native plains topminnow. Common carp can alter bottom substrates and impact water quality of lakes and streams, and in larger rivers, the filter-feeding silver carp can disrupt food chains. House sparrows and European starlings compete with native cavity nesting birds for nest sites. Additionally, free-ranging domestic cats pose a major ecological threat, killing an estimated 2.4 billion birds and 12.3 billion mammals annually in the U.S. Beyond direct predation, cats also affect wildlife through competition, disease transmission, behavioral changes, and broader ecological disruptions, making them the leading human-caused threat to native birds and a major contributor to biodiversity loss (Schweitzer & Gillin, 2020). Lastly, the highly aggressive zebra mussel threatens the state's native mollusks.

Less is known about the impact of many pathogens or disease-causing agents on wildlife; however, the impact of some pathogens have been well-documented. Both avian cholera and Highly Pathogenic Avian Influenza have resulted in large die-offs of waterfowl during migrations, West Nile virus has caused mortality in more than 150 species, including humans. Chronic Wasting Disease can have population-level impacts on native ungulates, including deer and elk. Additional resources are needed to determine the impacts of disease-causing agents and other pathogens on biological diversity, and proactive solutions need to be identified and implemented.

In all likelihood, invasive plant and animal species, as well as pathogens, will continue to spread and increase in abundance. This increase in invasive species will only amplify the stress of our native flora and fauna.

Actions Needed to Reduce the Impacts of Invasive Species and Pathogens

- Support existing cooperatives and organizations, such as the Nebraska Invasive Species Council, that strive to gather and distribute information about the spread of all known invasive species and share the best methods of control.
- Develop and implement early detection and rapid response programs for invasive species, pests, and pathogens.
- Discourage the use of non-native species in prairie and other restoration efforts, while promoting the use of local-ecotype seed.
- Promote and fund the removal of invasive fish, such as invasive carp, from lakes and streams with a goal to improve water quality, aquatic vegetation, and overall biological diversity.

- Promote the use of only native plants within the horticulture and forage plant industries.
- Promote the use of only native species in fish stocking programs.
- Develop best management guides and other educational materials to reduce the inadvertent transport of invasive species, pests, and pathogens.
- Collaborate with natural resource organizations and others to develop a list of preferred native plants (e.g., trees, shrubs, grasses, wildflowers) to be used in urban and rural plantings.
- Develop best management guidelines for herbicides and biocontrol methods that are used to control invasive species to lessen the impacts to biological diversity.
- Provide public outreach that highlights the ecological impacts of free-ranging domestic cats, including their role in the decline of native bird and mammal populations, and encourage responsible pet ownership practices such as keeping cats indoors or in enclosed outdoor spaces.
- Investigate the factors leading to the spread of invasive species, diseases, and other pathogens and their impacts on biological diversity.
- Develop and implement protocols to better monitor, assess impacts, respond to, and manage invasive species and pathogens in Nebraska.

Habitat Fragmentation

Large-scale habitat fragmentation has occurred across most of Nebraska, with the Sandhills being a notable exception. The main drivers of this fragmentation include the conversion of grassland to crop fields and rural and urban development. Infrastructure, such as roads, dams, cellphone towers, energy development (e.g., wind turbines), and fences, also impacts wildlife by altering habitat use, disrupting movement, or increasing mortality (e.g., birds and bats colliding with wind turbines). Fragmentation can also increase the spread of non-native species, disrupt ecological processes and predator-prey relationships.

Nebraska, the Arbor Day State, has a long and proud history of tree planting, with millions of trees planted as windbreaks, wildlife habitat, and in urban settings. However, the planting and spread of trees, such as eastern red-cedar has caused extensive fragmentation of native grasslands.

Large-scale energy development continues to expand in the state. Unfortunately, energy development comes with environmental costs. Proper placement of energy development is needed to prevent further habitat fragmentation. For example, turbines should not be placed near wetlands, rivers, or riparian corridors, as they pose a risk to migrating songbirds and waterbirds, including the endangered whooping crane. The energy development guidelines, by

the Nebraska Game and Parks Commission and its partners, include detailed recommendations for siting infrastructure in ways that minimize harm to native plant communities and wildlife.

Many wildlife species' ranges are shifting as habitats are altered or lost. However, such shifts are only possible if appropriate habitat is available. For less mobile species, habitat fragmentation limits their ability to relocate. Conservationists need to be aware of this lack of connectivity and strategic planning and investment will be necessary to overcome it.

One approach to offset the impacts of habitat fragmentation is to identify, restore, and conserve migration corridors. Identifying corridors can be challenging, as species do not always move in straight lines. Current models are limited in their ability to predict where suitable habitat conditions will exist in the future. Additionally, restoring and conserving habitat corridors in highly fragmented areas, such as the tallgrass prairie ecoregion, will be both expensive and politically challenging.

Actions Needed to Reduce Habitat Fragmentation

- Provide incentives to private landowners to maintain natural habitats and to cooperatively manage large blocks of habitat that reduce fragmentation and conserve biological diversity.
- Collaborate with planning commissions, county commissions, and building associations to site new housing units in a manner that limit fragmentation of native plant communities.
- Use prairie, woodland and wetland restoration to reduce fragmentation and create migration corridors.
- Discourage the placement of woody plantings and food plots in prairies.
- Select sites for cellphone towers, wind turbines, dams, fences and other semi-permanent structures that minimize landscape fragmentation. Preferred sites are cropland or near towns, cities or industrialized areas that make use of existing access roads and utility corridors.
- Collaborate with transportation planners (e.g., Nebraska Department of Roads, Federal Highway Administration) to minimize impacts to at-risk species and their habitats.
- Create bypasses around dams, road culverts and other structures that impede the movement of fish and other aquatic animals.
- Work with energy companies building infrastructure to establish and sustain wildlife-friendly habitat corridors within their properties and easement areas.

Pollution

Water pollution, both point and nonpoint source, includes toxic chemicals, sediment, nutrients, and human and animal waste, all of which stress biological diversity, particularly aquatic species. Pollutants can directly harm species, such as when toxic chemical spills kill fish, or they can disrupt natural communities and ecosystem functions, like fertilizer runoff from fields causing lake eutrophication. Additionally, the bioaccumulation of toxic substances can impact food chains and food webs, reducing the recreational value of our lakes and streams.

Nebraska has more than 1,500 streams that flow over 16,000 miles, as well as 553 lakes and reservoirs covering more than 148,000 acres. According to the *2022 Water Quality Integrated Report*, by the Nebraska Department of Water, Energy, and Environment (DWEE), 688 stream segments and 347 lakes were assessed for water quality. Of the assessed streams, 253 (37%) were classified as impaired, due to the presence of elevated bacteria levels [*Escherichia coli* (E. coli)], impaired aquatic communities, high atrazine levels, and fish consumption advisories due to mercury in fish tissues. There were 202 (58%) lakes classified as impaired, due to nutrients, fish consumption advisories (i.e., mercury presence), Chlorophyll a, high pH, low dissolved oxygen, and bacteria (i.e., E. coli, microcystin).

According to the 2004 NASIS survey, 92% of Nebraskans stated water pollution is very likely or moderately likely to threaten at-risk species (Bureau of Sociological Research, 2004). Local Natural Resources Districts, the Nebraska Department of Water, Energy and Environment, and the federal Environmental Protection Agency regulate water quality and implement best management practices to help prevent or mitigate sources of water pollution.

Actions Needed to Reduce the Impacts of Pollution

- Promote integrated pest management (e.g., nonchemical controls such as biocontrol and tillage, spot spraying) through outreach and incentives to minimize impacts to biological diversity.
- Exchange information between conservationists, landowners, regulatory agencies and the public regarding the sources and impacts of pollution on wildlife.
- Implement and seek funding for filter strips, grassed waterways, sediment control basins, and grassed buffers to minimize the effects of fertilizers and pesticides on wetlands, streams, rivers and reservoirs.
- Install and implement conservation buffers, conservation tillage practices, etc., in watersheds in areas that maximize benefits to biological diversity.
- Promote management practices that reduce nutrients, sedimentation, bacteria and pesticides to enhance quality, such manure application on crop fields land, sediment control on construction sites, incentives for organic farming and low-chemical farming.
- Promote the location of power plants, factories, animal-feeding operations, homes and

other pollution sources in areas that will have minimal impact on river, stream, and wetland water quality. When optimal siting is not feasible, promote waste containment facilities.

Focus Conservation on the Best Opportunities

Conserving Nebraska's biological diversity is a significant undertaking, particularly given the limited resources available. Past conservation efforts have often been opportunistic and may not have represented the most effective use of these limited resources. For example, using scarce funds to protect a lower-quality tallgrass prairie with less diversity could preclude the protection of a higher-quality prairie with greater diversity. A more systematic and focused approach is needed to identify and prioritize the conservation of biological diversity in our state.

Multiple objectives can often be achieved using a habitat-based approach to conservation that benefits multiple species. Often, the most effective strategy is to conserve species-rich native plant communities in relatively intact landscapes. If the goal is to target specific species, sites should be chosen based on high viability (i.e., large population size, appropriate age class, successful reproduction, and few threats). For native plant communities, sites should feature a high percentage and diversity of native species, few non-native species, and the ability to implement ecological processes like fire and grazing. These sites will be more resilient.

The development of the Nebraska Natural Legacy Project utilized a systematic approach to identify at-risk species, ecological communities, and biologically unique landscapes (see Chapter 3). This effort was based on the best available data and represents a statewide, strategic approach to conserving biological diversity. Through adaptive management, conservationists continue to refine our wildlife conservation priorities and actions. We hope these efforts will help identify conservation targets and focal areas, ensuring the best use of our limited resources.

Actions Needed to Focus Conservation on the Best Opportunities

- Conduct inventories of at-risk species and plant communities to identify additional biologically unique landscapes (BULs), or modify existing BUL boundaries, and to prioritize areas within BULs for conservation efforts.
- Provide information to conservation planners and practitioners to help focus conservation actions.
- Ensure that high-quality occurrences of all terrestrial and aquatic community types and viable populations of at-risk species are placed under long-term protection and management.

Maintain and Expand the Network of Public and Private Conservation Lands

The continued loss and degradation of natural habitats undermine efforts to conserve biological diversity in the state. Nebraska's ranches, farms, and private and public conservation lands provide the foundation for a support system for the state's flora and fauna. Almost all existing habitat in Nebraska is under the stewardship of private landowners, and this will continue. Maintaining and improving existing habitat on working farms and ranches is key to conserving biological diversity and offers the greatest hope for success. There is also a need for some lands to be put under long-term protection and managed specifically for biological diversity. A network of conservation lands is needed that includes a combination of protected working private lands and public and private conservation areas managed for the purpose of perpetuating biological diversity.

Habitat loss is the primary cause of species decline. Most of the state's natural communities, with the exception of those found in the Sandhills and a few other areas, have undergone extensive losses. Some, like the tallgrass prairie have been reduced to less than 2% of their original extent. While it is possible to restore cropland and other altered lands, reestablishing the full complement of biological diversity is often impractical and prohibitively expensive. To be able to conserve the full array of biological diversity, we need to conserve existing natural habitats that are still in relatively good condition. John Weaver the acclaimed prairie ecologist noted:

"Prairie is much more than land covered with grass. It is slowly evolved, highly complex, and centuries old. Once destroyed, it can never be replaced by man."

An important way to ensure that species, habitats, and ecosystem processes are maintained over time is to devote some portion of the landscape to those specific purposes. This can be done by expanding the network of lands that have long-term protection from conversion/ degradation and to manage these lands principally for biological diversity. This network of conservation lands does not have to be limited to those owned by government agencies or conservation organizations. Private lands with conservation easements, long-term leases or management agreements could also be included. Length of conservation easements and long-term management should be carefully considered. Collaboration with private landowners adjacent to lands under long-term protection can enlarge or buffer these lands resulting in larger blocks of habitat. These lands do not need to be managed to the exclusion of human uses. The key lies in the emphasis on biological diversity values, not as a collateral or subsidiary benefit, but as a primary goal for managing the land.

Consideration of sites with greater habitat and topographic diversity will allow species to move locally to find suitable conditions if the current habitat changes. In addition, the more heterogeneous and complex a site, the more microhabitats are likely present that can meet requirements for a wide range of species. Selecting sites within intact landscapes will also facilitate species movement. A network of conservation areas should include representation of all habitat and community types as well as ample replication.

New approaches to land conservation that take into account the dynamic nature of the environment will likely be needed. One approach that is being discussed is to protect a network of conservation “stages,” nature reserves that capture the geophysical diversity (topography, soils, geology) of a region. Conserving a full spectrum of different geophysical settings, stratified across elevation zones and latitudes, may offer an approach to conservation that protects biological diversity for years to come. Instead of aiming to maintain a particular species composition, the conservation of ecosystems defined by geophysical settings puts more emphasis on accommodating dynamic processes, maintaining ecological function and building adaptive capacity. These approaches allow for species distributions to shift, and for novel communities to form, while still conserving the maximum biodiversity. This approach would conserve the ecological “stage” rather than the temporary “actors.” This approach would need to be a combined strategy to ensure that the actors are able to move between stages.

In some cases, voluntary acquisition of land by public agencies or private conservation organizations is an appropriate conservation alternative. With less than 3% of the state in public conservation lands, Nebraska has one of the lowest percentages of public land in the country. A large proportion of the state's public land is in the Sandhills and the northwestern corner of the state, leaving many natural communities underrepresented or not included at all as public trust lands. Acquisition of underrepresented natural communities from willing sellers by private or public conservation groups would help ensure the long-term conservation of biological diversity. In addition, 25% of the Tier I at-risk species have no documented occurrences on public lands and therefore are not ensured long-term habitat protection. A number of these species may have habitat management requirements that are not conducive to achieving an economic return. Thus, public or private conservation ownership may be the most practical way to maintain some species. To be acceptable to the public, these acquisitions should ensure that payments are made in lieu of property taxes to maintain the local tax base. Public lands have the additional benefits of meeting recreational, educational, research and other societal needs.

There is also a need to improve management on existing public and private conservation lands so that the needs of a greater array of species can be met. Public land managers and private conservation groups often lack the financial and human resources to adequately manage their lands for biological diversity. Demands on managers’ time to control invasive species and administer public use often leave little additional time to restore or manage natural communities. Insufficient capacity to monitor and evaluate management activities and a lack of information about species habitat requirements and management alternatives serve as barriers to improved conservation land management. These issues need to be addressed so that public and private conservation organization lands can more fully contribute to the conservation of our natural heritage.

Actions Needed to Improve the Network of Public and Private Conservation Lands

- Identify and secure long-term protection for unique or high-quality natural communities through actions such as conservation programs, land exchanges, voluntary acquisition, or conservation buyer programs.
- Encourage and support the formation of new or expansion of existing land trusts to

acquire and manage conservation easements that conserve biological diversity in Nebraska.

- Continue to improve or change management on public lands to better protect, enhance, and sustain biological diversity and natural communities.
- Facilitate the long-term protection of biologically important lands enrolled in short-term conservation programs (e.g., Conservation Reserve Program, private lands programs) through conservation easements.
- Continue to seek opportunities to improve management on publicly-owned lands that are not part of the conservation network (e.g., Bureau of Education Land Fund holdings) to increase benefits to biological diversity.
- Support efforts to provide voluntary public access to private conservation lands managed for biological diversity.

Demonstrate Success

Components of at-risk species conservation include demonstrating successful habitat management and sharing this story with the public. Engaging local communities is a necessary component of establishing the Nebraska Natural Legacy Project statewide as a guide for conservation. When local communities are engaged in local conservation initiatives, there is greater understanding of at-risk species conservation, willingness to participate in conservation actions, and greater collaboration among landowners and conservation practitioners. This sets the stage for collaborative habitat improvement projects that cross ownership boundaries.

One way to demonstrate success and engage local individuals is through demonstration sites. There are many conservation projects and lands across Nebraska that offer improved wildlife habitat. Natural Legacy Demonstration Sites should capture Nebraska's representative habitat types and management that is currently fostering the mission of the Natural Legacy Project. Demonstration sites need to provide habitat for at-risk species and the support necessary for sustainable management. Demonstration sites should be open for the public to view conservation projects and results and learn more about a site's unique qualities, importance to at-risk species, and management practices that sustain biological diversity.

Actions Needed to Demonstrate Success

- Establish Natural Legacy Demonstration Sites across Nebraska.
- Advertise Natural Legacy Demonstration Sites and hold regular meetings to discuss management and at-risk species conservation.
- Support conservation management actions at these locations.

- Develop informational materials branded with the Nebraska Natural Legacy Project suitable for each location.

The following sites have been selected as Nebraska Natural Legacy Demonstration Sites based on their locations across the state and potential for public demonstrations.

Natural Legacy Demonstration Sites:

1. Oglala National Grasslands
2. Fort Robinson State Park
3. Ponderosa Wildlife Management Area
4. Wildcat Hills
5. Crescent Lake National Wildlife Refuge
6. Enders Reservoir
7. Cedar Valley Wildlife Management Area
8. Valentine National Wildlife Refuge
9. Niobrara Valley Preserve
10. Pressey Wildlife Management Area
11. Calamus Wildlife Management Area and State Recreation Area
12. Funk Waterfowl Protection Area
13. Rowe Sanctuary
14. Platte River Prairies
15. Crane Trust
16. Gjerloff Prairie
17. Grove Lake Wildlife Management Area
18. Niobrara State Park
19. Wood Duck Wildlife Management Area
20. Ponca State Park
21. Rock Glen Wildlife Management Area and Rock Creek Station State Historical Park
22. Spring Creek Prairie Audubon Center
23. Saline Wetland Complex
24. Burchard Wildlife Management Area
25. Schramm Park State Recreation Area
26. Boyer Chute National Wildlife Refuge
27. Fontenelle Forest (a) and Neale Woods (b)
28. Indian Cave State Park

Strengthen Connections between People and Nature through Nature-Based Recreation

Nature-based recreation includes outdoor activities in natural settings that directly involve elements of nature, such as wildlife viewing, fishing, hunting, hiking, kayaking, and mountain biking. By providing people with opportunities to engage with natural resources, nature-based recreation can create a more personal connection to wildlife and habitats. This cultivates an appreciation and support for conservation of natural resources.

As the demand for nature-based recreation continues to rise, it's essential to offer sustainable opportunities that strengthen public connections to nature while aligning with long-term conservation goals. According to the 2022 *National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* of people 16 years or older in the U.S., 39.9 million people fished, 14.4 million hunted, and 148.3 million (57% of the U.S. population age 16+) engaged in wildlife watching. Birdwatching was the most popular form, with 96 million birders (U.S. Fish and Wildlife Service, 2023, 2024).

As interests expand beyond hunting and fishing, it's important to explore and support diverse recreation opportunities. Doing so builds stronger connections with nature across a broader audience, fostering more conservation support. According to the *Sustainability in Parks and Recreation* report, 93% of U.S. adults agree that conservation is an essential role of parks and recreation (National Recreation and Park Association, 2023). Recreationists also have the potential to support conservation through financial contributions and volunteer activities such as litter clean-ups. A national survey found that many wildlife viewers are willing to financially support state agencies if the funds are used for conserving preferred species, habitats, or improving wildlife viewing experiences (Sinkular et al., 2022). This highlights an opportunity to develop additional ways for recreationists to contribute to conservation efforts.

Nebraska's Opportunities

Nebraska, with its varied landscapes and wildlife, offers abundant nature-based recreational opportunities. A survey of Nebraskans revealed 88.5% thought outdoor recreation was moderately to very important for their quality of life. Popular activities included using trails

2018 Participant Estimates in Nebraska



185,300
hunters



223,900
anglers



425,600
wildlife watchers

Source: Nebraska's Outdoor Economy Report, 2020

(99%), walking outdoors (91%), birding/wildlife viewing (54%), and hiking (53%; Bureau of Sociological Research, 2024). From the Missouri River in the east to western pine forests and the wetlands and prairies in between, Nebraska boasts a rich variety of natural areas with diverse recreational opportunities.

Balancing Recreation and Conservation

Without sustainable wildlife populations and intact natural communities, opportunities for nature-based recreation will be severely limited. Nature-based recreation can serve as a strong incentive for conserving biological diversity, but it must be managed carefully to prevent negative impacts. Poorly planned or over-crowded recreational activities can degrade natural systems, causing erosion, compacting soil, disturbing wildlife, and spreading invasive species.

As the demand for recreation opportunities continues to grow, it's important that recreation development considers the social carrying capacity of natural areas and maintains a balance between access and protection to ensure people have quality experiences in nature.

Creating more recreation opportunities, like multi-use trails, in urban areas may help curb the perceived crowding felt by more than a third of Nebraskans in the Omaha and Lincoln metro areas (Bureau of Sociological Research, 2024).

Invasive species also remain a growing concern. They can reduce biodiversity, impact

Closures of portions of a beach for nesting piping plovers can intensify crowding in the remaining open portions of the beach. Setting a max capacity to limit crowding on the beach can not only reduce crowding and disturbance to the nesting plovers, but also improve attitudes toward the species (Jorgensen and Brown, 2016).

recreational experiences, and be spread unintentionally by visitors. Educational campaigns like “Clean, Drain, Dry Your Watercraft” and “Look Before You Leave” aim to prevent the spread of species like zebra mussels and Eurasian watermilfoil. Expanding such outreach efforts is key to conserving recreation areas and natural ecosystems.

Strategic Planning and Partnerships

To promote sustainable recreation while conserving natural resources, innovative strategies and planning are necessary. Nebraska's *Statewide Comprehensive Outdoor Recreation Plan (SCORP)* helps guide recreation development tailored to regional needs in private and public spaces like local or state parks, WMAs and other protected areas. Many state parks, WMAs, and other natural areas already offer a balance of recreation and conservation. Yet awareness of these areas and the recreational opportunities they offer remains a barrier. Over 40% of Nebraskans said that lack of information limited their outdoor participation (Bureau of Sociological Research, 2024). This aligns with a national survey that found wildlife viewers want more information about where to go observe wildlife (Sinkular et al., 2022). Online tools like the Game and Parks online maps and the Nebraska Birding Guide website highlight recreational opportunities across the state. These resources make it easier for the public to find and enjoy outdoor activities. Expanding the marketing of these current resources and developing new resources would help further connect people with nature.

Partnerships with business and tourism sectors are also essential. Involving more individuals with nature-based recreation knowledge can help inform community leaders, promote opportunities, and strengthen the region's conservation and recreation economy.

Economic Impact

Beyond its ecological and cultural value, nature-based recreation offers significant economic benefits through trip-related and equipment expenditures, which supports jobs, and contributes to local, state and national tax revenue. In 2022, nature-based recreationists in the U.S. spent approximately \$394.8 billion on expenditures related to these activities, with wildlife

watching alone accounting for \$250.2 billion in expenditures (U.S. Fish and Wildlife Service, 2023). In Nebraska, nature-based recreation contributed \$4 billion to the economy in 2024, supporting local communities and jobs (Nebraska Game and Parks Commission, 2024). For rural communities in particular, wildlife viewing and other nature-based activities can provide a crucial economic boost by attracting visitors and generating spending in local businesses.

Providing sustainable, well-managed nature-based recreation opportunities offers ecological, social, and economic benefits. When people enjoy wildlife and natural areas, they become more invested in conserving those resources. This nurtures a conservation-minded public that supports conservation efforts and boosts outdoor recreation economies.

As nature-based recreation continues to grow, thoughtful planning is key to maintaining healthy ecosystems while expanding access to enriching outdoor experiences. With careful management, nature-based recreation can inspire lifelong connections to nature and help ensure the support of Nebraska's Natural Legacy for generations to come.

Recommended Actions to Provide Quality Nature-based Recreation

Resources & programs: Promoting and offering tools, outreach opportunities, and trainings can help build meaningful connections to nature while encouraging responsible recreation.

- Promote resources and opportunities (e.g., recreation grants) that assist communities with sponsorship of nature-based recreation programs and events.
- Increase the number of individuals knowledgeable about and committed to promoting nature-based recreational opportunities by developing new and supporting existing programs, such as naturalist programs.
- Enhance and promote current maps, mobile apps, and resources of public nature-based recreation sites like, All Trails App, OnX, Nebraska Birding Guide and other Nebraska recreation maps found on the website ([outdoornebraska.gov > guides-maps](https://outdoornebraska.gov/guides-maps)).
- Develop and promote resources and programs to educate recreationists on safe, ethical practices and proper behavior in natural settings and in proximity to wildlife to mitigate environmental, social, and ecological impacts. Share these resources and information with recreation outfitters and program providers (e.g., Leave No Trace, Trails are Common Ground).
- Develop new and promote existing funding mechanisms for recreationists to support nongame conservation efforts and nature-based recreational opportunities (e.g., Wildlife Conservation Fund).

Collaboration & partnerships: Strong partnerships with a variety of stakeholders, such as public agencies, nonprofits, community groups, and recreation professionals, are essential to expanding and enhancing nature-based recreation while supporting conservation and community goals.

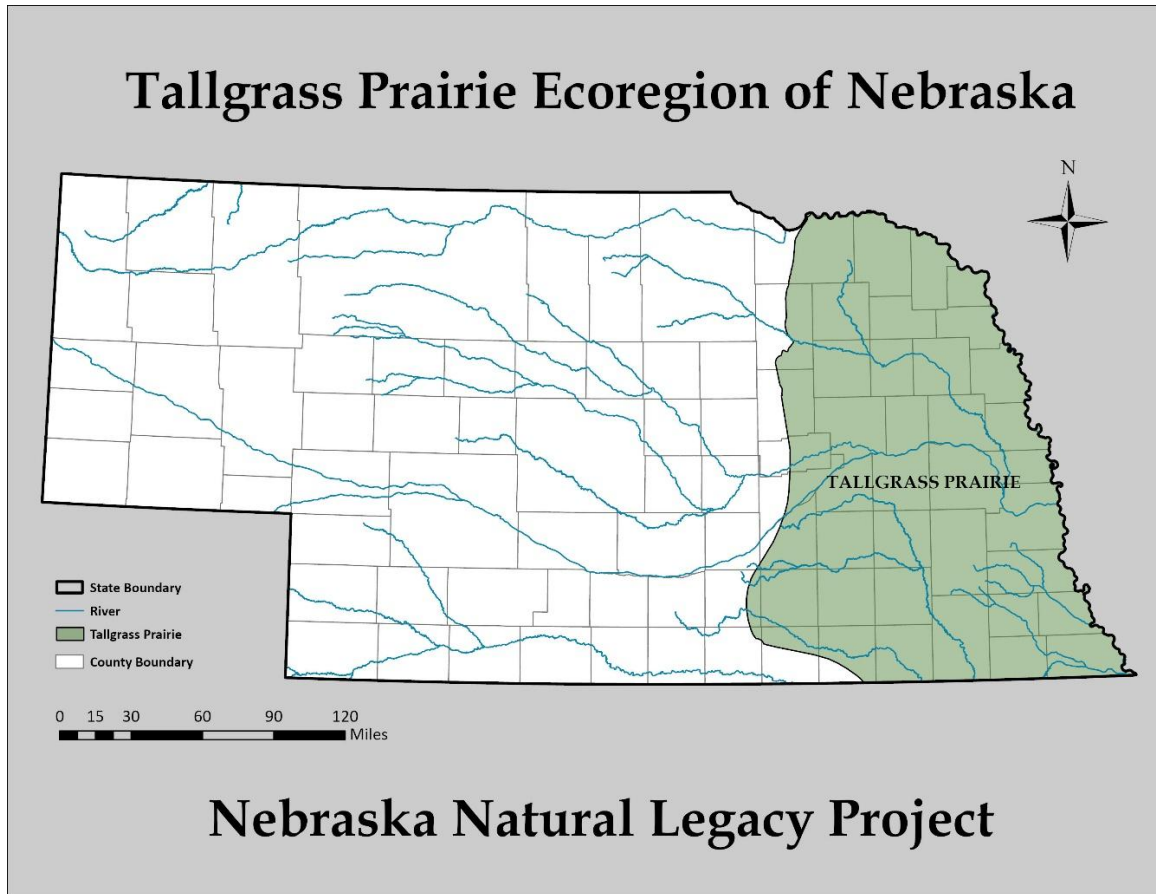
- Collaborate with partners to develop, enhance, publicize, and increase accessibility of nature-based recreation opportunities (e.g., trail amenities, wildlife-viewing opportunities).
- Provide resources and support to help communities develop new and connect existing green spaces that meet conservation, economic, and nature-based recreation goals (e.g., SCORP and Natural Playscape Guide found on the website (outdoornebraska.gov > community resources).
- Collaborate with partners to develop and support urban nature-based recreation programs and multilingual resources to introduce diverse audiences to recreational opportunities in their neighborhoods and the wildlife habitats found within their communities (e.g., Urban Wetlands video teaching about wetlands close to communities).
- Develop partnerships with landowners to increase access and opportunities for a variety of nature-based recreation opportunities on private lands and look into opportunities for compensation.
- Foster partnerships with naturalist and recreation groups to enhance positive engagement and increase the capacity to inform and improve policies related to the conservation of at-risk species and their habitats.

Recreation management: Thoughtful recreation management and careful planning ensures outdoor activities are compatible with conservation priorities.

- Increase assessments of potential impacts recreation use has on at-risk species and their habitats.
- Use collaborative planning to develop and enhance infrastructure to meet demands and guide recreationists to appropriate places to minimize impacts on key habitats, wildlife, and rare plants.
- Use a balanced approach when designing spaces that are suitable for habitat and recreation.

Chapter 5

Tallgrass Prairie Ecoregion



Introduction

Early European explorers described the tallgrass prairie, which stretched from eastern Nebraska to Indiana and from Texas to southern Canada, as “a sea of grass.” The Tallgrass Prairie Ecoregion covers the eastern quarter of the state, but tallgrass prairie itself extends westward into central Nebraska along stream valleys, such as the Republican, Platte, Loup, and Niobrara rivers. Tallgrass prairie is one of our nation's most endangered ecosystems. In our state, roughly two percent of the original tallgrass prairie remains, mostly as smaller hay meadows and pastures.

During the last few million years, glaciers, wind, and water shaped the topography of Nebraska’s tallgrass landscape. Today, the land surface is mostly rolling hills intersected by stream valleys. Elevation ranges from 850 feet above sea level in the far southeastern Nebraska to about 1,700 feet at the western edge of the ecoregion. Receding glaciers left evidence of their presence through till deposits and hilly moraines. After the glaciers receded, windblown loess was deposited over the till in much of the region. Water erosion later cut loess into hills

and valleys. Mainly loess and till parent materials, combined with organic matter accumulation from the deep-rooted prairie grasses, form the fertile soils that typify eastern Nebraska.

The ecoregion receives 25 to 36 inches of annual precipitation, significantly more than other ecoregions in the state. About 75% of this precipitation falls between April and September, with May and June being the wettest months. Near Omaha, average winter high temperatures are in the mid-30s Fahrenheit, while average lows are in the mid-teens Fahrenheit. In summer, average high temperatures are in the mid- to high 80s, with average lows in the mid-60s.

The ecoregion contains stretches of two of Nebraska's major rivers. The wide-valleyed, steep-bluffed Missouri River, the state's largest river, forms the northern and eastern boundaries of the ecoregion. The Platte River is a classic prairie river that, historically, has a shallow, braided channel reaching three miles wide. The ecoregion also includes many smaller streams, such as Papillion, Turkey, and Bazile creeks.

Vegetation

Prior to Euro-American settlement, tallgrass prairie prevailed across the uplands of the ecoregion, with the majority of woodlands and wetlands being restricted to stream valleys. Moist floodplains supported wet meadows, marshes, and cottonwood woodlands, while drier stream terraces supported deciduous woods of elms, ash, and oaks.

Tall grasses (big bluestem, Indiangrass, switchgrass, and Canada wild rye) dominated the upland prairies, often reaching six or more feet tall on the loamy soils. The prairie was also home to hundreds of wildflower species, including showy goldenrod, prairie blazing star, silky aster, and purple coneflower.

The loamy to sandy-soiled wet meadows of subirrigated floodplains were home to a lush vegetation of sedges, spikerushes, prairie cordgrass, and switchgrass. Marshes occurred in river floodplains and zones bordering the streams. Broadleaf cattails, bulrushes, bur-reed, smartweeds, and arrowheads were abundant along with other wetlands plants. Isolated playas were scattered in the uplands. The Todd Valley wetlands, located in a long-abandoned floodplain of the Platte River, are the region's largest playa complex. These shallow, often temporary wetlands support cattails, rushes, and a variety of annual plants.

A unique wetland type of the region, the eastern saline wetlands, occur in swales and depressions within the floodplains of Salt Creek and its tributaries in Lancaster and southern Saunders counties. As the name suggests, the wetlands have saline soils that support salt-tolerant plants such as saltgrass, sea-blite, and saltwort. The salts originate from underground rock formations deposited by an ancient sea that once covered the central Plains; they are brought to the surface through artesian flow and accumulate on the soil surface through evaporation.

Native woodlands are found mainly in more mesic and fire-protected stream valleys and bluffs and are most extensive in the Missouri River valley and its lower tributaries. Cottonwoods, willows, boxelders, and American elms dominate the wetter floodplain woodlands, while drier bluff woodlands support oaks, hickories, basswoods, black walnuts, and other deciduous trees.

Eastern red-cedar woodlands were limited to fire-protected islands, steep, north-facing bluffs and canyon bottoms.

Animals

More than 300 species of resident and migratory birds have been observed in the Tallgrass Prairie Ecoregion. Nesting waterbirds include wood duck, green heron, northern pintail, blue-winged teal, and mallard. The region also supports populations of greater prairie-chicken and a variety of grassland birds, including Henslow's sparrow, dickcissel, grasshopper sparrow, bobolink, vesper sparrow, and Swainson's hawk. Red-eyed vireo, black-and-white warbler, rose-breasted grosbeak, and orchard oriole are common woodland breeders.

The ecoregion is home to more than 55 mammal species, most of which have a widespread distribution and are also found westward in Nebraska. Small prairie mammals include the plains pocket gopher, prairie vole, plains pocket mouse, thirteen-lined ground squirrel, and Franklin's ground squirrel. The masked shrew and jumping mouse are found in wet meadows and other wetlands. Before European settlement, the tallgrass prairie was home to large grazers and browsers, such as bison, elk, and mule deer. Today, white-tailed deer are the most common large ungulate in the region, although mule deer are still occasionally found in upland grasslands.

Large predators that once lived in the region — such as mountain lions, black bears, grizzly bears, and gray wolves — are now extremely rare or have been extirpated. The most common large predators today are coyotes and bobcats. Other common predators include red fox, gray fox, American badger, least weasel, long-tailed weasel, and mink.

Streams, rivers, and lakes in the Tallgrass Ecoregion are home to more than 75 species of fish. Big river generalists include channel catfish, flathead catfish, flathead chub, and river carpsucker. Sport fish such as northern pike, largemouth bass, walleye, and bluegill have been introduced into many lakes and ponds. Invasive species like grass carp, common carp, silver carp, and bighead carp now inhabit most major rivers and lakes in the region.

Fifty-three species of amphibians and reptiles are found in the region, including two salamanders, five toads, six frogs, eight turtles, eight lizards, and 24 snakes. Although amphibians breed in wetlands, species such as the Great Plains toad, plains spadefoot, and Woodhouse's toad spend most of their adult lives in upland habitats. Common wetland reptiles include the northern painted turtle, false map turtle, and common snapping turtle. The six-lined racerunner and northern prairie skink are relatively common in grasslands but are rarely seen. Among the most common snakes are the bullsnake, western fox snake, yellow-bellied racer, and plains gartersnake. Venomous snakes such as the timber rattlesnake, western massasauga, and copperhead have very limited distributions in the southeastern portion of the state.

Insects are the most diverse and least studied animal group in the ecoregion even though they play vital roles as herbivores, predators, pollinators, decomposers, soil aerators, and as food for other wildlife. The regal fritillary and monarch are two at-risk butterflies that inhabit tallgrass prairie.

History and Dominant Land Use

Archaeological evidence suggests that Native Americans first hunted and foraged in eastern Nebraska about 12,000 years ago. In the early 1800s, the Otoe, Omaha, Ponca, and Pawnee tribes lived in eastern Nebraska often in earth-lodge villages. Farming and bison hunting were their primary form of subsistence.

In 1804, the Lewis and Clark expedition mapped what would later become the eastern boundary of our state. In 1812, the St. Louis Missouri Fur Company built a post in present-day Washington County — one of the first Euro-American establishments in Nebraska. Bellevue, founded in 1823, was the first permanent settlement. During the 1840s and 1850s, tens of thousands of migrants passed through the region on the Oregon and California trails heading westward.

The Homestead Act of 1862, which allowed settlers to claim 160 acres of free land, was the driving force behind settlement of the region. By 1900, the vast majority of eastern Nebraska was settled by people of European descent and being farmed. The bison herds that once sustained Native American had been wiped out decades prior, and the local tribes — and their culture — had been devastated by disease and relocated to reservations, many outside Nebraska. Today, all Native American reservations in Nebraska are located along the rugged terrain bordering the Missouri River, including those of the Santee, Omaha, Winnebago, Sac and Fox, and Ioway tribes.

Presently, major crops grown in the Tallgrass Ecoregion include corn, soybeans, and alfalfa. Nebraska's dairy, pork, and poultry industries are based in the eastern part of the state, while the cattle grazing is more concentrated in central and western Nebraska. The livestock and poultry industries utilize a lot of corn and soybeans as feed, and significant portion of the corn harvest goes to ethanol production.

Since the 1950s, advances in machinery and farming methods have made agriculture more efficient, reducing the number of people directly employed in farming, and farms have become fewer in number but larger in size. Many rural residents have been forced to move to cities and towns in search of other jobs.

Nebraska's largest cities, Lincoln and Omaha, are in this ecoregion. Omaha was founded in 1854 and later became the eastern terminus of the first transcontinental railroad, which helped spur its early growth. In the early 1880s, the establishment of the South Omaha stockyards further fueled the cities' expansion. Today, Omaha continues to expand and is now the 41st largest city in the U.S. Lincoln is Nebraska's second-largest city. Early settlers were drawn to the area by the salt industry, which was thriving there in the 1880s. In warm, dry weather, salt crust formed on the surface of saline wetlands and was collected for local use. The salt industry declined quickly after more efficient underground salt mines were developed in Kansas. In 1867, Lincoln was named the state capital and two years later the University of Nebraska was established there, further stimulating its growth.

Nature-based Recreation

Several of the state's top tourist attractions are outdoors in nature and provide a combination of conservation, education and recreation opportunities. Omaha's Henry Doorly Zoo sits on 160 acres and offers day camps, Scout programs, and family-friendly activities with a conservation message. Lauritzen Gardens, Omaha's Botanical Center, provides opportunities to view wildlife like pollinators and birds in their extensive gardens. Lauritzen Gardens is also conducting conservation research on unique Great Plains plant communities like the sandsage prairie in southwest Nebraska and is a participating institution in the Center for Plant Conservation. Fontenelle Forest is a popular place for residents around the Omaha area to go to view and learn about wildlife and enjoy a quiet walk through the woods and prairies. For more than 100 years, this nonprofit has worked to conserve habitats along the Missouri River near Omaha, while also providing recreational and educational opportunities for the public.

Nebraska Scenic Byway encourages travelers to enjoy the journey. The Lewis and Clark Scenic Byway retraces the path of Lewis and Clark from Omaha to South Sioux City on U.S. Highway 75, where you can see wooded bluffs, open bottomlands, cropland, and historic waterways. The Heritage Highway stretches from the Missouri River to south-central Nebraska along U.S. Highway 136 and cuts across the land memorialized by writer Willa Cather. Travelers can enjoy Homestead National Monument of America, where they can visit the second oldest restored prairie. The Outlaw Trail Scenic Byway along Highway 12 begins at South Sioux City and ends in Valentine. Along this route you can observe the transition from forested bluffs to the Sandhills.

Several state parks and recreation areas offer a plethora of recreation activities that are easily accessible. For example, Eugene T. Mahoney State Park offers hiking, camping and many other family-friendly activities. Ponca State Park and Schramm Park State Recreation Area (SRA) offer activities year-round at their education centers. Two Rivers and Branched Oak SRAs offer fishing, boating, swimming and hunting.

Wildlife Viewing

Wildlife viewing and birding enthusiasts find ample opportunities in this region with the diversity of habitats. More than 300 species of resident and migratory birds have been documented in this ecoregion. Fontenelle Forest, Indian Cave State Park, and Ponca State Park offer trails through wooded bluffs along the Missouri River that provide great opportunities to view numerous birds including warblers, thrushes, tanagers, and other birds seen almost exclusively in these areas during migration. Tallgrass prairie remnants, like the University of Nebraska's Nine-Mile Prairie and Audubon's Spring Creek Prairie, provide opportunities to see grassland nesting birds like Henslow's sparrow and bobolink. The saline wetlands in Lancaster and southern Saunders counties offer opportunities in and around the City of Lincoln to view a variety of wildlife, including waterfowl, shorebirds, white-tailed deer, and muskrats.

Trails

There are opportunities for canoeing, kayaking, hiking, and biking in this region. The Elkhorn River meanders through hilly areas with steep slopes, woodlands and dense forested areas interspersed with farmland. The Platte River is braided but usually has one deeper, darker

channel suitable for canoeing or kayaking. Sandbars in the river are used by waterfowl and shorebirds. The Missouri River has perhaps the greatest untapped potential as a nature-based recreation and tourism destination. This ecoregion includes a 59-mile stretch of the un-channelized Missouri River that has been designated as a National Recreational River. The stretch from Gavin's Point Dam to Ponca State Park is used by canoeists and kayakers but requires caution for navigating. Observers may also appreciate the unique geology of orange and white chalk and gray shale that is often exposed where the river has carved away at the bluffs.

Rail-to-Trail conversions are prevalent in this ecoregion: Cowboy Recreation and Nature Trail, Steamboat Trace, MoPac East Trail, Oak Creek Trail, Homestead Trail, Dark Island Trail, and Chief Standing Bear Trail all offer walking, hiking, and biking opportunities; some even allow equestrian use. These rail trails offer a low barrier to entry gateway to outdoor recreation. Most do not require a fee-based permit or pass.

Fishing

Anglers can enjoy a diversity of fishing opportunities from large rivers to small farm ponds. Missouri River anglers can take advantage of smallmouth bass, walleye, sauger, and catfish, which are plentiful in the river. Paddlefish bowfishing and snagging in the Missouri River offer a unique fishing experience. Seasonal trout fishing opportunities are available at Crystal Cove Lake, David City Park Ponds, and several other lakes and ponds. Numerous impoundments and prairie streams offer warm-water angling opportunities throughout this region. In the Omaha metro area, there are numerous new lakes and renovations to existing lakes to improve angling access to urban residents. Bullfrog angling is permitted seasonally east of Highway 81 and year-round west of the highway.

Hunting

The tallgrass prairie offers a diversity of hunting opportunities. Quail hunters find greater success south of the Platte River in Johnson and Pawnee counties. Turkeys are abundant along the Missouri River, Platte River, Big Nemaha, and Little Blue rivers. Waterfowl hunting along the Missouri River and its marshy backwaters is some of the best Nebraska has to offer. White-tailed deer can be found throughout the region. The Missouri River Bluffs also support an excellent squirrel population. Wildlife Management Areas (WMAs) provide great public hunting access.

Challenges

Over half of Nebraskans live in the Lincoln and Omaha metropolitan areas. The continuing urbanization of the state has significantly increased demands for both traditional and modern outdoor recreational opportunities in eastern Nebraska. According to the *2024 Nebraska Statewide Comprehensive Outdoor Recreation Plan Survey Summary Report*, over a third of the respondents from the Omaha and Lincoln metro areas reported overcrowding at recreation sites was a limiting factor to their participation in outdoor recreational activities. As a result, some natural areas around urban centers are exceeding their social carrying capacity, with overcrowding becoming an issue. Additionally, more than 40% of respondents indicated that the desired recreational amenity or opportunity was too far away (Bureau of Sociological Research,

2024). To address this, expanding amenities and facilities in urban areas could make nature-based recreation more accessible to a larger population. For example, over the past decade, efforts have been made to increase fishing opportunities within the Omaha metro area by creating new lakes (e.g., Prairie Queen, Flanagan, Big Elk, Portal Lakes), with 2-3 more planned in the next eight years. Renovations of existing lakes (e.g., Wehrspann, Standing Bear, Cunningham Lakes) to improve angling access has also taken place. Expanding other nature-based recreation opportunities, like the new angling access, could help alleviate some of the barriers to participation.

Another challenge in this region is managing for invasive species. Aquatic invasive species such as zebra mussels and Eurasian watermilfoil, pose a particular concern, especially in waterbodies near the state boundaries and the Missouri River, where recreation users frequently move from one lake to another. Expanding educational efforts and resources about the risk of invasive species hitching a ride on recreational equipment is crucial for preventing their further spread.

Key individuals from the business, economic development, and agricultural sectors should be involved in planning, promotion, and development of nature and wildlife tourism. There are many quality opportunities for nature-based recreation in this region; however, promotion of nature-based recreation opportunities is limited. While new resources have been created to inform people about recreational opportunities (e.g., trail, fishing, and birding maps), they are spread out across various websites and guides. A centralized clearinghouse of all nature-based recreation information in this region would be beneficial for easily promoting the diverse opportunities that are available. To fully realize the potential of the region's nature-based recreation opportunities, more individuals who are knowledgeable about nature-based recreation are needed to help inform community leaders and the public about these opportunities.

Education

The Tallgrass Prairie Ecoregion features environmental education opportunities from Homestead National Monument and Indian Cave State Park in the south to the Omaha Nation Public Schools along the northeastern border. Many opportunities are concentrated around the Lincoln/Omaha Metro Areas. This region has established models of environmental education being integrated into formal education. For instance, the City of Lincoln offers early childhood environmental education through Nature Preschool at Pioneers Park Nature Center. The Lincoln Children's Zoo collaborates with Lincoln Public Schools through the Science Focus Program. Similarly, Omaha's Henry Doorly Zoo and Aquarium partners with local districts to offer the Zoo Academy, a science-focused alternative education option.

Robust nonformal education initiatives and regional partnerships support large-scale outdoor recreation events, water festivals, and outdoor education for schools and the public. These collaborations often involve community partners and organizations, such as Natural Resources Districts, UNL Cooperative Extension, Natural Resources Conservation Service, Audubon, Nebraska Master Naturalist, and Nebraska Game and Parks Commission. The Outdoor Venture

Parks initiative, a public-private partnership, has expanded environmental education and recreation opportunities across four state parks within the Lower Platte River corridor.

State parks, such as Schramm Park SRA, Natural Resources Districts, and private organizations, such as Fontenelle Forest and Spring Creek Prairie Audubon Center, offer high-quality environmental education field trips that allow students to engage in hands-on science and connect Nebraska's natural environment with key scientific concepts. However, barriers such as limited transportation, funding, and institutional support have made it difficult for students to access these experiences. More environmental education training and workshops for educators and partnerships with school administrators are needed to address these challenges, particularly within the largest school districts in the state.

The region's colleges and universities present opportunities to prepare pre-service educators to incorporate Nebraska's natural resources into their curricula. The demand for nonformal education programs, such as after-school activities and summer camps, is growing, particularly for seniors and diverse communities. However, accessibility barriers continue to hinder participation from certain populations. Environmental educators must collaborate with diverse communities to foster connections with local green spaces and create inclusive programming that welcomes all groups.

Representative species with educational and community science opportunities:

- Plains Spotted Skunk (*Spilogale putorius*)
- Bobolink (*Dolichonyx oryzivorus*)
- Bur Oak (*Quercus macrocarpa*)
- Big Bluestem (*Andropogon gerardii*)

Ecoregion-specific Stresses

Key Stresses

In addition to the stresses and conservation actions identified in this chapter for the Tallgrass Prairie Ecoregion, statewide concerns are also identified in chapter four. Conservation practitioners identified the following stresses as the top threats in the ecoregion.

Altered frequency and intensity of fire, grazing, and other natural disturbances: Tallgrass prairie, wetland, and forest habitats in the ecoregion were maintained historically by periodic flooding, fires, and grazing. The interaction of effects from these disturbances promoted structural heterogeneity and floristic diversity. Today, the relative lack of fire has resulted in the degradation of thousands of acres of prairie by invasive species including eastern red-cedar. The proliferation of deciduous trees and shrubs, some of which are fire resistant, in grassland habitats also threatens native herbaceous plant diversity. Grazing systems that do not prioritize heterogeneity often result in a loss of biodiversity and ecological function. Drought and flooding cycles have changed in frequency and intensity, resulting in altered plant communities, grazing patterns, and spread of invasive species.

Spread of invasive species: Invasive and noxious species are threatening the ecoregion's biological diversity. Exotic cool-season grasses, aggressive woody plants, and other species have competitively excluded native plants and degraded habitat for fish and wildlife. Many plant and aquatic invasive species can hitchhike on maintenance machinery, recreation equipment, vehicles, pets, and clothing without being detected. Other causes of invasive species spread include interbasin water transfer and dumping fish bait into aquatic systems. Early detection monitoring and rapid response are key to preventing invasive and noxious species from becoming established and altering ecosystems. Treatment of invasive species should be weighed for potential costs to ecosystem health. Free-ranging cats are a major cause of anthropogenic mortality for birds and mammals. There is a need for improved communication, greater awareness, and education about the harmful effects that free-ranging cats can have on wildlife populations.

Loss of pollinators: Pollinators are essential to a well-functioning ecosystem. Broadcast spraying of pesticides on fields harm pollinators and other native insects. There is a loss of large-scale, diverse, season-long habitats that contain a diversity of forbs. Pollinator habitat restoration should only use native species and avoid broad spectrum pesticides. Currently, there is limited availability of local ecotype, forb-heavy, high-diversity seed mixes. Additionally, more monitoring efforts are needed to establish baseline population estimates for many of the pollinators in this ecoregion and across the state. More communication is needed to inform beekeepers about the negative impact honeybee parasites can have on native pollinator populations.

Limited awareness about the region's biological diversity and ecological processes: Many residents have a desire to increase their knowledge and understanding of ecological processes and management that can help maintain biological diversity, but educational resources are often not available. Funding and collaboration among conservation agencies are essential to develop and implement relevant environmental education opportunities about native ecosystems and best management practices for conserving them. There is a lack of trusted advisors and community ambassadors that can provide peer-to-peer learning opportunities and share their experiences and knowledge about the financial relevance of ecosystem conservation. Increases in nonresident landowners and younger residents will require the use of new communication channels to deliver informational materials. Additionally, there is little school curriculum that teaches students about Nebraska's native species, habitats, and conservation issues. Although the region's remaining native grasslands, woodlands, and wetlands are unique and of high value, many of the ecoregion's residents have limited awareness of the importance of these habitats to biological diversity.

Alteration of hydrology, channel degradation and sedimentation of rivers, streams, and wetlands: The installation of drainage tile, construction of moderate sized dams, development of flood-protection levees, declines in beaver populations, and other alterations have contributed to hydrological changes on the landscape. Historically, the ecoregion's rivers experienced spikes in flows during the spring and early summer. These

spikes enabled sediment to be transported and deposited, which allowed channels to meander and migrate, creating habitats like sandbars that are important to many species, including piping plovers and least terns, and scour holes that harbor fish during drought conditions. Reductions in historical flows have reduced habitat available to fish and other species. Incised streams have led to channelization, lowering water tables of adjacent wetlands and affecting plant composition. The use of tiling practices has accelerated wetland loss in the ecoregion. The potential for interbasin water transfer could negatively impact wetlands in the region. Structures like dams and improperly sized culverts limit native fish and other aquatic species movement. Increasing and continuing communication and collaboration with counties on how to build fish-friendly culverts and other fish-movement structures that facilitate movement and maintain connectivity of populations in small streams.

The proximity of urban development, construction sites, and annual row-crop fields to rivers, streams, and wetlands has resulted in large volumes of sediment entering the ecoregion's water bodies. Fewer cover crops are planted to hold soil over winter. Sedimentation increases stream turbidity and changes bottom substrates. Increased sedimentation of wetlands alters storage capacity and changes plant composition, reducing habitat available to aquatic species, including waterfowl. There is limited awareness of the grassland buffer program and the importance of riparian buffers. Additionally, there are inadequate technical and financial incentives available to encourage the preservation of riparian buffers, especially next to crop fields where soil erosion and nutrient and chemical runoff are more prevalent. Along the Platte River, dams and altered hydrology have prevented the natural flow of sedimentation that is essential for creating shallow braided streams and rivers that attract the sandhill cranes and endangered whooping cranes during their spring migration. In instances like this, an increase in sedimentation is needed to more accurately represent the historical flow regime.

Point and nonpoint source pollution: Point and nonpoint pollution negatively impacts biodiversity. The introduction of pesticides, storm-sewer runoff, fertilizers and nitrates, and industrial pollutants into rivers and streams impacts water quality, exposes fish and other species to harmful agents, and causes algal blooms. The loss of vegetative buffers around wetlands and riparian areas increases transport of chemicals into waterways. Advanced technology associated with pesticide development may create longer lasting chemicals in the environment and contribute to herbicide-resistant invasive weeds. Neonicotinoid seed treatments and disposal of treated seeds pollute surface waters and cause harm to insects, birds, and other wildlife. Wildlife, including birds, mammals, and insects, are increasingly threatened by light pollution. Artificial lights are impacting ecosystems and animal behaviors including their ability to find food, mates, and avoid predators.

Conversion and fragmentation of natural habitats: Although most of the ecoregion's natural habitats have already been converted to agriculture, many remaining natural communities are threatened by continued development. Increased farming efficiency

has led to loss of non-cropped corridors between habitats and decreased resources for pollinators and other wildlife. A decrease in crop diversity has also furthered the impact of agriculture on wildlife. Landowners have increasingly diverse goals for natural areas/communities, some of which are not compatible with biodiversity conservation. Urban sprawl into peripheral intact habitats is accelerating conversion of prairies, bluff woodlands, and wetlands.

Loss of natural areas because of local economics: Economic pressures are changing ownership patterns in this ecoregion. This may affect management decisions and stewardship of the land's natural resources. Conversion of remnant areas for agricultural purposes, development of agricultural areas for housing, and subdivision of large, grazed areas for recreational land-use are potential sources of loss. Such changes result in increased fragmentation and loss of biodiversity. An increase in nonresident landownership, nonoperating landowners, and recreational landownership may make connections to local communities, economies, and information about conservation incentives less accessible.

Loss of lands enrolled in conservation programs: Lands enrolled in conservation programs, such as the Conservation Reserve Program (CRP), provide significant benefits to wildlife, including at-risk species. Shifting agricultural economics and programmatic challenges may result in large tracts of conservation lands being converted to agricultural cropland. Retention of previously enrolled acres in programs such as General and Continuous CRP is vital to ensure that the benefits of these programs for local economies and wildlife populations persist. Placement of Grassland CRP in areas prone to conversion or implemented in a way to provide and manage habitat for targeted wildlife benefits will also be key to ensure benefits of the program are realized. The loss of even a modest percentage of these lands will result in impacts to terrestrial and aquatic species.

Poorly sited utility-scale energy infrastructure development: Utility-scale energy infrastructure development (e.g., solar farms, wind turbines, CO₂ sequestration plant and pipelines, fracking waste, power lines) is expanding in the Great Plains. To conserve biodiversity in the ecoregion, it is important to carefully consider the placement of energy infrastructure, such as transmission lines and pipelines, to minimize negative impacts on wildlife and native habitats. Poorly sited infrastructure can fragment intact ecosystems, negatively impact important migratory corridors, harm migratory birds and bats, and disturb wildlife. Focus on siting energy infrastructure in already disturbed areas (e.g., cultivated lands, old railway/road corridors). Encourage companies to temporarily halt turbines during peak migration periods for bats and birds. Pre-and post-construction monitoring should be implemented. See Game and Parks' Environmental Review (Visit OutdoorNebraska.gov and search for Environmental Review) and TNC's Site Renewables Right (Search The Nature Conservancy Site Renewables Right: A Clean and Green Energy Future) webpages for guidelines.

Need for greater collaboration between the agricultural and conservation communities: Past contention between the agriculture and conservation communities on issues related to water and threatened and endangered species have sometimes left deep divisions.

Although there is often common ground on many issues related to conserving biological diversity, there remains some lack of trust and resolve to collaborate on issues important to all stakeholders. Staff turnover at conservation agencies has made it difficult to build meaningful relationships and has contributed to the lack of trust and communication with the agricultural communities. Opportunities exist to merge firsthand knowledge of the land with newly developed conservation practices that benefit producers and ecosystems alike. While progress is being made, there is still a need for improved communication with agricultural communities about current and changing contracts and their impacts on agricultural and conservation communities.

Limited assessment, monitoring, and applied science to inform species and habitat conservation efforts: Conservation organizations and universities have limited capacity to monitor and assess many species, especially nongame and at-risk wildlife, and their habitats. There is a need for more baseline population estimates to better inform conservation decisions and listings of at-risk species. The lack of species and habitat monitoring overtime, especially in response to management efforts, hinders the understanding of an area and ways to best manage and conserve it. An increase in applied science efforts in this area could greatly enhance our understanding of this ecoregion. Additionally, wildlife diseases (e.g., Avian influenza, White-nose Syndrome, Snake Fungal Disease) impacting wild populations of birds, mammals, and reptiles should be monitored and researched further.

Primary Invasive Plant Species by Habitat Type

Note: This list highlights key invasive species of concern in the Tallgrass Prairie Ecoregion and is not exhaustive.

<u>Habitat Type</u>	<u>Invasive Plant Species</u>
Upland Prairie	Kentucky bluegrass, smooth brome, Japanese brome, downy brome, Caucasian bluestem, crown vetch, sickleweed, knapweeds, St. John's wort, leafy spurge, sericea lespedeza, red clover, yellow and white sweet clover, autumn olive, roughleaf dogwood, smooth sumac, eastern red-cedar, Siberian elm, and Osage orange
Deciduous Woodlands	Sericea lespedeza, garlic mustard, Amur honeysuckle, autumn olive, roughleaf dogwood, tree-of-heaven, white mulberry, honey locust, Osage orange, and eastern red-cedar
Wet Meadows	Smooth brome, Kentucky bluegrass, reed canary grass, timothy, Canada thistle, leafy spurge, and non-native clovers
Lakes and Marshes	European phragmites, reed canary grass, narrow-leaf/hybrid cattail, purple loosestrife, curly-leaf pondweed, and Eurasian watermilfoil

Biologically Unique Landscapes of the Tallgrass Prairie Ecoregion

One main goal of the Nebraska Natural Legacy Project is to identify priority landscapes that, when properly managed, will help conserve most of the state's biological diversity. These areas, called Biologically Unique Landscapes (BULs), were selected based on the presence of at-risk species and natural communities. See Chapter 3 for a full description of the selection methods.

The map shows the BULs for the Tallgrass Prairie Ecoregion. Brief descriptions of each BUL follow the map, including information about the stresses affecting species and habitats, proposed conservation actions, and natural communities found in each landscape.

In the Tallgrass Prairie Ecoregion, some BULs are truncated by the Nebraska state boundary. We suggest opportunities for wildlife conservation in these areas based on review of corresponding adjacent state wildlife action plans (SWAPs).

Tallgrass Biologically Unique Landscapes:

- Elkhorn Confluence
- Lower Platte River
- Missouri River and Bluffs
- Rainwater Basin (see Mixed-grass Prairie Ecoregion for description)
- Running Water (see Mixed-grass Prairie Ecoregion for description)
- Saline Wetlands
- Sandstone Prairies
- Southeast Prairies
- Willow Creek

Demonstration Sites of the Tallgrass Prairie Ecoregion

Demonstration sites are locations across the state with potential for showcasing conservation projects and the results of sustainable management to the public. They provide opportunities for learning about the site's unique qualities and importance to at-risk species. See Chapter 4 for information on selecting demonstration sites. The Tallgrass Prairie Ecoregion map shows the location of demonstration sites in the area.

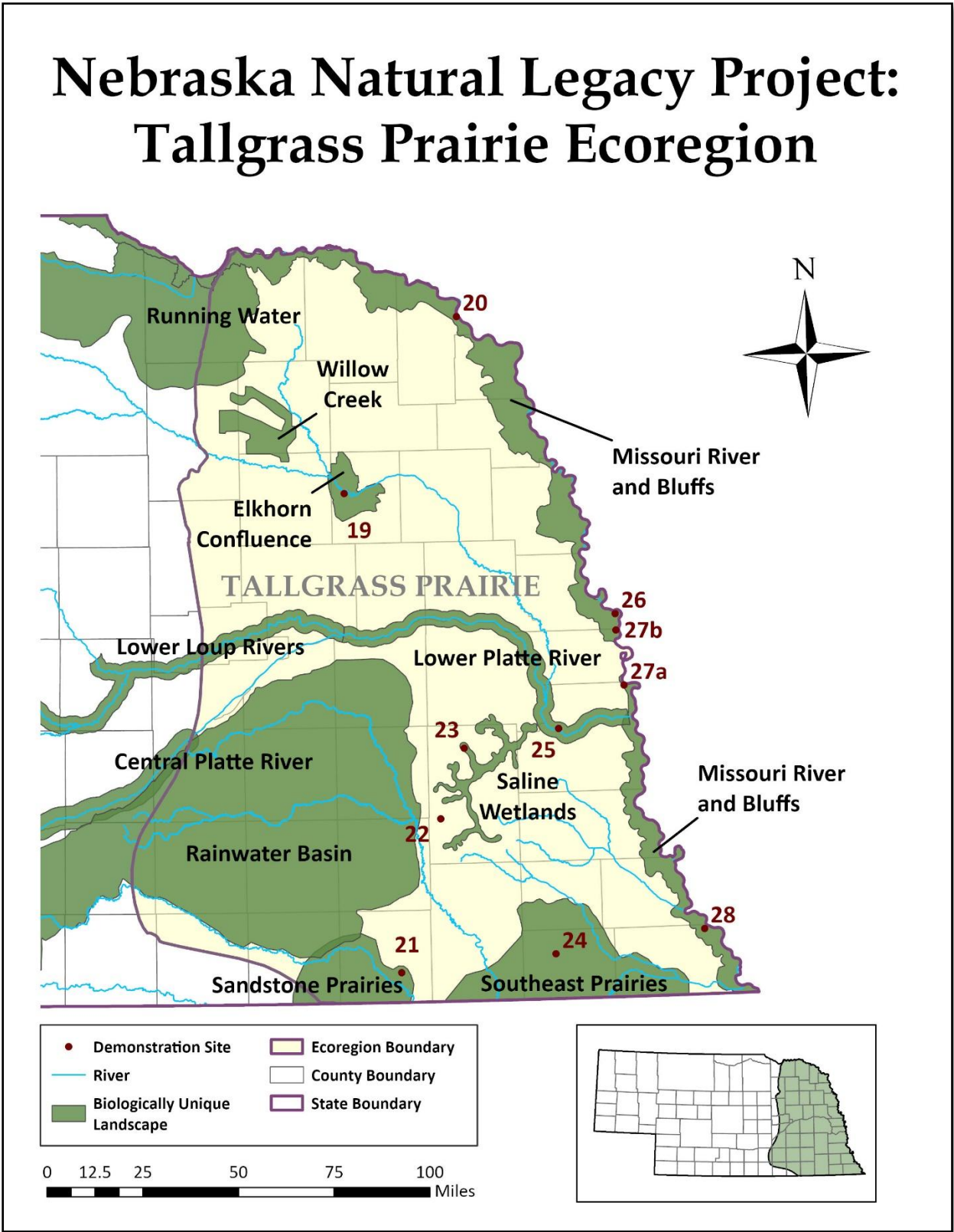
<u>Site name</u>	<u># on map</u>	<u>BUL</u>
Boyer Chute NWR	26	Missouri River and Bluffs
Burchard WMA	25	Southeast Prairies
Fontenelle Forest	27	Missouri River and Bluffs
Indian Cave State Park	28	Missouri River and Bluffs
Ponca State Park	20	Missouri River and Bluffs
Rock Glen WMA/Rock Creek SHP	21	Sandstone Prairies
Saline Wetlands Complex	23	Saline Wetlands
Schramm Park SRA	25	Lower Platte River
Spring Creek Prairie	22	N/A
Wood Duck WMA	19	Elkhorn Confluence

Descriptions of each site are found in the write-up for the BUL in which the site is found. The Spring Creek Prairie site is not within a BUL and the description is included here.

22. Spring Creek Prairie - National Audubon Society

Spring Creek Prairie is one of the few large tracts of tallgrass prairie within easy driving distance from Lincoln. The 1,160 acres are predominantly undisturbed tallgrass prairie. Native oak woodlands and spring fed riparian wetlands are also found on portions of the property. This prairie is managed using grazing, haying, prescribed burning, and prescribed rest. Spring Creek Prairie reaches up to 12,000 people per year, ranging from visitors enjoying the more than four miles of trails, as well as student and public education programs and events, workshops, trainings, and tours.

Nebraska Natural Legacy Project: Tallgrass Prairie Ecoregion



Elkhorn Confluence

Biologically Unique Landscape Description

This landscape includes land adjacent to the confluence of the North Fork of the Elkhorn River and the main branch of the Elkhorn River in Stanton County. The Elkhorn River floodplain is primarily cropland, but also contains cottonwood woodlands, wet meadows, and freshwater marshes. Sand dunes formed of windblown river alluvium are scattered south of the river and support dry-mesic sand prairie, mostly grazed, and bur oak woodlands. Most of the dunes have been converted to cropland. The uplands north of the river have loam soils that are largely cropped, although some degraded tallgrass prairies remain. Wood Duck WMA is the only protected area in this landscape.

Natural Legacy Demonstration Site

19. Wood Duck Wildlife Management Area – Nebraska Game and Parks Commission

Wood Duck WMA is 1,850 acres of habitat, running adjacent to the Elkhorn River and encompassing its oxbow wetlands. Terrestrial communities are numerous on this WMA and, though highly fragmented, are characteristic of the Tallgrass Prairie Ecoregion. Eastern riparian woodland, sandhills prairie, and cattail shallow marsh are communities best represented here. To a lesser extent, cottonwood diamond willow woodland and dry mesic bur oak woodland are representative communities that blend onto adjacent properties. Blanding's turtle and regal fritillary are among the Species of Greatest Conservation Need (SGCN) that have been documented in these habitats numerous times. The habitat communities on this property are under active management. Prescribed burns conducted during both dormant and growing seasons have helped shape this landscape. Planned grazing is used on all tracts of this property and is combined with prescribed burns or herbicide treatments to further stress exotic species. Invasive plant species have encroached into all habitat types and require constant attention to remain in check. Eight parking lots are open year-round with well-maintained county road access. Two additional parking lots are open during the summer season and provide access to the river. With some exploration, visitors may experience a hognose snake, marsh marigold, marsh mallow, wild rice, interior least terns, or many other unique species.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species.
- Limited use of prescribed fire on the landscape.
- Tiling and drainage of wetlands and water diversion for agricultural irrigation.
- Increased chemical runoff and nutrient loading into streams.

- In-stream structures (e.g., culverts) that obstruct fish movement.
- Conversion of grasslands to cropland.
- Infrastructure development (e.g., housing, recreation, industrial, energy).
- Limited awareness of native wildlife (e.g., pollinators) and management practices to improve their habitats.

Conservation Strategies

- Implement planned grazing strategies on private and public lands, in combination with prescribed fire and rest, to improve native plant diversity and reduce exotic cool-season grass dominance.
- Implement woody encroachment clearing programs in combination with prescribed fire and planned grazing on private and public lands to improve native plant diversity and maintain open prairie habitat.
- Facilitate the establishment and/or support of prescribed burn associations. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns and offer trainings.
- Restore wetland hydrology at important sites.
- Create and maintain natural grassland buffers around riparian areas to filter chemical runoff into streams. Increase stream quality monitoring.
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure in-stream structures allow for native aquatic organism movement (e.g., fish ladders), especially when culverts get washed out. Continue to innovate low-cost fish passage structures.
- Coordinate with landowners interested in using conservation programs to protect high-quality habitats.
- Encourage and implement zoning ordinance to minimize habitat fragmentation and impacts to wildlife.
- Continue to increase environmental education programs to increase awareness toward wildlife, habitats, and management practices that improve their habitats.

Tier 1 Species:

Black-billed Cuckoo

Black-billed Magpie

Interior Least Tern

Flathead Chub

Plains Minnow

Shoal Chub

Silver Chub

Western Silvery Minnow

Bucholz Black Dash

Monarch

Nebraska Fritillary

Platte River Caddisfly
Regal Fritillary
Smoky-eyed Brown
Two-spotted Skipper
Eastern Red Bat
Hoary Bat
Silver-haired Bat
Plain Pocketbook
Yellow Sandshell
Blanding's Turtle

Aquatic Communities:

Mid-order, Warm Water River

Terrestrial Communities:

Eastern Riparian Forest
Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood-Diamond Willow Woodland
Sandbar Willow Shrubland
Riparian Dogwood-False Indigobush Shrubland
Dry-mesic Bur Oak Forest and Woodland*
Freshwater Seep
Eastern Bulrush Deep Marsh
Cattail Shallow Marsh
Reed Marsh
Eastern Pondweed Aquatic Wetland
Upland Tall-grass Prairie*
Lowland Tall-grass Prairie*
Sandhills Dune Prairie
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

Lower Platte River

Biologically Unique Landscape Description

This landscape includes a mostly 2-mile buffer on each side of the Platte River from its confluence with the Loup River in Platte County eastward to its mouth, where it flows into the Missouri River, in Sarpy County. The lower Platte is a large, shallow, braided river with sandbars and wooded islands and a wide floodplain. Much of the streambank is wooded, primarily with cottonwood and eastern red-cedar. Sandpits are common, and in many areas, riverbanks are lined with cabins. Most of the floodplain is now cropland, with scattered wet meadows and marshes.

Primary lower Platte River tributaries include the Loup and Elkhorn rivers. This stretch of the Platte has more stable flows than the central Platte and its sandbars support colonies of the federal and state-endangered piping plover and the state-endangered interior least tern. Channel constriction from dikes and levees has eliminated most floodplain sloughs, backwaters, and wetlands. This has led to higher flow stages during runoff events, sometimes washing away tern and plover nests. The river also supports rare large-river fish, such as lake sturgeon, blue sucker, sturgeon chub, and pallid sturgeon. Protected areas include Two Rivers SRA, Louisville SRA, Platte River State Park, Schramm SRA, and Mahoney State Park.

Natural Legacy Demonstration Site

25. Schramm Park State Recreation Area – Nebraska Game and Parks Commission

Schramm Park State Recreational Area is a relatively small but biologically-rich area on the lower Platte River. Uplands are covered with oak forest with small patches of prairie. The floodplain has a large area of mature riparian forest. Natural communities at the area include dry-mesic bur oak forest and woodland and upland tall-grass prairie. Ongoing land management at the park seeks to improve wildlife habitat through a variety of techniques, including prescribed woodland burns, tree thinning, and non-native invasive plant control.

Stresses Affecting Species and Habitats

- Proliferation of aquatic herbaceous invasive species, including Eurasian phragmites, on streambanks and sandbars, and in meadows, marshes, and woodlands.
- Encroachment of eastern red-cedar and other woody species into woodlands and meadows.
- Limited use of prescribed fire on the landscape.
- Altered natural hydrology, including lack of periodic pulse flows and reduced sediment transport to maintain sandbars and aquatic habitats.
- Dike and levee construction.
- Armoring of streambanks.

- Water withdrawal.
- Increased chemical runoff and nutrient loading into the river.
- Conversion of wet meadows to cropland, including wetland drainage and dewatering resulting from lower groundwater levels.
- Continued cabin and house development adjacent to the river.
- Sandpit and gravel mine development, which eliminates native meadows, woodlands, and river channel, and new mining practices that reduce the available piping plover nesting habitat.
- Excessive recreational use of the river (e.g., air boats, four-wheelers), which disturbs tern and plover nesting. Limited awareness and knowledge about impacts to the nesting terns and plovers and the potential for transporting aquatic invasive species.
- Light pollution, which adversely impacts much wildlife.
- Lack of best management and logging practices for native woodlands. High-grade logging, especially harvest of mature trees that reduces age-class diversity of native woodlands. Oak blight and other tree diseases affecting woodlands.

Conservation Strategies

- Develop and implement best management practices to control, manage, and remove invasive species. Encourage producers to employ integrated pest management (IPM) techniques.
- Undertake eastern red-cedar and other invasive tree clearing programs, and develop tree remediation programs and incentives to protect woodlands adjacent to the river.
- Increase implementation of prescribed burns.
- Maintain the natural hydrology necessary to sustain ecosystem function and biodiversity.
- Create and maintain natural buffers around riparian areas to filter chemical runoff.
- Coordinate with landowners interested in placing conservation programs on undeveloped reaches of the river, wet meadows, and woodlands to protect them from development.
- Encourage and implement zoning ordinances to minimize habitat fragmentation and impacts to wildlife.
- Work with sand and gravel companies to site gravel pits away from ecologically sensitive areas of the floodplain and to restore pits to wetland habitat after sand and gravel extraction has been completed.
- Provide outreach and communication about responsible recreation to minimize impacts to SGCN (e.g., nesting piping plovers) and their habitats. Increase signage and outreach at public access sites about the SGCN and invasive species that can hitch a ride on recreational equipment.
- Work with the cities and developers to reduce light pollution. Provide education and outreach about light pollution.
- Implement prescribed burns in native woodlands to enhance woodland structure, floral composition, and oak regeneration on public and private lands.

Tier 1 Species:

Smallmouth Salamander
Black-billed Cuckoo
Interior Least Tern
Piping Plover
Wood Thrush
Flathead Chub
Lake Sturgeon
Pallid Sturgeon
Plains Minnow
Plains Topminnow
Shoal Chub
Silver Chub
Sturgeon Chub
Western Silvery Minnow
Monarch
Nebraska Fritillary
Ottoe Skipper
Platte River Caddisfly
Regal Fritillary
Southern Plains Bumble Bee
Two-spotted Skipper
Variable Cuckoo Bumble Bee
Eastern Red Bat
Hoary Bat
Little Brown Myotis
Northern Long-eared Myotis
Silver-haired Bat
Tricolored Bat
Creeping
Blanding's Turtle
Western Massasauga
Small White Lady's Slipper
Western Prairie Fringed Orchid

Aquatic Communities:

Mid-order, Warm Water River

Terrestrial Communities:

Eastern Riparian Forest*
Cottonwood-Peachleaf Willow Riparian Woodland*
Red Oak-Basswood-Ironwood Forest
Oak-Hickory-Ironwood Forest
Mesic Bur Oak Forest and Woodland*

Dry-Mesic Bur Oak Forest and Woodland*
Dry Upland Bur Oak Woodland*
Sandbar Willow Shrubland
Riparian Dogwood-False Indigobush Shrubland
Freshwater Seep
Eastern Cordgrass Wet Prairie*
Eastern Sedge Wet Meadow*
Eastern Bulrush Deep Marsh
Reed Marsh
Eastern Pondweed Aquatic Wetland
Upland Tall-grass Prairie
Lowland Tall-grass Prairie*
Perennial Sandbar*
Sandbar/Mudflat
Eastern Sandstone Bluff and Cliff

* Priority for conservation in this BUL

Missouri River and Bluffs

Biologically Unique Landscape Description

This landscape includes the Missouri River channel, its floodplain, and the mostly wooded bluffs from the Nebraska–Kansas border to the Nebraska–South Dakota border. The bluffs are primarily covered by eastern deciduous forest. Remnants of tallgrass prairie and northern loess shale bluff prairie also occur on bluff tops. The bluffs are interspersed with cropland and residential development.

Historically, the Missouri River was one of North America’s most dynamic rivers more than a mile wide and 20 feet deep in places, with a channel consisting of many sandbars and forested islands. Its floodplain featured a mosaic of oxbow lakes, backwater marshes, wet prairies, and forests. River alteration began in 1829 with snag removal for steamboat navigation. Between the 1930s and 1960s, a bank stabilization project created a navigational channel from St. Louis to Sioux City. From 1940 to 1964, six mainstem dams were constructed upstream, resulting in managed flows along this stretch of the river. These changes have had major negative ecological impacts.

Woodlands along the Missouri River bluffs support many at-risk species, including the timber rattlesnake, wood thrush, yellow-throated warbler, ginseng, and yellow lady’s-slipper orchid. The Missouri River bluff corridor is an important migration route for songbirds, raptors, monarchs, and bats. Nine state-listed and five federally listed species occur in Nebraska’s Missouri River valley. Unchannelized stretches from Sioux City to Gavins Point Dam and from the upper end of Lewis and Clark Lake to the South Dakota border are designated as National

Recreational River segments. Large, protected areas include Indian Cave and Ponca state parks, Fontenelle Forest, and Boyer Chute and DeSoto national wildlife refuges (NWRs).

Natural Legacy Demonstration Sites

26. Boyer Chute National Wildlife Refuge – U.S. Fish and Wildlife Service

Boyer Chute NWR was established to recover fish and wildlife habitat in the Missouri River and its floodplain. Refuge floodplains have been restored to near pre-channelization conditions without affecting navigation on the main stem of the Missouri River. Boyer Chute is once again an ecologically functioning part of the river. Close to 4,040 acres of floodplain woodland, tallgrass prairie, and wetland habitats now benefit Missouri River fishes, migratory birds, pollinators, endangered species, and resident wildlife. Boyer Chute's proximity to the Omaha metro area makes it a convenient location for those living in urban areas to experience Missouri River habitat and the wildlife that calls it home.

27. Fontenelle Forest – Fontenelle Forest

Fontenelle Forest, a nonprofit nature organization, owns and operates two properties in the Omaha area: Neale Woods, (27b) which contains about seven miles of trails on nearly 600 acres, and Fontenelle Forest, (27a) with 17 miles of trail, including a river-view boardwalk on 1,500 acres. Both properties are comprised of riverine floodplain, woodlands, forest, and small grassland reconstructions. Habitat restoration focuses on the oak woodland complex found along the Missouri River bluffs and includes prescribed fire, tree/shrub thinning, and invasive plant treatments. Outreach is done through formal school programs, public programming, on-the-go senior programs, and daily by the staff and volunteers around the nature center.

28. Indian Cave State Park – Nebraska Game and Parks Commission

Indian Cave State Park is approximately 3,300 acres, comprised primarily of wooded bluffs along the Missouri River, along with areas of ridgetop prairies, floodplain wetlands, and restored backwater habitats. Natural communities at this park include oak-hickory-ironwood forest and red oak-basswood-ironwood forest. Ongoing land management at the park, and with surrounding neighbors, seeks to improve wildlife habitat through a variety of techniques including prescribed woodland burns, tree thinning, and non-native invasive plant control.

20. Ponca State Park – Nebraska Game and Parks Commission

Ponca State Park contains approximately 2,284 acres and includes the steep bluffs covered in hardwood forest and floodplains of the unchannelized Missouri River. Ponca State Park is located in the portion of the Missouri River designated as a National Recreational River. Restored sandbars in the Missouri River and backwater provide habitat for several listed species, while allowing the channel to meander restores the dynamic floodplain. The park has bur oak-basswood-ironwood forest, dry-mesic bur oak

forest and woodland, oak savanna, upland tall-grass prairie, and a manmade wetland. Habitat management occurs throughout the park and includes prescribed fire, timber thinning, wildlife surveys, and noxious weed control to improve the habitat for native species. Chemical, mechanical, and biological tactics are all used. Ponca State Park also provides outreach through events and signage to educate the public on the species and habitat management in the park.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant and animal species in prairies, woodlands, and rivers compounded by landowners' limited awareness of these species, their methods of spread, and effective treatment options.
- Broadcast herbicide application to prairies.
- Lack of best management and logging practices for native woodlands. High-grade logging, especially harvest of mature trees that reduces age-class diversity of native woodlands. Oak blight and other tree diseases affecting woodlands.
- Limited use of fire on the landscape has led to woody encroachment in prairies and an increase of undesirable species and plant densities in woodlands.
- Altered natural flows and lack of diverse instream habitat will continue to threaten at-risk aquatic species, as well as some terrestrial species whose life histories are closely linked to the availability of riverine habitat.
- Wetland drainage and conversion.
- Channel downcutting from lack of sediment, restricted channel, and bank stabilization practices.
- Chemical runoff, pollution, and nutrient loading into rivers from adjacent cropland and developments leading to endocrine disruption in fish species, toxic algal blooms, and other negative impacts to aquatic species.
- Conversion of oak woodland to cropland.
- Infrastructure development and other forms of fragmentation (e.g., housing, ranchettes, recreation, industrial).
- Energy infrastructure development (e.g., wind, solar, pipelines, limestone mining).
- Light pollution, which adversely impacts much wildlife.
- Limited applied science, including research, assessment, and monitoring.
- Lack of awareness and knowledge by recreationists about SGCN (e.g., nesting piping lovers and least terns) and the spread of invasive species via recreational equipment.
- Limited landowner awareness of management practices to improve prairie and woodland habitats and to manage invasive species.

Conservation Strategies

- Implement ecologically sensitive planned grazing and prescribed fire strategies in native habitats on public and private lands.

- Continue to monitor and implement best management practices to control, manage, and remove invasive species with a concerted effort on protected lands and adjacent private lands. Seek partner collaboration and methods that do not require broadcast spraying of grasslands.
- Implement prescribed burns in native woodlands to enhance woodland structure, floral composition, and oak regeneration on public and private lands.
- Increase capacity for landscape-scale prescribed fire with partners, tribes, and landowners. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns.
- Implement forest stand improvement practices on public and private lands for oak regeneration. Develop and implement practices to combat the oak blight and other tree diseases.
- Work with private landowners to implement tree and shrub thinning and prescribed burning within high-quality native woodlands and prairies.
- Seek to alter river flow management to conform to more natural flows and coordinate with the U.S. Army Corps of Engineers to identify best management practices for riparian areas.
- Restore river meandering where possible, especially in off-channel chutes. Reduce navigation channel where possible.
- Restore sediment availability for river reaches downstream of Fort Randall Dam. Develop an erodible corridor for sediment input and floodplain connectivity.
- Restore coarse particulate organic matter and large woody debris in the river.
- Uphold wetland conservation processes (e.g., Swampbuster) and studies that evaluate the ability of aquatic wildlife to pass through dams.
- Increase top width of the channelized reach and interception rearing complexes to establish shallow water habitat diversity for fish and wildlife purposes.
- Restore natural plant communities (e.g., wetlands, prairies, and woodlands) on the river floodplain and terraces.
- Work with partners (e.g., local weed management groups) to use integrated pest management and nutrient management to reduce pollution runoff into tributaries.
- Encourage levee setbacks and a functional connected floodplain according to the Galloway Plan (IFMRC 1994), the National Research Council Report (2002), and the Large-Scale Levee Setback Playbook (The Nature Conservancy, 2021).
- Work with landowners interested in conservation programs or voluntary fee title acquisition to protect important habitats and reaches of the river from development and commercial logging of mature forests.
- Encourage and implement zoning setbacks and ordinances to reduce habitat fragmentation and address bank stabilization along the Missouri River. Use bioengineered bank stabilization.
- Work with energy companies to select sites for energy infrastructure development that minimize fragmentation and impacts to wildlife.
- Work with the cities and developers to reduce light pollution and provide education and outreach about light pollution.

- Assist with conservation planning and implementation as requested by tribes for reservation lands.
- Implement research, monitoring, and inventory projects to determine best management practices for SGCN and continue to survey and inventory fungi.
- Expand education programs on invasive species identification, prevention, and inadvertent transfer along with communication about responsible recreation to minimize impacts to SGCN and habitats.
- Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about the practices that improve habitats and their benefits.
- Offer training for identifying and treating invasive species.

Tier 1 Species:

Smallmouth Salamander
Black-billed Cuckoo
Interior Least Tern
Piping Plover
Wood Thrush
Flathead Chub
Lake Sturgeon
Pallid Sturgeon
Plains Minnow
Plains Topminnow
Shoal Chub
Sicklefin Chub
Silver Chub
Sturgeon Chub
Western Silvery Minnow
Elusive Clubtail
Ghost Tiger Beetle
Iowa Skipper
Monarch
Mottled Duskywing
Pawnee Stonefly
Regal Fritillary
Southern Plains Bumble Bee
Two-lined Stonefly
Two-spotted Skipper
Eastern Red Bat
Hoary Bat
Little Brown Myotis
Northern Long-eared Myotis
Silver-haired Bat
Southern Flying Squirrel

Tricolored Bat
Creeper
Fatmucket
Flat Floater
Plain Pocketbook
Pondmussel
Scaleshell Mussel
Yellow Sandshell
Timber Rattlesnake
American Ginseng
Butternut
Nodding-pogonia
Snow Trillium
Western Prairie Fringed Orchid
Woolly Milkweed

Aquatic Communities:

Headwater, Warm Water Stream
Large, Warm Water River*

Terrestrial Communities:

American Lotus Aquatic Wetland*
Buffaloberry Shrubland
Bur Oak-Basswood-Ironwood Forest
Cattail Shallow Marsh*
Cottonwood-Diamond Willow Woodland
Cottonwood-Peachleaf Willow Riparian Woodland*
Dry Upland Bur Oak Woodland
Dry-Mesic Bur Oak Forest and Woodland
Eastern Bulrush Deep Marsh*
Eastern Cordgrass Wet Prairie*
Eastern Cottonwood-Dogwood Riparian Woodland*
Eastern Pondweed Aquatic Wetland*
Eastern Riparian Forest
Eastern Sandstone Bluff and Cliff
Eastern Sedge Wet Meadow*
Freshwater Seep
Lowland Tall-grass Prairie
Mesic Bur Oak Forest and Woodland
Missouri River Floodplain Terrace Grassland*
Missouri River Valley Dune Grassland*
Northern Chalk Bluff and Cliff
Northern Loess/Shale Bluff Prairie
Oak-Hickory-Ironwood Forest

Perennial Sandbar
Red Oak-Basswood-Ironwood Forest
Reed Marsh*
Riparian Dogwood-False Indigobush Shrubland*
Sandbar Willow Shrubland*
Sandbar/Mudflat*
Upland Tall-grass Prairie

* Priority for conservation in this BUL

Saline Wetlands

Biologically Unique Landscape Description

This landscape includes saline wetlands in the floodplains of Salt, Little Salt, and Rock creeks, along with portions of the surrounding uplands. Wetland salinity originates from deeply buried salts brought to the surface by artesian groundwater flow. The marsh vegetation is dominated by salt-tolerant species including saltgrass, sea-blite, and saltwort. Surrounding uplands are mostly cropland, with some tallgrass prairie remnants. Commercial and residential development is common in the uplands bordering the wetlands.

This is Nebraska's only saline wetland complex. Over 90% of the original wetlands have been lost or severely degraded. The most viable remnants are in two core areas: the upper Little Salt Creek valley near Raymond and the Rock Creek valley near Ceresco. The Little Salt Creek wetlands contain the world's only known populations of the state- and federally endangered Salt Creek tiger beetle and the state-endangered saltwort. Protected areas include Arbor Lake, Little Salt Creek, and Jack Sinn WMAs; the City of Lincoln's Shoemaker Marsh, Anderson Tract, and King tracts; and Lower Platte South Natural Resources District's Saline Wetland Nature Center, Warner Wetland, and Little Salt Fork Marsh.

Natural Legacy Demonstration Site

23. Saline Wetland Complex

The Saline Wetland Complex includes 16 properties. All are open to public use; however, some of the best locations to visit include Marsh Wren (Lower Platte South NRD), Saline Meadows (Pheasants Forever), Little Salt Fork Marsh Preserve (Lower Platte South NRD), Little Salt Creek West WMA (Game and Parks), and Frank Shoemaker Marsh (City of Lincoln). Eastern saline wetlands are considered critically imperiled. These locations are actively managed, contain restored wetlands, existing or reestablished native prairie, and habitat for listed species. Natural communities at this location include eastern saline meadow, eastern saline marsh, and upland and lowland tall-grass prairie. The Saline

Wetlands Conservation Partnership has been fundamental in facilitating collaboration between local entities to conserve the few remaining saline wetlands.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Lack of natural disturbances on the landscape.
- Invasive plant species.
- Excess vegetation on stream banks, which negatively impacts Salt Creek tiger beetle habitat.
- Downcutting of streams leading to decline in groundwater levels, loss of salts from the wetlands, and general alteration of wetland hydrology.
- Conversion of saline wetlands to freshwater wetlands.
- Wetland drainage and sedimentation.
- Lower plant diversity in many restored systems.
- Urban residential and ranchette development.
- Infrastructure development (e.g., energy infrastructure development, clay mining).
- Limited applied science, including research, assessment, and monitoring.
- Limited awareness of native wildlife and the unique habitats in this landscape.
- Light pollution, which may adversely impact Salt Creek tiger beetles and other wildlife.

Conservation Strategies

- Intensify management (e.g., prescribed fire and planned grazing) on conservation lands and private lands to improve the quality of saline wetlands.
- Continue to develop and implement plans to control reed canary grass, narrow-leaf cattail, and other invasive plants in saline wetlands, especially on protected lands.
- Develop, implement, and evaluate methods to improve Salt Creek tiger beetle habitat along the existing streambank pull-backs.
- Use in-channel structures and restore natural meanders, where feasible, to stop stream downcutting and subsequent headcutting into wetlands.
- Develop and implement methods (e.g., pumping) to restore the hydrology of saline wetlands.
- Continue stream and wetland water-quality monitoring programs.
- Reduce the number of wells that lower hydrologic pressure or interrupt the hydrologic system needed for saline ecology.
- Continue to remap saline plant communities within the BUL and conduct studies to investigate saline soil properties.
- Protect uplands in the watersheds surrounding these wetlands from development through use of conservation easements or other protection measures.
- Channel stormwater away from saline wetlands in urban areas.
- Protect high-quality wetlands through the use of conservation easements or voluntary fee title acquisition. The wetlands in need of protection have been prioritized by the

Saline Wetland Conservation Partnership, along with identifying strategies for their protection.

- Work with developers to increase use of cluster development in areas surrounding saline wetlands, protecting even very small saline habitats.
- Restrict energy and other infrastructure development in this landscape as it has been recognized as critical habitat for the federally endangered Salt Creek tiger beetle. The effects of development and runoff from site construction could be a threat to the beetle.
- Implement research, monitoring, and inventory projects to determine best management practices for SGCN.
- Continue to provide education and outreach about this landscape and the unique species that inhabit this area.
- Work with the City of Lincoln and developers to reduce light pollution near saline wetlands. Monitor and review city lighting ordinance.

Tier 1 Species:

Plains Minnow
Shoal Chub
Silver Chub
Western Silvery Minnow
Monarch
Nebraska Fritillary
Regal Fritillary
Salt Creek Tiger Beetle
Southern Plains Bumble Bee
Variable Cuckoo Bumble Bee
Eastern Red Bat
Hoary Bat
Northern Long-eared Myotis
Silver-haired Bat
Tricolored Bat
Creeper
Fatmucket
Pondmussel
Yellow Sandshell
Saltwort

Aquatic Communities:

Headwater, Warm Water Stream

Terrestrial Communities:

Sandbar Willow Shrubland
Freshwater Seep
Eastern Saline Meadow*
Cattail Shallow Marsh

Eastern Saline Marsh*
 Saline/Alkaline Aquatic Wetland*
 Upland Tall-grass Prairie

* Priority for conservation in this BUL

Sandstone Prairies

Biologically Unique Landscape Description

This landscape includes the bluffs and breaks along the Little Blue River and Rose Creek in Jefferson and Thayer counties. Soils are shallow and derived from Dakota Sandstone with sandstone outcrops exposed on the surface. Large blocks of tallgrass prairie remain, although these prairies are often interspersed with cropland. Many prairies have been disturbed by past grazing and invasion by non-native cool-season grasses. Eastern red-cedar and other invasive trees and shrubs are also problematic. Bur oak woodlands occur in stream and ravine bottoms. Prairie fens appear occasionally on the side slopes and bottoms of deep, sandstone canyons.

This landscape harbors some of Nebraska's largest tallgrass prairie remnants and last remaining populations of western massasauga and timber rattlesnakes in the state. The prairies here also provide habitat and breeding grounds for greater prairie-chickens and other grassland birds. While many prairies are degraded, the large size of the remaining patches makes this area valuable for landscape-scale conservation. Major protected areas include Rock Glen WMA, Rose Creek WMA, and Rock Creek Station State Historical Park (SHP).

Natural Legacy Demonstration Site

21. Rock Glen Wildlife Management Area and Rock Creek Station State Historical Park – Nebraska Game and Parks Commission

Rock Creek Station SHP includes 350 acres with a high proportion of native vegetation. Uplands are covered with both oak woodland and tallgrass prairie. Riparian forest occurs along Rock Creek. The nearby Rock Glen WMA includes 706 acres of rolling native upland and tree-lined drainages. Eastern red-cedar is a primary threat, so thinning in conjunction with burning and grazing are the primary conservation actions.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species in prairies.
- Limited use of fire has led to woody encroachment in prairies and woodlands.
- Streambed degradation.
- Chemical runoff and nutrient loading into streams from adjacent cropland and developed areas.

- Conversion of native prairies to cropland and other uses.
- Development (e.g., housing, energy infrastructure), clay mining for bricks, and fragmentation of habitat.
- Roadside and trail haying and mowing in areas with known populations of SGCN snakes.
- Limited awareness of management practices to improve prairie and woodland habitats and to better manage invasive species.

Conservation Strategies

- Implement planned grazing and haying strategies on public and private lands, in combination with prescribed fire and rest, to improve native plant diversity and reduce exotic grass dominance.
- Develop and implement best management practices to control, manage, and remove invasive plant communities.
- Increase monitoring and surveys for invasive plants in woodlands and prairies, especially on public lands. Survey before and after management efforts to evaluate effectiveness of techniques.
- Implement tree-clearing programs in combination with prescribed fire and planned grazing on grasslands on public and private lands to improve native plant diversity and maintain open prairie habitat. Expand incentives for prescribed burns.
- Facilitate the establishment and/or support of prescribed burn associations. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns and offer trainings.
- Restore degraded wetlands and stream reaches.
- Create and maintain natural grassland buffers around streams to reduce siltation and filter chemical runoff. Coordinate with NRDs and utilize watershed planning to address potential water quality problems.
- Coordinate with landowners interested in conservation programs or voluntary fee title acquisition to protect high quality prairies.
- Work with energy and mining companies to select sites for development that minimize fragmentation and impacts to wildlife. Encourage and implement zoning ordinances to address other development to minimize fragmentation and impacts to wildlife.
- Work with partners (e.g., Nebraska Department of Transportation) to avoid roadside and trail mowing during times when known population of SGCN snakes are using the area. Enhance education efforts about SGCN snakes, their behavior, and habitat use.
- Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about collaborative conservation strategies and practices that improve habitats and their benefits.
- Offer training for identifying and treating invasive species.

Tier 1 Species:

Smallmouth Salamander
Henslow's Sparrow
Loggerhead Shrike
Byssus Skipper
Iowa Skipper
Monarch
Ottoe Skipper
Regal Fritillary
Southern Plains Bumble Bee
Eastern Red Bat
Hoary Bat
Northern Long-eared Myotis
Silver-haired Bat
Tricolored Bat
Creeper
Fatmucket
Plain Pocketbook
Pondmussel
Yellow Sandshell
Timber Rattlesnake
Western Massasauga
Woolly Milkweed

Aquatic Communities:

Headwater, Warm Water Stream
Mid-order, Warm Water River

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Sandstone Upland Bur Oak Woodland*
Sandbar Willow Shrubland
Riparian Dogwood-False Indigobush Shrubland
Freshwater Seep*
Prairie Fen*
Eastern Cordgrass Wet Prairie
Eastern Sedge Wet Meadow
Eastern Bulrush Deep Marsh
Cattail Shallow Marsh
Upland Tall-grass Prairie*
Dakota Sandstone Tall-grass Prairie*
Lowland Tall-grass Prairie
Southern Sand/Gravel Prairie*
Perennial Sandbar

Sandbar/Mudflat
Eastern Sandstone Bluff and Cliff*

* Priority for conservation in this BUL

Southeast Prairies

Biologically Unique Landscape Description

This landscape encompasses the rolling hills of western Richardson, Pawnee, southern Johnson, and southern Gage counties. The dominant landcover is cropland, but many tallgrass prairie remnants remain as either hay meadows or pastures with hay meadows being in higher ecological condition. Reseeded native and exotic grasslands are common.

The Big Nemaha River drains the eastern portion of the region, while the Big Blue River drains the western portion of the BUL. Oak woodlands occur along stream bluffs with cottonwood woodlands in floodplains. Larger streams have deeply incised channels, though higher-quality smaller streams — such as Wildcat, Turkey, Rock, and Yankee creeks — still persist.

The abundance of native and restored grasslands supports stable populations of greater prairie-chickens and other grassland birds. Burchard Lake WMA and Pawnee Prairie WMA are the largest protected areas. These sites are strongholds for the state's largest remaining western massasauga populations. The Barneston Bluff area in Gage County contains rocky woodlands that support timber rattlesnakes and copperheads.

Natural Legacy Demonstration Site

24. Burchard Wildlife Management Area – Nebraska Game and Parks Commission

Burchard WMA totals 560 acres. It consists of a 150-acre reservoir and roughly 285 acres of native upland tallgrass prairie. Management is directed toward maintaining the current tallgrass prairie composition. Primary habitat management prescriptions replicate historic disturbance through the use of prescribed fire and rotational grazing. Supplemental habitat management practices include rotational haying and spot herbicide applications to control noxious and invasive plants. Greater prairie-chickens are a common sight on the property. The WMA also provides critical habitat for many native species of wildlife including Henslow's sparrows and western massasaugas.

Stresses Affecting Species and Habitats

- Livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species in prairies, woodlands, and wetlands.

- Limited use of fire has led to woody encroachment in prairies, woodlands, and riparian corridors (e.g., Osage orange, honey locust, and eastern red-cedar).
- Streambed and bank degradation.
- Chemical runoff and nutrient loading into streams from adjacent cropland.
- Conversion of native prairies and CRP to cropland.
- Infrastructure development (e.g., road, industrial, energy).
- Mining rare metals and byproduct runoff into rivers and streams is likely to become a threat.
- Roadside and trail haying and mowing in areas with known populations of SGCN snakes.
- Limited awareness of management practices to improve prairie and woodland habitats and to better manage invasive species.

Conservation Strategies

- Implement planned grazing and haying strategies on public and private lands, in combination with prescribed fire and rest, to improve native plant diversity and reduce exotic grass dominance.
- Conduct annual surveys and implement best management practices to control, manage, and remove invasive plant communities with a concerted effort on protected lands.
- Implement woody encroachment clearing programs and forest stand improvement practices in combination with prescribed fire and planned grazing on public and private lands. Increase capacity for landscape-scale prescribed fire.
- Facilitate the establishment and/or support of prescribed burn associations. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns and offer trainings.
- Restore degraded wetlands and stream reaches.
- Create and maintain a natural grassland buffer around streams to reduce siltation and filter chemical runoff. Coordinate with NRDs and utilize watershed planning to address potential water quality problems. Coordinate with landowners interested in using conservation programs and voluntary fee title acquisition to protect high-quality prairies and establish riparian buffer strips.
- Work with energy and mining companies to select sites for development that minimize fragmentation and impacts to wildlife. Encourage zoning ordinances to minimize fragmentation and impacts to wildlife.
- Work with partners (e.g., Nebraska Department of Transportation) to avoid roadside and trail mowing during times when known populations of SGCN snakes are using the area. Enhance education efforts about SGCN snakes, their behavior, and habitat use.
- Continue to implement integrated public and private lands management. For example, work with private landowners with properties bordering public lands to manage larger habitat blocks.
- Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about collaborative conservation strategies and practices that improve habitats and their benefits.
- Offer training for identifying and treating invasive species.

Tier 1 Species:

Smallmouth Salamander
Henslow's Sparrow
Loggerhead Shrike
Wood Thrush
Plains Minnow
Silver Chub
Western Silvery Minnow
Byssus Skipper
Fox Mayfly
Iowa Skipper
Monarch
Regal Fritillary
Eastern Red Bat
Hoary Bat
Little Brown Myotis
Northern Long-eared Myotis
Silver-haired Bat
Tricolored Bat
Creeper
Fatmucket
Pistolgrip
Plain Pocketbook
Pondmussel
Yellow Sandshell
Timber Rattlesnake
Western Massasauga
Missouri Sedge
Woolly Milkweed

Aquatic Communities:

Headwater, Warm Water Stream*
Mid-order, Warm Water Stream

Terrestrial Communities:

Eastern Riparian Forest
Cottonwood-Peachleaf Willow Riparian Woodland
Mesic Bur Oak Forest and Woodland*
Dry-Mesic Bur Oak Forest and Woodland*
Dry Upland Bur Oak Woodland*
Sandbar Willow Shrubland
Riparian Dogwood-False Indigobush Shrubland
Freshwater Seep
Eastern Cordgrass Wet Prairie*

Eastern Sedge Wet Meadow
Eastern Bulrush Deep Marsh
Cattail Shallow Marsh
Upland Tall-grass Prairie*
Lowland Tall-grass Prairie*
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

Willow Creek

Biologically Unique Landscape Description

This landscape includes the Willow Creek valley, Foster Bottoms, and surrounding uplands in Pierce County and parts of Madison and Antelope counties. Willow Creek is a meandering prairie stream, and its floodplain contains wet meadows dominated by big bluestem and prairie cordgrass. Cropland is also interspersed within the floodplain.

The Willow Creek meadows support one of Nebraska's largest populations of the federally and state-threatened western prairie fringed orchid. The meadows serve as valuable stopover habitat for migrating waterbirds in both spring and fall. Sand dunes, supporting dry-mesic sand prairies, dominate the uplands bordering Willow Creek. Many of these prairies are hayed and in good condition; others are grazed and degraded. Cropland is also common on the dunes. There are around 1,000 acres under conservation easement.

Foster Bottoms consists of wet meadows interspersed with cropland. These meadows and adjacent roadside ditches contain the state's largest population of the state-threatened small white lady's-slipper orchid.

Stresses Affecting Species and Habitats

- Livestock grazing practices that may reduce native plant diversity and promote uniform habitat structure.
- Annual mid-summer haying of wet meadows that impacts populations of the western prairie fringed orchid and native plant species diversity.
- Invasive plant species in native prairies.
- Broadcast herbicide application on prairies.
- Limited use of fire has led to woody encroachment into prairies, and an increase of undesirable species in woodlands and riparian areas (e.g., eastern red-cedar).
- Altered natural hydrology, increased sedimentation, and stream incision. Center pivot development, tiling, and wetland drainage that could lower groundwater levels and degrade native prairies.

- Chemical runoff and nutrient loading into streams from adjacent cropland and livestock confinements.
- Conversion of native prairies to cropland.
- Housing development.
- Energy infrastructure development and fragmentation of habitat.
- Lack of applied science, including research, assessment, and monitoring

Conservation Strategies

- Support voluntary implementation of ecologically-sensitive grazing and haying strategies on private and public lands in combination with prescribed fire and rest.
- Develop and implement cooperative leafy spurge and other invasive species control methods, potentially using biocontrol agents, in orchid meadows and other native grasslands. Work with county weed authority and use care to protect sensitive areas (e.g., small white lady's-slipper habitat) and to map high-quality areas where broadcast spraying of ditches is not desired.
- Offer training on invasive species and SGCN plant identification.
- Implement tree clearing programs and forest stand improvement practices in combination with prescribed fire and planned grazing on public and private lands.
- Increase capacity for landscape-scale prescribed fire. Facilitate the establishment and/or support of prescribed burn associations. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns and offer trainings.
- Restore the natural hydrology to wetlands and streams and implement conservation strategies necessary to sustain biological diversity and ecosystem function.
- Create and maintain natural grassland buffers around riparian areas to reduce sedimentation and filter chemical runoff. Implement measures to site livestock confinements away from sensitive habitats and watersheds.
- Promote conservation programs and coordinate with interested landowners to restore strategic areas of cropland to grassland through conservation programs or voluntary fee title acquisition, enhancing connectivity and establishing core habitats.
- Coordinate with interested landowners and partners to manage and conserve areas with orchids and other high-quality prairies.
- Work with energy companies to select sites for energy infrastructure development that minimize fragmentation and impacts to wildlife.
- Implement research, monitoring, and inventory projects to determine best management practices for SGCN (e.g., western prairie fringed orchid).

Tier 1 Species:

Black-billed Magpie

Loggerhead Shrike

Plains Topminnow

Bucholz Black Dash

Monarch

Regal Fritillary

Eastern Red Bat
Hoary Bat
Silver-haired Bat
Blanding's Turtle
Small White Lady's Slipper
Western Prairie Fringed Orchid

Aquatic Communities:

Headwater, Warm Water Stream

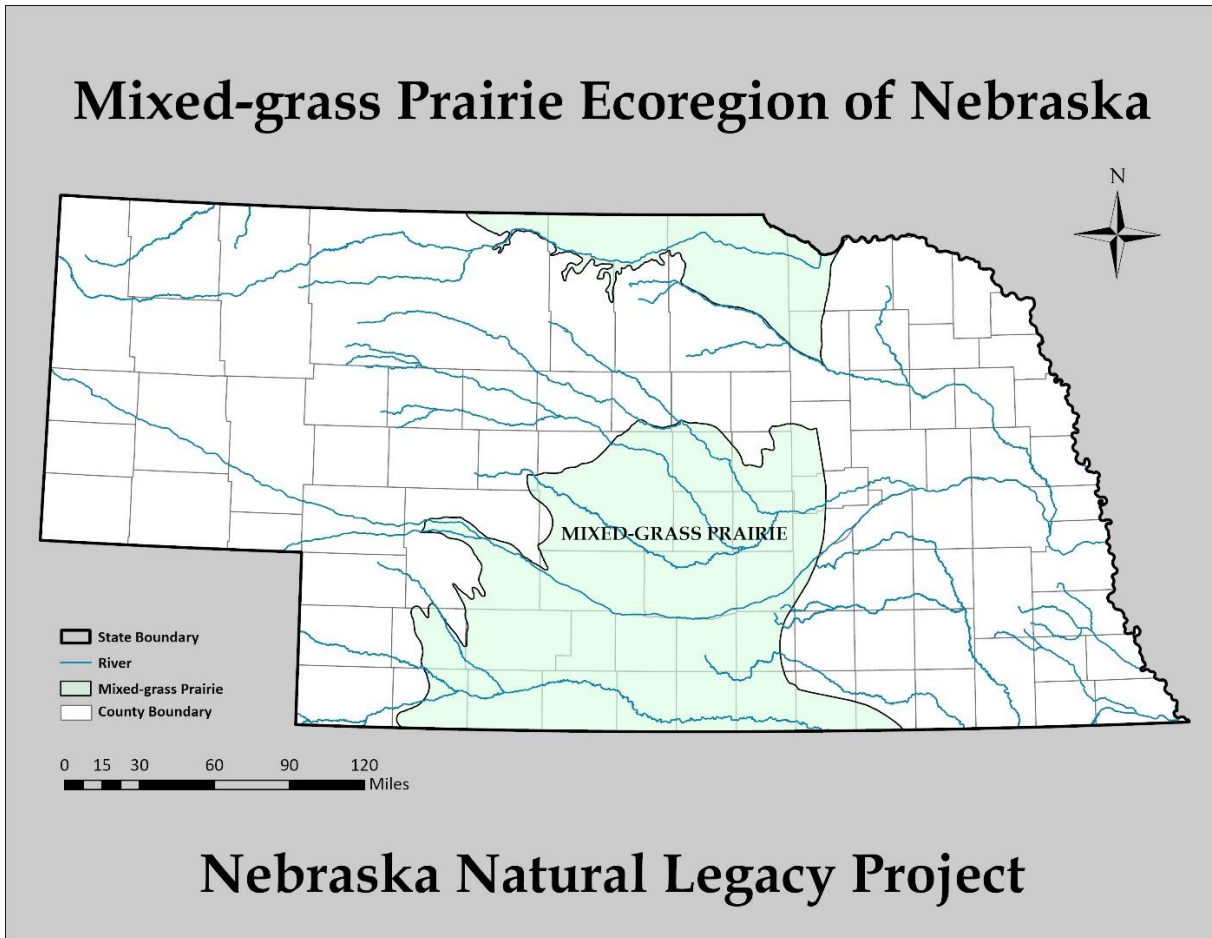
Terrestrial Communities:

Sandbar Willow Shrubland
Riparian Dogwood-False Indigobush Shrubland
Freshwater Seep
Eastern Cordgrass Wet Prairie*
Eastern Sedge Wet Meadow*
Eastern Bulrush Deep Marsh
Cattail Shallow Marsh
Reed Marsh
Lowland Tall-grass Prairie*
Eastern Sand Prairie*
Sandhills Dune Prairie
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

Chapter 6

Mixed-grass Prairie Ecoregion



Introduction

The Mixed-grass Prairie Ecoregion is a land of transition — a broad band in the central Great Plains where eastern tallgrass prairie species meet western shortgrass prairie species, along with a scattering of plants and wildlife unique to the ecoregion. As a vegetation zone, the region is not fixed. During prolonged droughts, the mixed-grass prairie shifts eastward into the tallgrass prairie, and during wet periods, it moves west into the shortgrass prairie. Its plant composition varies depending on soil type, topography, weather, and land use.

This ecoregion is divided into two sections: a northern unit in north-central Nebraska and a larger southern unit in central and south-central Nebraska. The units are separated by the Sandhills Ecoregion. The southern unit's primary geologic feature is a thick mantle of wind-blown loess, deposited during the last glacial period between 25,000 and 13,000 years ago. In areas such as the Central Loess Hills and Loess Canyons BULs, water erosion has carved the once-level loess plains into steep hills and valleys. In other areas, such as the Rainwater Basin

BUL, younger, not yet eroded, loess plains dominate the landscape. Wind-excavated playas are common on the plain. An additional landscape feature south of the Platte and Loup rivers, sand dunes have formed from windblown river alluvium. Elevation in the ecoregion increases gradually from east to west, ranging from 1,650 to 3,000 feet above sea level.

Major rivers in the southern unit include the Republican, Platte, and the South, Middle, and North Loup rivers. Several of the Platte River's major tributaries begin in Colorado and Wyoming, and, prior to the construction of upstream dams beginning in the early 1900s, mountain snowmelt caused annual spring floods that maintained a wide, braided, sandy channel. Reduced flows and flooding due to dams and irrigation diversion have allowed the channel to narrow and become choked with trees. The Republican River, which begins in eastern Colorado and exits Nebraska into Kansas near the town of Superior, flows along the region's southern boundary. Its flows have also been greatly reduced by dams on the river and its major tributaries along with diversion for irrigation. The South, Middle, and North Loup rivers headwater in the Sandhills Ecoregion and therefore receive most of their water from groundwater discharge and maintain near constant year-round flows.

The ecoregion's northern unit is characterized by rolling hills and river breaks. Soils here are formed from loess, sand, shale, and other sedimentary layers. The deep and wide Missouri River is the largest river in this unit. A 39-mile stretch of the Missouri — from Fort Randall Dam to the town of Niobrara — is designated as the Missouri National Recreational River. The Niobrara and Keya Paha rivers are the other major rivers in the northern unit. The Keya Paha flows into the Niobrara, which eventually merges with the Missouri River in Knox County.

The region's annual precipitation ranges from about 20 inches in the west to 24 inches in the east, with May and June being the wettest months. In Kearney, average winter high temperatures are 36 to 40 °F, with average lows of 13 to 16 °F. In summer, highs average 83 to 87 °F, and lows average from 58 to 63 °F.

Wetlands — primarily playas, river valley wet meadows, and marshes — are a key feature of the region. Playas are wind-formed, often circular depressions with a clay subsurface layer that limits water infiltration. The Rainwater Basin playas of south-central Nebraska are a vital spring migration staging area for waterfowl and shorebirds. The Central Table playas occur on level plains north of the Platte River, mainly in Custer County. The broad, subirrigated floodplains of the Platte and Loup rivers support extensive wet meadows, while abandoned channels within the meadows form marshes.

Vegetation

Most of the unfarmed uplands in this ecoregion support loess mixed-grass prairie, which now includes a mix of native and non-native plants. The main non-natives are smooth brome, Kentucky bluegrass, and cheatgrass. Abundant native species include tall grasses like big bluestem and Indiangrass on moist lower slopes and bottoms; mid grasses like sideoats grama and little bluestem on mid and upper slopes; and short grasses like blue grama and buffalograss on drier, heavily grazed uplands. Common wildflowers — such as prairie clover, wild alfalfa, deervetch, leadplant, prairie coneflower, stiff sunflower, and dotted gayfeather — are still fairly

common on well-managed sites. Due to fire suppression, eastern red-cedars have invaded extensive areas of mixed-grass prairie in the region.

Before settlement, less than one percent of the ecoregion was covered by woodlands, which mostly occurred in stream valleys and associated ravines. Today, however, many watercourses are lined with riparian forests dominated by plains cottonwood, green ash, hackberry, and eastern red-cedar. Native bur oak woodlands occupy areas on bluffs and in ravines, especially in the eastern part of the ecoregion. Due to fire suppression, many of the oak stands are now heavily invaded by eastern red-cedar and fire-intolerant deciduous trees such as elms and hackberry.

Wet meadows and wet prairies occur in creek and river floodplains and are dominated by sedges and grasses, including woolly sedge, Emory's sedge, big bluestem, switchgrass, and prairie cordgrass. The state-threatened small white lady's-slipper orchid grows in high-quality meadows in the floodplains of the Loup rivers. Playa wetlands — many of which have been farmed or altered hydrologically — are often dominated by dense stands of narrowleaf and hybrid cattails, river bulrush, and reed canary grass. Annual plants like smartweeds and barnyard grasses are also common in playas.

Animals

More than 350 species of resident and migratory birds have been documented in the Mixed-grass Prairie Ecoregion. Common grassland birds include grasshopper sparrow, dickcissel, western meadowlark, bobolink, northern bobwhite, field sparrow, northern harrier, and greater prairie-chicken. The Platte River serves as an important stopover for the endangered whooping crane and provides critical spring staging habitat for over 80% of the world's sandhill cranes. In total, more than 300 bird species have been recorded along the Platte River, and 141 are known to nest there. Over two dozen waterfowl species regularly use the Rainwater Basin wetlands during migration, including over one-third of the continent's northern pintails, half of its mallards, and more than 90% of the mid-continent's greater white-fronted geese. Around 300,000 shorebirds, representing over 30 species, use the basins. These include Baird's sandpiper, stilt sandpiper, lesser yellowlegs, and large flocks of buff-breasted sandpipers. Each fall, thousands of Swainson's hawks migrate through the region. Reservoirs like Harlan County and Sherman support large numbers of American white pelicans and Franklin's gulls.

Small mammals in the region include plains pocket gopher, prairie vole, North American least shrew, and eastern cottontail. Smaller populations of Ord's kangaroo rat, white-tailed jackrabbit, eastern woodrat, and black-tailed prairie dog occur in suitable habitats. White-tailed and mule deer are the most common large mammals, with mule deer more typical in the western grasslands. A small but growing elk herd is found in the loess canyons south of the North Platte River. Aquatic mammals like American beaver, river otter, muskrat, and mink are associated with rivers and streams. The most abundant large predator is the coyote. Other common predators include American badger, bobcat, red fox, raccoon, long-tailed weasel, and striped skunk. Bats commonly found here include the eastern red bat and big brown bat.

Common river fish include channel catfish, shortnose gar, flathead chub, and river carpsucker. Sportfish such as walleye, northern pike, largemouth bass, white bass, and bluegill have been introduced to reservoirs. Minnows and chubs in prairie streams include speckled chub, blacknose shiner, Topeka shiner, common shiner, northern pearl dace, finescale dace, plains topminnow, and brook stickleback.

Turtles found in the ecoregion include smooth and spiny softshells, northern painted turtles, and common snapping turtles. Ornate box turtles live in native grasslands, while yellow mud turtles inhabit the Republican River valley. The northern watersnake is the ecoregion's only aquatic snake and is found near permanent water. The prairie rattlesnake is the only venomous snake and is most common on dry upland sites in the west. Other fairly common snakes include bullsnake, eastern yellow-bellied racer, terrestrial gartersnake, and common gartersnake. Western hognose snakes occur in dry, sandy prairies. Rare species include the smooth green snake and red-bellied snake, which can be found in open riparian areas and wet meadows.

Four lizard species are common in the region. The lesser earless lizard prefers open, sandy soil with sparse vegetation. The six-lined racerunner uses a range of habitats in both uplands and lowlands. The northern prairie lizard favors sandy sites with weeds, brush, or mammal burrows. The Great Plains skink is found in open habitats. The only common salamander is the tiger salamander. The plains spadefoot toad lives in dry grasslands and rarely uses wetlands or river bottoms. Other common amphibians in wet areas include Woodhouse's toad, Great Plains toad, Blanchard's cricket frog, boreal chorus frog, bullfrog, and plains leopard frog.

Relatively little is known about the ecoregion's invertebrates. The regal fritillary butterfly, though rare elsewhere, is relatively common in the ecoregion's mixed-grass prairies. A large population of the federally endangered American burying beetle also exists here.

History and Dominant Land Use

The Pawnee were the primary tribe living in the ecoregion at the time of Euro-American settlement. The Pawnee built their first villages in Nebraska in the late 13th and 14th centuries along the Platte, Loup, and Republican rivers. Here, they grew corn, squash, beans, and sunflowers in the river bottoms, gathered wild turnips, grapes, plums, acorns, and other native plants, and hunted a variety of game species, including bison, elk, pronghorn, deer, rabbits, and waterfowl.

Although hundreds of thousands of immigrants traveled through the ecoregion along the Oregon and Mormon trails in the mid-1800s, Euro-American settlement remained sparse until the passage of the Homestead Act and completion of the transcontinental railroad in the 1860s. After initial growth, the ecoregion's population went through cycles of expansion and decline in the late 1800s and early 1900s, often tied to periods of drought. Important early crops in the region included wheat, corn, and alfalfa.

World War I increased demand for agricultural products and led to the expansion of farming into the drier western part of the ecoregion and, by the 1920s, most of the region's farmable

land was under cultivation. The depression of the 1930s, combined with severe drought, caused widespread hardship among the ecoregion's residents. Most cropland was not irrigated at the time, and crop yields fell sharply; corn yields dropped from about 24 bushels per acre to just two or three. Grasshopper outbreaks further damaged pastures, and frequent dust storms worsened the situation. The ecoregion's population declined by nearly 20% during the mid-1930s.

The drought prompted the construction of Kingsley Dam on the North Platte River and other regional dams for irrigation. These irrigation efforts, along with cropping innovations, led to population growth in the ecoregion in the 1940s and 1950s. With the spread of center-pivot irrigation in the mid-1900s, more mixed-grass prairies were converted to cropland. By the early 1970s, the ecoregion's population increased further even though the number of farms had declined. That trend of fewer but larger farms continues today.

Currently, about two-thirds of the land in the ecoregion is used for cropland and one-third for rangeland. Corn, soybeans, and alfalfa are now the primary crops, and the beef industry remains strong. The populations of smaller towns continue to decline, while larger cities like Grand Island, Kearney, North Platte, and Hastings continue to grow.

Nature-based Recreation

This ecoregion offers a plethora of outdoor and nature-based recreation opportunities. It is recognized worldwide for premiere wildlife viewing spectacles. Each spring, over a million sandhill cranes stage in south-central Nebraska on their way to breeding grounds as far away as Siberia. Tens of thousands of visitors come to witness this migration. Another popular destination in this region is the 76-mile Niobrara National Scenic River, which offers great kayaking and wildlife watching opportunities.

Wildlife Viewing

The sandhill crane spring congregation along the Platte River is an incredible experience that attracts wildlife viewers and photographers from around the world. National Audubon's Rowe Sanctuary and the Crane Trust Nature and Visitor Center provide viewing-blind tours and educational programming to thousands of visitors annually. Roadside viewing sites constructed by the Central Platte Natural Resources District provide additional crane-viewing opportunities. Visitors can find a plethora of crane-viewing and tourist information on the helpful Nebraska Flyway website.

Although less known, the Rainwater Basin hosts outstanding spring waterfowl and shorebird viewing. Each spring, about 7-9 million waterfowl, including more than 3 million geese, stage here while concentrations of more than a million snow and Ross's geese congregate on larger basins. The basins also support 300,000 to over 500,000 shorebirds comprising more than 30 species, including some of the largest buff-breasted sandpiper concentrations. While public lands are abundant, viewing infrastructure is limited to a few sites including a waterfowl

observation tower at Massie Waterfowl Production Area (WPA) and an accessible blind at the Funk WPA Demonstration Site.

During winter, bald eagles gather in significant numbers. The Central Nebraska Public Power and Irrigation District's J-2 facility near Lexington offers prime eagle viewing. Harlan County and Sherman Reservoirs also draw wintering and nesting eagles, with over 300 observed at once during winter at Harlan. The large reservoirs also host thousands of migrating American white pelicans and Franklin's gulls. Other unique opportunities include viewing and photographing sharp-tailed grouse and greater prairie-chickens from blinds, like those at Niobrara State Park.

Trails

Trail systems in the ecoregion are expanding, but opportunities exist for further development. The Crane Trust's Nature and Visitor Center and Audubon's Rowe Sanctuary offer trail networks through Platte River habitats. Harlan County Reservoir, Lake Seldom, and WPAs such as Funk, Harvard, and Massie also have trails. Paved hike-bike trails can be accessed at Fort Kearny State Recreation Area (SRA) and throughout the city of Kearney. Many large towns also have trail systems tied to parks that offer access to natural settings. Long Pine SRA is somewhat of an outlier as it sits on the edge of the Sandhills Ecoregion but offers natural surface trails through woodland habitat and access to the meandering, spring fed, Long Pine Creek. Further west, the Cowboy Trail features a 145-foot-high bridge overlooking the creek, offering scenic views of the valley.

The Republican River below Harlan County Dam, Cedar and Platte rivers are used by canoeists and kayakers, although access points, outfitters, and seasonal water levels can be limiting. The northern region's Niobrara National Scenic River remains a highlight for paddling and tubing. The river attracts over 80,000 floaters annually, many stopping at Smith Falls State Park. Outfitters near Valentine rent kayaks, canoes, and inner tubes. Smith Falls features an accessible boardwalk and viewing platform to Nebraska's tallest waterfall.

Fishing

Anglers take to the ecoregion's reservoirs in search of walleye, largemouth bass, catfish, white bass, and bluegill. Popular fishing locations include Harlan County, Sherman County, Johnson Lake, and Swanson Reservoirs. Harlan County Reservoir is known for its trophy-sized hybrid striped bass and frequently ranks among the state's top providers for master angler awards. Grove Lake Wildlife Management Area (WMA) offers seasonal trout fishing opportunities. Publicly owned sandpits offer quality fishing by shore or boat, and rivers and streams provide catfishing opportunities. West of Highway 81, bullfrog angling is available year-round.

Hunting

There is a strong tradition of hunting in the ecoregion. More than 100,000 Canada geese winter along the Platte River, making it a top goose hunting destination. The Rainwater Basin wetlands provide ample, quality public waterfowl hunting sites. Snow goose conservation hunts draw many hunters in late winter and early spring. White-tailed deer hunting is popular across the ecoregion, especially along riparian corridors such as the Platte, Republican, and Loup rivers.

Hunters can also harvest mule deer, though population declines have reduced their range to the western third of the ecoregion. Hunting opportunities also include pheasant, quail, turkey, prairie-chicken, and rabbit. Mountain lion hunting is permitted along the Middle Niobrara River.

Challenges

Additional collaborations with business, economic development, and agriculture stakeholders is essential in planning, promoting, and developing wildlife tourism. For example, the Nebraska Flyway, a group of tourism professionals, successfully promotes sandhill crane viewing and prairie grouse tours every spring. However, beyond these spring birding attractions, other recreational opportunities receive limited promotion.

While the region offers outstanding nature-based experiences, access can be limited or poorly marked. Interpretive signage is sparse and promotion of these opportunities is minimal. For example, the Rainwater Basin is an important stopover location for migratory waterfowl and shorebirds, yet the area lacks sufficient viewing infrastructure and interpretive information at the sites. To fully realize the potential of nature-based recreation in the region, communities need more individuals knowledgeable in outdoor recreation to help raise awareness and inform planning. Enhanced outreach, infrastructure, and engagement efforts are essential to ensuring long-term enjoyment and support for conserving these natural resources.

Education

Nebraska's Mixed-grass Prairie Ecoregion boasts numerous successful environmental education initiatives. Public access Demonstration Sites like Niobrara State Park, The Nature Conservancy's Niobrara Valley Preserve, and The Crane Trust offer excellent opportunities for expanding educational outreach. Proposed park facilities and an education center in the region will further enhance these efforts.

Programs such as Prairie Plains Resource Institute's "Summer Orientation About Rivers," Tri-Basin NRD's "Conservation Day," and Rowe Sanctuary's youth engagement programs have introduced thousands of students to Nebraska's diverse natural world. Additionally, the Cooperative Extension supports agricultural producers and post-secondary educators with curricula that emphasize techniques compatible with conservation and agricultural practices.

To sustain and expand environmental education in this region, increased resources, broader outreach, and stronger partnerships are needed. Programs should engage diverse groups — including students, adults, and underserved communities — through both formal and nonformal education. Partnering with Educational Service Units (ESUs) can help integrate conservation education into school curricula, while hands-on learning experiences like the Kearney Outdoor Learning Area (KOLA) enrich science education.

While existing programs have been impactful, more infrastructure, staffing, and funding are required to meet the region's educational goals. As technology and urbanization increase, it becomes increasingly difficult to connect people with nature, requiring innovative strategies to keep audiences engaged. By supporting local champions, expanding public access, and

addressing cultural and economic barriers, we can inspire deeper connections with the natural world.

Representative species with educational and community science opportunities:

- Plains Spadefoot (*Spea bombifrons*)
- Purple Coneflower (*Echinacea angustifolia*)
- Dung Beetle (*Melanocanthon nigricornis*)
- Prairie Rattlesnake (*Crotalus viridis*)

Ecoregion-specific Stresses

Key stresses

In addition to the stresses and conservation actions identified in this chapter for the Mixed-grass Prairie Ecoregion, statewide concerns are identified in Chapter Four. Conservation practitioners identified the following stresses as the top threats in the ecoregion.

Altered frequency and intensity of fire, grazing, and other natural disturbances: Mixed-grass prairie, wetland, and forest habitats in the ecoregion were maintained historically by periodic flooding, fires, and grazing. The interaction of effects from these disturbances promoted structural heterogeneity and floristic diversity. Decreased frequency of fire has resulted in the degradation of prairie remnants by invasive species including eastern red-cedar and by decrease in grassland vigor. The proliferation of deciduous trees and shrubs, some of which are fire resistant, in grassland habitats also threatens native herbaceous plant diversity. Grazing systems that do not prioritize heterogeneity often result in a loss of biodiversity and ecological function. Historically, grazing patterns were likely driven in part by fire occurrences. Today, opportunities for fire and ecologically sensitive grazing are increasing in this ecoregion but still under realized.

Spread of invasive species: Invasive and noxious species are threatening the ecoregion's biological diversity. Exotic cool-season grasses, aggressive woody plants, and other species have competitively excluded native plants and degraded habitat for fish and wildlife. Many plant and aquatic invasive can hitchhike on maintenance machinery, recreation equipment, vehicles, pets, and clothing without being detected. Other causes of invasive species' spread include interbasin water transfer and dumping fish bait into aquatic systems. Early detection monitoring and rapid response are key to preventing invasive and noxious species from becoming established and altering ecosystems. Treatment of invasive species should be weighed for potential costs to ecosystem health. Free-ranging cats are a major cause of anthropogenic mortality for birds and mammals. There is a need for improved communication, greater awareness, and education about the harmful effects that free-ranging cats can have on wildlife populations.

Limited awareness about the region's biological diversity and ecological processes: Many residents have a desire to increase their knowledge and understanding of ecological

processes and management that can help maintain biological diversity, but educational resources are often not available. Funding and collaboration among conservation agencies are essential to develop and implement relevant environmental education opportunities about native ecosystems and best management practices for conserving them. There is a lack of trusted advisors and community ambassadors that can provide peer-to-peer learning opportunities and share their experiences and knowledge about the financial relevance of ecosystem conservation. Increases in nonresident landowners and younger residents will require the use of new communication channels such as realtors, bankers, and social media to deliver informational materials. Additionally, there is little school curriculum that teaches students about Nebraska's native species, habitats, and conservation issues. Although the region's remaining native grasslands, woodlands, and wetlands are unique and of high value, many of the ecoregion's residents have limited awareness of the importance of these habitats to biological diversity.

Alteration of hydrology, channel degradation, and sedimentation of rivers, streams, and wetlands: Historically, rivers in this region including the Platte and Republican rivers experienced spikes in flows during the spring and early summer. These spikes caused large-scale sediment movement and prevented the establishment of perennial vegetation on sandbars, islands, and accretion ground. However, dams and other diversions have reduced the flow of sediment and confined natural movement of streams and rivers, contributing to channelization. Meanwhile, the loss of Spencer Dam on the Niobrara River in 2019 coupled with flooding caused by large rain events have changed the hydrology of the river. Groundwater and surface water withdrawals and storage in upstream reservoirs have significantly reduced flow peaks and caused water tables adjacent to rivers to decline, affecting animal and plant diversity and abundance. Many of the ecoregion's streams now go dry; reduced inflows, stream channelization, and bank stabilization projects have altered natural geomorphic and hydrologic processes. Increased woody encroachment has also reduced stream flow. Changes to the historical natural flows have caused native mussel declines and reduced habitat available to fish and other species. Structures like dams and improperly sized culverts limit native fish and other aquatic species movement. Increase and continue communication and collaboration with counties on how to set culverts and other alternatives that facilitate native fish movement in small streams. The potential for interbasin water transfer could negatively impact wetlands in the region.

The proximity of urban development, construction sites, and annual row-crop fields to rivers, streams, and wetlands has resulted in large volumes of sediment entering the ecoregion's water bodies. Fewer cover crops are planted to hold soil over winter. Sedimentation increases stream turbidity and changes bottom substrates. Increased sedimentation of wetlands alters storage capacity and changes plant composition, reducing habitat available to aquatic species including waterfowl. There is limited awareness of the grassland buffer program and the importance of riparian buffers. Additionally, there are inadequate technical and financial incentives available to encourage the preservation of riparian buffers, especially next to crop fields where soil

erosion and nutrient and chemical runoff are more prevalent. Along the Platte River, dams and altered hydrology have prevented the natural flow of sedimentation that is essential for creating shallow braided streams and rivers that attract sandhill cranes and endangered whooping cranes during their spring migration. Here, an increase in sedimentation is needed to more accurately represent the historical flow regime.

Conversion and fragmentation of natural habitats: Most of the ecoregion's level, productive soils have already been converted to crop fields. However, center pivots have made conversion of steeper prairie sites more feasible to farm resulting in the conversion of thousands of additional acres of native prairie. Increased farming efficiency has also led to loss of non-cropped corridors between habitats and decreased resources for pollinators and other wildlife. Natural wetlands in the area continue to face drainage pressures due to agriculture. Decreases in crop diversity have also furthered the impact of agriculture on wildlife. Urban sprawl into peripheral intact habitats and riparian areas is accelerating conversion and fragmentation as well.

Loss of natural areas because of local economics: Economic pressures are changing ownership patterns in this ecoregion. This may affect management decisions and stewardship of the land's natural resources. Conversion of remnant areas for agricultural purposes, development of agricultural areas for housing, and subdivision of large, grazed areas for recreational land use are potential sources of loss. Such changes result in increased fragmentation and loss of biodiversity. An increase in nonresident landownership, nonoperating landowners, and recreational landownership may make connections to local communities, economies, and information about conservation incentives less accessible.

Loss of lands enrolled in conservation programs: Lands enrolled in conservation programs, such as the Conservation Reserve Program (CRP), provide significant benefits to wildlife, including at-risk species. Shifting agricultural economics and programmatic challenges may result in large tracts of conservation lands being converted to agricultural cropland. Retention of previously enrolled acres in programs, such as General and Continuous CRP, is vital to ensure that the benefits of these programs for local economies and wildlife populations persist. Placement of Grassland CRP in areas prone to conversion or implemented in a way to provide and manage habitat for targeted wildlife benefits will also be key to ensure benefits of the program are realized. The loss of even a modest percentage of these lands will result in impacts to terrestrial and aquatic species.

Poorly sited utility-scale energy infrastructure: Utility-scale energy infrastructure development (e.g., solar farms, wind turbines, CO₂ sequestration plant and pipelines, fracking waste, power lines) is expanding in the Great Plains. To conserve biodiversity in the ecoregion, it is important to carefully consider the energy infrastructure location and the associated transmission lines and pipelines in order to minimize negative impacts to wildlife and native habitats. Poorly sited energy infrastructure can fragment intact ecosystems, negatively impact important migratory corridors, harm migratory birds and bats, and disturb wildlife. Focus on siting energy infrastructure in already disturbed areas (e.g., cultivated lands, old railway/road corridors). Encourage companies to

temporarily halt turbines during peak migration periods for bats and birds. Pre-and post-construction monitoring should be implemented. See Game and Parks' Environmental Review (Visit OutdoorNebraska.gov and search for Environmental Review) and TNC's Site Renewables Right (Search The Nature Conservancy Site Renewables Right: A Clean and Green Energy Future) webpages for guidelines.

Wetland and wet meadow drainage: Past and current drainage of many of the ecoregion's playa wetlands, wet meadows, and riverine wetlands continues to impact wetland-dependent species. Temporary and seasonal wetlands were perhaps the most common wetland types historically but proportionally few have been restored. As the groundwater table becomes lower, it becomes harder to restore wetlands. Invasive species and woody encroachment are also negatively impacting wetlands and reducing habitat availability for native species.

Need for greater collaboration between the agricultural and conservation communities: Past contention between the agriculture and conservation communities on issues related to water and threatened and endangered species have sometimes left deep divisions. Although there is often common ground on many issues related to conserving biological diversity, there remains some lack of trust and resolve to collaborate on issues important to all stakeholders. Staff turnover at conservation agencies has made it difficult to build meaningful relationships and has contributed to the lack of trust and communication with the agricultural communities. Opportunities exist to merge firsthand knowledge of the land with newly developed conservation practices that benefit producers and ecosystems alike. While progress is being made, there is still a need for improved communication with agricultural communities about current and changing contracts and their impacts on agricultural and conservation communities.

Primary Invasive Plant Species by Habitat Type

Note: This list highlights key invasive species of concern in the Mixed-grass Ecoregion and is not exhaustive.

<u>Habitat Type</u>	<u>Invasive Plant Species</u>
Upland Prairie	Kentucky bluegrass, smooth brome, Japanese brome, downy brome, crown vetch, wormwood sage, knapweeds, St. John's wort, leafy spurge, sericia lespedeza, red clover, yellow and white sweet clover, autumn olive, roughleaf dogwood, smooth sumac, eastern red-cedar, and Siberian elm
Deciduous Woodlands	Sericea lespedeza, garlic mustard, Amur and other non-native honeysuckles, autumn olive, roughleaf dogwood, tree-of-heaven, white mulberry, honey locust, Osage orange, and eastern red-cedar
Wet Meadows	Smooth brome, Kentucky bluegrass, reed canary grass, tall wheatgrass, timothy, Canada thistle, leafy spurge, and non-native clovers
Lakes and Marshes	European phragmites, reed canary grass, narrow-leaf/hybrid cattail, purple loosestrife, curly-leaf pondweed, and Eurasian watermilfoil

Biologically Unique Landscapes of the Mixed-grass Prairie Ecoregion

A goal of the Nebraska Natural Legacy Project is to identify priority landscapes that, if properly managed, would conserve the majority of the state's biological diversity. These landscapes, referred to as Biologically Unique Landscapes (BULs), were selected based on the occurrences of at-risk species and natural communities. See Chapter 3 for a description of the methods used to select the landscapes.

The map shows the BULs for the Mixed-grass Prairie Ecoregion. Following the map are brief descriptions of each BUL including stresses affecting species and habitats, proposed conservation actions, and natural communities found in the landscape.

In the Mixed-grass Prairie Ecoregion, some BULs are truncated by the Nebraska state boundary. We suggest opportunities for wildlife conservation in these areas based on review of corresponding adjacent state wildlife action plans (SWAP).

Mixed-grass Prairie Biologically Unique Landscapes

- Central Loess Hills
- Central Platte River
- Keya Paha

- Loess Canyons
- Lower Loup River
- Middle Niobrara (see Sandhills Ecoregion for description)
- Platte Confluence
- Rainwater Basin
- Running Water

Demonstration Sites of the Mixed-grass Prairie Ecoregion

Demonstration sites are locations across the state with potential for showcasing conservation projects and the results of sustainable management to the public. They provide opportunities for learning about the site's unique qualities and importance to at-risk species. See Chapter 4 for information on selecting demonstration sites. The Mixed-grass Prairie Ecoregion map shows the location of demonstration sites in the area.

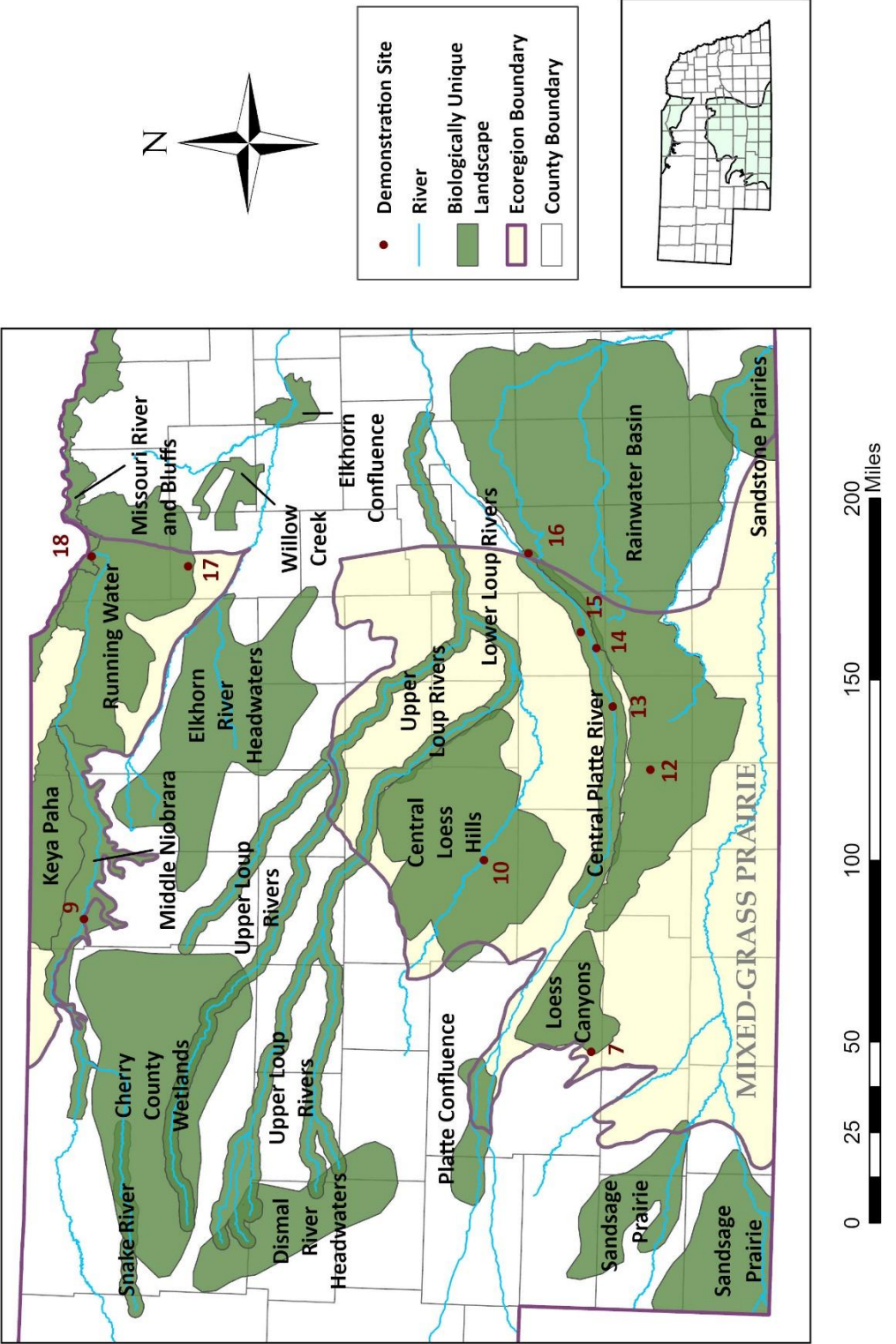
<u>Site name</u>	<u># on map</u>	<u>BUL</u>
Cedar Valley WMA	7	Loess Canyons
Crane Trust	15	Central Platte River
Funk WPA	12	Rainwater Basin
Gjerloff Prairie	16	N/A
Grove Lake WMA	17	Running Water
Niobrara State Park	18	Middle Niobrara
Platte River Prairies	14	Central Platte River
Pressey WMA	10	Central Loess Hills
Rowe Sanctuary	13	Central Platte River

Descriptions of each site are found in the write-up for the BUL in which the site is found, except for the Niobrara State Park description which can be found in the Middle Niobrara BUL write-up in Chapter 7 – Sandhills Ecoregion. The Gjerloff Prairie site serves as a representative site of the Mixed-grass Prairie Ecoregion, and its description is provided here.

16. Gjerloff Prairie - Prairie Plains Resource Institute

Gjerloff Prairie is managed by Prairie Plains Resource Institute and serves as an excellent example of the loess hills prairie, historically found throughout the Mixed-grass Prairie Ecoregion. The preserve is 390 acres and is managed using a combination of grazing, prescribed fire and tree removal. Management here supports a rich diversity of native flora, the seeds of which are harvested and used in restoration projects statewide. There are publicly accessible hiking trails through the prairie along which Species of Greatest Conservation Need (SGCN) such as the southern plains bumble bee, wild indigo duskywing, regal fritillary, and wooly milkweed can be seen. Prairie Plains provides summer programming for school children and hosts community events focused on prairies.

Nebraska Natural Legacy Project: Mixed-grass Prairie Ecoregion



Central Loess Hills

Biologically Unique Landscape Description

This landscape occupies the loess hills region of central Nebraska. It consists of rolling to steep hills formed from wind-deposited loess. The valleys of the Loup rivers dissect the loess hills. The hills now form a mosaic of loess mixed-grass prairie and cropland. Over a century of livestock grazing, along with invasion by non-native plants and widespread herbicide use, has greatly changed the plant species composition and overall biodiversity of the prairie. The level tablelands in this landscape contain playa wetlands, which are used by whooping cranes and many other waterbirds during migration.

Natural Legacy Demonstration Site

10. Pressey Wildlife Management Area – Nebraska Game and Parks Commission

Pressey WMA is located five miles north of Oconto in Custer County. The area encompasses 1,700 acres of diverse habitats, which include mixed-grass prairie, warm-season grasslands, croplands, subirrigated native grasslands, wetlands, and riparian woodlands associated with the South Loup River. Habitat management activities utilized on the area are patch-burn grazing, prescribed fire, food plot management, early successional management, timber stand improvement, and removal of invasive trees and shrubs. Pressey WMA also hosts the High School Silhouette Shoot on an annual basis.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species in upland prairies, meadows, and woodlands, including eastern red-cedar and smooth brome.
- Broadcast herbicide application to prairies.
- Lack of best management and sustainable logging practices for native woodlands. High-grade logging, especially harvest of mature trees, reduces age-class diversity of native woodlands. Oak blight and other tree diseases affecting woodlands.
- Limited prescribed fire on the landscape and interruption of natural fire frequency leading to increased tree and shrub densities, primarily eastern red-cedar, litter accumulation, and exotic plant invasion. Shelter belts are a seed bank and can lead to the expansion of woody encroachment into the prairies.
- Increased sedimentation and nutrients in streams and drainage of playa wetlands.
- Reduced stream flows.
- Conversion of grasslands to cropland.
- Housing and ranchette development.

- Infrastructure development (e.g., energy infrastructure development). Limited awareness of management practices to improve prairie and woodland habitats and to manage invasive species.

Conservation Strategies

- Implement planned grazing and haying strategies on private lands, in combination with prescribed fire and rest, to improve native plant diversity and vigor and reduce exotic grass dominance.
- Develop and implement best management practices to control, manage, and remove invasive plants.
- Seek and implement methods to control noxious and other invasive species that do not require broadcast spraying of grasslands.
- Implement prescribed burns in native woodlands to enhance woodland structure, floral composition, and oak regeneration on public and adjacent private lands. Implement forest stand improvements on public and private lands for oak regeneration. Develop and implement practices to combat oak blight and other tree diseases.
- Increase tree thinning, removal of unused shelter belts, and use of prescribed fire to reduce cedar and other woody species from encroaching into prairies. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns. Offer trainings to increase their comfort level and awareness of the needs for prescribed burn plans and permits to address both safety and liability concerns.
- Continue to restore the hydrology of playa wetlands. Create and maintain natural grassland buffers around riparian areas to reduce sedimentation and filter chemical runoff.
- Maintain the natural hydrology of streams and implement conservation strategies necessary to sustain biological diversity and ecosystem function.
- Coordinate with interested landowners to protect high-quality sites through conservation programs or voluntary fee title acquisition. Restore additional grassland habitat with a priority on grassland habitat connectivity, through high-diversity, local ecotype restoration.
- Encourage and implement zoning ordinances to address development and to minimize habitat fragmentation and impacts to wildlife.
- Work with companies and agencies to select sites for development that minimize fragmentation and impacts to wildlife.
- Continue to implement integrated public and private lands management. Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about the practices that improve habitats and their benefits.
- Offer trainings for identifying and treating invasive species.

Tier 1 Species:

Burrowing Owl
Loggerhead Shrike
Whooping Crane
Flathead Chub
Northern Redbelly Dace
Plains Minnow
Plains Topminnow
Shoal Chub
Silver Chub
Monarch
Regal Fritillary
Southern Plains Bumble Bee
Variable Cuckoo Bumble Bee
Eastern Red Bat
Hoary Bat
Silver-haired Bat
Woolly Milkweed

Aquatic Communities:

Headwater, Warm Water Stream
Mid-order, Warm Water River

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Dry Upland Bur Oak Woodland
Sandbar Willow Shrubland
Riparian Dogwood-False Indigobush Shrubland
Buckbrush Shrubland
Freshwater Seep
Playa Wetland*
Cattail Shallow Marsh
Reed Marsh
Loess Mixed-grass Prairie*
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

Central Platte River

Biologically Unique Landscape Description

This BUL includes the Platte River channel and its floodplain, stretching from central Dawson County eastward to central Hamilton County. Before Euro-American settlement, the Platte River flooded annually from snowmelt from the Rocky Mountains. These floods maintained an open, sandy, braided channel that was several miles wide. Wet meadows and lowland tallgrass prairie then dominated the wide valley, while woodlands were mostly limited to some fire-protected islands.

Settlement and upstream water development have greatly changed the central Platte River system. Floods and stream flows are now much reduced, and former channels and stream banks have been invaded by trees, mainly cottonwoods and eastern red-cedar. Sand pits are now common along the river, and many are surrounded by housing developments, further fragmenting the valley. Most of the river floodplain is now cropland, though scattered wet meadows and patches of lowland tallgrass prairie still remain. Sand dunes, originating from river alluvium, occur on the south side of the river in some areas.

The spring staging of sandhill cranes on the central Platte River is a world-renowned event. Each spring, more than a million cranes gather here, roosting at scattered sites and foraging in nearby crop fields and grasslands. The loss of staging habitat along the Platte is a serious threat to the mid-continental crane population. The river is also a key stopover site for migrating waterfowl and shorebirds along the Central Flyway. Several federally listed species are found along the central Platte, including the whooping crane, interior least tern, and piping plover. The stretch of river between Lexington and Shelton has been designated by the U.S. Fish and Wildlife Service as critical habitat for whooping cranes. The Crane Trust, the National Audubon Society, the Platte River Recovery Implementation Program, The Nature Conservancy, and the Game and Parks own and manage many protected areas within this BUL.

Natural Legacy Demonstration Sites

15. Crane Trust – Crane Trust, Inc.

The Crane Trust is an area of over 6,000 acres located in South Central Nebraska. The property contains grassland, woodland, and wetland habitat. In fact, the Crane Trust owns the largest complex of remnant wet meadow and lowland tallgrass prairie habitat (Mormon Island, 1,807 acres) remaining in the Central Platte River Valley. This area is critical to migratory birds including sandhill cranes and the endangered whooping crane. Management of Crane Trust properties includes grazing, haying, mowing, spraying, and prescribed burning. The Crane Trust prides itself in the maintenance of river habitat through disking accretions and sandbars along the Platte River to improve river conditions for use by cranes. Additionally, the Crane Trust maintains a bison herd of more than 100 individuals. Outreach events at the Crane Trust include tours during the spring crane migration, regular education events, a public speaker series, and virtual programs.

14. Platte River Prairies – The Nature Conservancy

Platte River Prairies (PRP) consists of approximately 4,000 acres scattered along a 13-mile stretch of the Central Platte River owned by the Nature Conservancy. Habitats include wet, mesic and sandhills prairie, riparian woodlands, riverine habitat, and a variety of wetlands. The Conservancy uses cattle grazing, combined with prescribed fire and haying to manage for habitat heterogeneity in the grassland habitats. More than 1,000 acres of the Platte River Prairies is former cropland restored to diverse prairie using seed mixes of between 150 and 200 plant species. PRP hosts many research projects, conducted by Conservancy staff and collaborating universities. In addition, most of the land stewardship and restoration work is designed to develop, test, and demonstrate a wide variety of approaches. Research and experimentation results are showcased during frequent habitat workshops for land managers and habitat advisors from across Nebraska, as well as through broader communication methods. Two public hiking trails are available, allowing the public to explore more than 300 acres of prairie near the Conservancy's Field Headquarters. In addition, PRP hosts a public field day each summer, geared toward families and nature enthusiasts.

13. Rowe Sanctuary – National Audubon Society

Rowe Sanctuary is operated by the National Audubon Society and protects 3,000 acres along the Platte River. It is dedicated to the conservation of sandhill cranes, whooping cranes and other migratory birds and their habitat. Sanctuary habitats include riverine braided channels, slough wetlands, riparian woodlands, and grassland ecosystems. Adaptive management practices are used to promote ecosystem health, including prescribed fire, grazing, chemical and mechanical treatment for invasive species, as well as other management tools. The Iain Nicolson Audubon Center is located on the Sanctuary and provides educational exhibits, accessible walkways and trails. The building and trails are open to the public at no cost during posted hours. Rowe Sanctuary operates a thriving education program, offering programs to the public, field trips for school children, and education for visitors who come from all 50 states and internationally.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species in sandbars, meadows and woodlands.
- Eastern red-cedar, and other nuisance shrub and tree encroachment of river sandbars, woodlands, uplands and meadows.
- Altered natural hydrology, particularly lack of periodic pulse flows and reduced sediment transport to maintain sandbars and fish habitat and to prevent channel degradation and incision.
- Sedimentation and drainage of backwater sloughs.
- Stabilization of aquifer and ground water level issues along upper stretches of river.
- Past conversion of wet meadows to cropland.

- Continued cabin and home development on the Platte River that results in bank protection, armoring and stabilization.
- Inconsistent zoning setbacks that result in bank destabilization and development in sensitive areas.
- Sand- and gravel-mining development, which eliminates native meadows, woodlands, and river channels, and new mining practices that reduce the available piping plover nesting habitat.
- Limited applied science, including research, assessment, and monitoring.
- Excessive recreational use of river (e.g., boats, ATVs), which disturbs tern and plover nesting and other wildlife.

Conservation Strategies

- Implement planned grazing strategies on private and public lands, in combination with prescribed fire and rest, to improve native plant diversity and reduce exotic grass dominance.
- Implement best management practices to control and manage invasive plant species and work with landowners to identify site-specific management.
- Undertake eastern red-cedar and other tree clearing to maintain open meadow habitat for sandhill and whooping crane migration and for breeding grassland birds. Maintain programs to control invasive species. Expand shrub and herbaceous vegetation clearing on the river sandbars for water bird roosting and loafing habitat and to increase water connectivity.
- Restore and/or maintain components of the Platte River hydrology that are necessary to sustain biological diversity and ecosystem function.
- Facilitate sediment augmentation and bank stabilization to restore the river channel.
- Restore wetland hydrology and connect backwater habitats to the river.
- Restore additional grassland habitat in the valley on private and public lands, with a priority on grassland habitat connectivity, through high-diversity, local ecotype restorations, and landowner collaboration.
- Acquire through voluntary fee title acquisition or place conservation easements on undeveloped reaches of the river, wet meadows, and woodlands to protect them from development. Encourage and implement zoning setbacks and ordinance to reduce habitat fragmentation and address bank stabilization along the river.
- Develop best management practices for bridge construction and direct to environmental review teams. Update utilities, like burying power lines, to be more wildlife friendly.
- Work with sand and gravel companies to site gravel pits away from ecologically sensitive areas of the floodplain and to restore sandpits to wetland communities once mining is completed.
- Implement research, monitoring, and inventory projects to track status and trends of SGCN and to determine best management practices.
- Provide outreach and communication about responsible recreation to minimize impacts to SGCN (e.g., nesting piping plovers) and their habitats. Increase signage and outreach

at public access sites about the SGCN and invasive species that can hitch a ride on recreational equipment.

Tier 1 Species:

Black-billed Cuckoo
Henslow's Sparrow
Interior Least Tern
Piping Plover
Whooping Crane
Flathead Chub
Plains Minnow
Plains Topminnow
Shoal Chub
Silver Chub
Western Silvery Minnow
Iowa Skipper
Monarch
Nebraska Fritillary
Platte River Caddisfly
Regal Fritillary
Smoky-eyed Brown
Southern Plains Bumble Bee
Two-spotted Skipper
Eastern Red Bat
Plains Spotted Skunk
Hoary Bat
Silver-haired Bat
Creeper
Red-bellied Snake
Blowout Penstemon
Western Prairie Fringed Orchid
Woolly Milkweed

Aquatic Communities:

Mid-order, Warm Water River

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood Riparian Woodland
Sandbar Willow Shrubland
Riparian Dogwood-False Indigobush Shrubland
Buckbrush Shrubland
Freshwater Seep
Northern Cordgrass Wet Prairie*

Cattail Shallow Marsh
Reed Marsh
Eastern Pondweed Aquatic Wetland
Loess Mixed-grass Prairie
Eastern Sand Prairie*
Sandhills Mesic Tall-grass Prairie*
Sandhills Dune Prairie*
Perennial Sandbar
Sandbar/Mudflat*

* Priority for conservation in this BUL

Keya Paha

Biologically Unique Landscape Description

This landscape covers the watershed of the Keya Paha River in Keya Paha and Boyd counties. The watershed is mainly a mix of cropland and mixed-grass prairie. The Keya Paha River has a deep and narrow floodplain dominated by wet meadows, cottonwood woodlands, and cropland. Bur oak woodlands grow on the bluffs and in the deeply cut lower valleys of many of its tributaries. The broad upper valleys of these tributaries often contain extensive areas of wet meadow. The state-threatened small white lady's-slipper occasionally grows in these meadows. The river has many cold-water tributaries that support several rare fish species, including the northern pearl dace, finescale dace, northern redbelly dace, and blacknose shiner. A population of the federally and state-threatened American burying beetle also occurs in this landscape. Holt Creek WMA and the Middle Niobrara Natural Resources District's Cub Creek Recreation Area are protected areas within this landscape.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plants species in meadows, upland prairies and woodlands.
- Lack of best management and sustainable logging practices for native woodlands. High-grade logging, especially harvest of mature trees reduces age-class diversity of native woodlands. Oak blight and other tree diseases affecting woodlands.
- Limited prescribed fire on the landscape.
- Modification of headwater streams in wet meadows through ditching, channelization, and large rain events and flooding.
- Increased erosion, sedimentation and nutrients in streams.
- Reduced stream flows in tributaries.
- In-stream structures (e.g., culverts, dams) that obstruct native fish movement.

- Conversion of grasslands to cropland.
- Infrastructure development (e.g., energy infrastructure development).
- Human-induced eradication of entire prairie dog colonies or the spread of diseases within prairie dog populations that can rapidly decimate an entire colony.
- Limited awareness of management practices to improve prairie and woodland habitats and to manage invasive species.

Conservation Strategies

- Implement planned grazing and haying strategies on wet meadows and upland prairies on private and public lands, in combination with prescribed fire and rest.
- Develop and implement best management practices to control, manage and remove invasive plant communities. Work with partners (e.g., Nebraska Department of Transportation, agronomists, Natural Resources Conservation Service) to prevent the promotion and planting of exotic forage grasses. Enhance education efforts about the value of native forbs.
- Implement prescribed burns in native woodlands to enhance woodland structure, floral composition and oak regeneration on conservation lands and adjacent private lands. Implement forest stand improvements on public and private lands for oak regeneration. Develop and implement practices to combat oak blight and other tree diseases.
- Facilitate the establishment and/or support of prescribed burn associations. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns and offer trainings.
- Restore or maintain the natural hydrology to wet meadows and streams and implement conservation strategies necessary to sustain biological diversity and ecosystem function.
- Create and maintain natural grassland buffers around riparian areas to reduce sedimentation and filter chemical runoff.
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that in-stream structures allow for native aquatic organism movement (e.g., fish ladders), especially when culverts get washed out. Continue to innovate low-cost fish passage structures.
- Coordinate with interested landowners to restore strategic areas of cropland to grassland through conservation programs or voluntary fee title acquisition to create connectivity and build core areas.
- Work with companies and agencies to select sites for development that minimize fragmentation and impacts to wildlife.
- Provide incentives to landowners to maintain black-tailed prairie dog towns at an ecologically functional level.
- Continue to implement integrated public and private lands management. Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about the practices that improve habitats and their benefits.
- Offer trainings for identifying and treating invasive species.

Tier 1 Species:

Black-billed Cuckoo
Burrowing Owl
Chestnut-collared Longspur
Loggerhead Shrike
Finescale Dace
Flathead Chub
Northern Pearl Dace
Northern Redbelly Dace
Plains Minnow
Plains Topminnow
Western Silvery Minnow
American Burying Beetle
Iowa Skipper
Monarch
Regal Fritillary
Bailey's Eastern Woodrat
Eastern Red Bat
Plains Spotted Skunk
Hoary Bat
Silver-haired Bat
Blanding's Turtle
Prairie Moonwort
Small White Lady's Slipper
Woolly Milkweed

Aquatic Communities:

Headwater, Cold Water Stream*
Headwater, Warm Water Stream*
Mid-order, Warm Water River*

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Dry Upland Bur Oak Woodland*
Green Ash-Eastern Red-cedar Scarp Woodland
Sandbar Willow Shrubland
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep
Northern Cordgrass Wet Prairie*
Cattail Shallow Marsh
Reed Marsh

Eastern Sand Prairie*
 Sandhills Dune Prairie
 Great Plains Gravel-Cobble Prairie*
 Perennial Sandbar
 Sandbar/Mudflat

* Priority for conservation in this BUL

Loess Canyons

Biologically Unique Landscape Description

This landscape consists of steep loess hills and canyons south of the Platte River in Lincoln, Dawson, and northern Frontier counties. These hills support loess mixed-grass prairie with only scattered cropland on more level areas. Steeper areas of the landscape support higher-quality prairie due to limited access for cattle, while the prairie on gentler slopes is of lower quality. Due to the lack of wildfire, eastern red-cedars have heavily invaded the landscape, forming dense stands in many areas. The landscape contains no rivers or large streams. This BUL contains one of the largest populations of the federally and state endangered American burying beetle. This landscape contains few protected areas, the largest being the Wapiti WMA.

Natural Legacy Demonstration Site

7. Cedar Valley Wildlife Management Area – Nebraska Game and Parks Commission

Cedar Valley WMA encompasses 880 acres in southern Lincoln County, 1.5 miles southeast of Wellfleet. Approximately 180 acres of the WMA consists of the Medicine Creek bottom and associated floodplain. Eighty-three acres were historically farmland and have been replanted to native prairie and shrubs or are being cultivated as food plots. The remainder of the property is mixed-grass prairie and cedar-covered canyons. A small prairie dog town is located near the center of the property. Prescribed fire, mechanical removal, and herbicide treatments are being used to combat invasive woody species. Invasive cool-season grasses are actively managed with grazing, prescribed fire, and herbicide. Eleven American plum shrub thickets have been established over the years. Aggressive, perennial wetland vegetation is occasionally sprayed with herbicide to set back succession. Disking is also used on the formerly farmed areas to reduce the amount of grass and to promote forb growth. Cattle grazing and prescribed fire are used to mimic historic disturbances and promote floristic diversity.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.

- Invasive plants species in upland prairies, primarily eastern red-cedar and exotic cool-season grasses.
- Broadcast herbicide application to prairies.
- Light pollution from acreage developments, which impacts the American burying beetle.
- Energy infrastructure development (e.g., wind, solar).
- Limited awareness among absentee landowners about integrated, large-scale land management practices to improve the prairies for wildlife, grazing, and recreation.

Conservation Strategies

- Implement planned grazing strategies on private lands to reduce exotic cool-season grasses and improve native plant diversity and vigor.
- Increase the use of prescribed fire and invasive tree cutting on public and private lands to reduce eastern red-cedar, improve native plant diversity, and improve grassland wildlife habitat.
- Seek and implement methods to control invasive species that do not require broadcast spraying of grasslands.
- Promote use of responsible outdoor lighting that will not interfere with American burying beetle habits.
- Work with companies and agencies to select sites for development that minimize fragmentation and impacts to wildlife.
- Continue to implement integrated public and private lands management. For example, work with private landowners with properties bordering public lands to manage larger habitat blocks.
- Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about collaborative conservation strategies and practices that improve habitats and their benefits.
- Offer trainings for identifying and treating invasive species.

Tier 1 Species:

Black-billed Cuckoo
Black-billed Magpie
Burrowing Owl
Loggerhead Shrike
American Burying Beetle
Monarch
Ottoe Skipper
Regal Fritillary
Eastern Red Bat
Hoary Bat
Silver-haired Bat

Aquatic Communities:

Headwater, Warm Water Stream

Terrestrial Communities:

Buckbrush Shrubland

Freshwater Seep

Loess Mixed-grass Prairie*

* Priority for conservation in this BUL

Lower Loup Rivers

Biologically Unique Landscape Description

This BUL includes the lower reaches of the Middle Loup River (from north-central Custer County southeastward), the North Loup River (from southwest Garfield County southeastward), and the Loup River from its origin to the Nance County and Platte County line. The landscape includes the rivers' channels and a two-mile buffer on each side. Within the BULs, the rivers are medium-sized, with braided, sandy, and mostly shallow channels. Sandbars and wooded islands are common.

The North Loup's flows have been altered by the upstream Taylor Dam and irrigation diversions, while the Middle Loup and Loup rivers have been modified by several water diversions. Although somewhat altered, the Loup rivers still maintain a fairly steady year-round flow due to groundwater discharge in their upper reaches in the Sandhills.

The valley bottoms are mainly cropland, though large areas still support cottonwood woodlands, wet meadows, and marshes. The valley bluffs are mostly shallow-sloped and covered with mixed-grass prairie, with bur oak woodlands in the steeper areas and ravines.

Sandbars on the lower reaches of the Loup River support nesting colonies of the federally and state threatened piping plover and the state threatened interior least tern. The endangered whooping crane uses sandbars and wet meadows in the Loup floodplains as migration stopover habitat. Nebraska's most extensive populations of the state threatened small white lady's-slipper occur in the Middle Loup River's floodplain meadows. Protected areas in this BUL include the Don Dworak, George Syas, and Leonard Koziol WMAs.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species in sandbars, meadows and woodlands.
- Proliferation of eastern red-cedar, Russian olive, and other invasive woody species in river sandbars, woodlands and meadows.
- Water diversions.

- Bank stabilization.
- Drainage and sedimentation of wetlands.
- Point and nonpoint source pollution, including nutrient loading into the river from adjacent livestock confinements.
- Altered hydrology, extreme weather events, and in-stream structures (e.g., culverts) that obstruct fish movement.
- Wet meadow and sand prairie conversion to cropland.
- Continued cabin and home development on riverbanks.
- Limited applied science, including research, assessment, and monitoring.
- Excessive use of recreational vehicles and boats causing damage to habitat.

Conservation Strategies

- Implement ecologically sensitive grazing strategies on wet meadows on both private and public lands, in combination with prescribed fire and rest.
- Continue to refine and implement best management practices to control and manage invasive plant communities.
- Implement invasive tree clearing projects on privately owned meadows, prairies and woodlands.
- Restore and/or maintain river and stream hydrology necessary to sustain biological diversity and ecosystem function.
- Restore wetland hydrology and connect backwater habitats to the river.
- Create and maintain natural buffers around riparian areas to reduce sedimentation and filter chemical runoff. Site livestock confinements away from sensitive habitats and watersheds.
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that in-stream structures allow for native aquatic organism movement (e.g., fish ladders), especially when culverts get washed out. Continue to innovate low-cost fish passage structures.
- Coordinate with landowners interested in using conservation programs and voluntary acquisitions to protect undeveloped reaches of the river, wet meadows, and woodlands from development.
- Encourage and implement zoning ordinances and setbacks to address development to minimize habitat fragmentation and impacts to wildlife and address bank stabilization along the river.
- Implement research, monitoring, and inventory projects to track status and trends of SGCN and to determine best management practices.
- Provide outreach and communication about responsible recreation to minimize impacts to SGCN (e.g., nesting piping plovers) and their habitats. Increase signage and outreach at public access sites about the SGCN and invasive species that can hitch a ride on recreational equipment.

Tier 1 Species:

Black-billed Cuckoo
Interior Least Tern
Loggerhead Shrike
Piping Plover
Whooping Crane
Finescale Dace
Flathead Chub
Lake Sturgeon
Northern Pearl Dace
Plains Minnow
Plains Topminnow
Shoal Chub
Silver Chub
Western Silvery Minnow
Monarch
Nebraska Fritillary
Ottoe Skipper
Platte River Caddisfly
Regal Fritillary
Smoky-eyed Brown
Southern Plains Bumble Bee
Two-lined Stonefly
Two-spotted Skipper
Eastern Red Bat
Hoary Bat
Silver-haired Bat
Blanding's Turtle
Sand Fawn-flower
Small White Lady's Slipper

Aquatic Communities:

Mid-order, Warm Water Stream*

Terrestrial Communities:

Eastern Riparian Forest
Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood Riparian Woodland
Cottonwood-Diamond Willow Woodland*
Dry Upland Bur Oak Woodland*
Sandbar Willow Shrubland
Riparian Dogwood-False Indigobush Shrubland
Buckbrush Shrubland
Freshwater Seep*

Eastern Cordgrass Wet Prairie*
Northern Cordgrass Wet Prairie*
Eastern Bulrush Deep Marsh*
Cattail Shallow Marsh*
Reed Marsh
Eastern Pondweed Aquatic Wetland*
Loess Mixed-grass Prairie*
Eastern Sand Prairie*
Sandhills Mesic Tall-grass Prairie*
Sandhills Dune Prairie
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

Platte Confluence

Biologically Unique Landscape Description

This BUL includes the channels and valleys of the South Platte and North Platte rivers, as well as the narrow strip of uplands between them in Keith and Lincoln counties, just before they merge to form the Platte River. The BUL also includes a small area of Sandhills north of the North Platte.

Before Euro-American settlement, these rivers experienced annual spring floods from mountain snowmelt. The flooding maintained wide, shallow, and braided channels that were nearly treeless. The river's broad valleys were subirrigated and supported extensive wet meadow and lowland prairie complexes. Starting in the early 1900s, construction of upstream dams and water development greatly changed the flow, flooding, and morphology of the North and South Platte rivers. Their once-open channels have become choked with trees, mainly cottonwoods, Russian olive, and eastern red-cedar and much of the floodplain is now cropped. However, wet meadows and open sandbars remain more common along this stretch of river than in other parts of western Nebraska and sandhill cranes use these open habitats for spring staging.

Whitetail, Birdwood, and White Horse creeks begin in the Sandhills north of the North Platte and flow south into the river. In their upper reaches, these creeks are cold-water streams that flow through meadow complexes and support several rare fish species, including the northern redbelly dace and finescale dace. Many at-risk trumpeter swans winter along these streams, feeding on submergent aquatic plants. There are no protected areas within this landscape.

Stresses affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species in sandbars, meadows and woodlands.
- Proliferation of eastern red-cedar, Russian olive, and other invasive woody species in river sandbars, woodlands and meadows.
- Altered natural hydrology, particularly lack of high spring flows, low summer flows, and reduced sediment transport to maintain sandbars and fish habitat and to prevent channel degradation.
- Sedimentation and drainage of backwater sloughs.
- Conversion of wet meadows to cropland and housing development.
- Infrastructure development (e.g., roads, homes, feedlots).

Conservation Strategies

- Implement planned grazing strategies on wet meadows and riparian grasslands on both private and public lands, in combination with prescribed fire and rest, to improve native plant diversity and vigor and reduce exotic grass dominance.
- Implement best management practices to control, manage and remove invasive plants. Expand shrub and herbaceous vegetation clearing along river channels and on sandbars for water bird roosting and loafing habitat.
- Undertake eastern red-cedar and woody vegetation clearing to maintain open meadow habitat for sandhill cranes, whooping cranes, and grassland birds. Maintain programs to control other invasive species.
- Restore and/or maintain Platte River hydrology necessary to sustain biological diversity and ecosystem function.
- Facilitate sediment augmentation to restore the river channel and wetland hydrology and connect backwater habitats to the river.
- Restore additional grassland habitat in the valley on private lands through high-diversity, local ecotype restorations, and landowner collaboration.
- Work with companies and agencies to select sites for development that minimize fragmentation and impacts to wildlife.

Tier 1 Species:

Black-billed Cuckoo

Long-billed Curlew

Whooping Crane

Finescale Dace

Northern Pearl Dace

Northern Redbelly Dace

Plains Minnow

Plains Topminnow

Western Silvery Minnow

Ghost Tiger Beetle
Iowa Skipper
Monarch
Ottoe Skipper
Platte River Caddisfly
Regal Fritillary
Sandy Tiger Beetle
Two-spotted Skipper
Variable Cuckoo Bumble Bee
Eastern Red Bat
Plains Spotted Skunk
Hoary Bat
Silver-haired Bat
Creeper
Niobrara Ambersnail
Blanding's Turtle
Large-spike Prairie-clover

Aquatic Communities:

Headwater, Cold Water Stream*
Mid-order, Warm Water River*

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood Riparian Woodland
Sandbar Willow Shrubland
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep
Western Alkaline Meadow*
Cattail Shallow Marsh*
Reed Marsh
Sandhills Dune Prairie
Perennial Sandbar*
Sandbar/Mudflat*
Riverine Gravel Flats*

* Priority for conservation in this BUL

Rainwater Basin

Biologically Unique Landscape Description

This BUL occupies all or parts of 17 counties in south-central Nebraska. The topography is a flat-to-gently-rolling loess plain. Prior to Euro-American settlement, the uplands of the region supported loess mixed-grass prairie. Soil survey maps from the early 1900s indicate that roughly 11,000 playas, covering about 200,000 acres, were scattered across the prairie-covered plain. These included temporary, seasonal, and semi-permanent wetlands.

By the early 20th century, most uplands in the landscape had been converted to cropland, and by the 1980s, most wetlands had been drained or filled. Today, fewer than 20% of the historical playa wetlands remain and these make up less than one percent of the entire landscape (approximately 40,000 acres). It is likely that nearly all playas in the landscape have been farmed at some point since settlement.

The Rainwater Basin playas are internationally recognized as a significant migratory bird area. They are a concentration point in the Central Flyway for an estimated 8.6 million waterfowl and 500,000 shorebirds during spring migration, along with whooping cranes, raptors, and other bird species. It is estimated that nearly the entire North American population of buff-breasted sandpipers stages in the eastern basins during spring migration. For these reasons, the Rainwater Basin is recognized as a landscape of hemispheric importance by the Western Hemisphere Shorebird Reserve Network (WHSRN) and as a waterfowl priority area by the North American Waterfowl Management Plan. Numerous U.S. Fish and Wildlife Service WPAs and WMAs protect playas and adjacent uplands within this BUL.

Natural Legacy Demonstration Site

12. Funk Waterfowl Production Area – U.S. Fish and Wildlife Service

Funk WPA is one of 62 public areas in the Rainwater Basin Wetland Management District managed by the U.S. Fish and Wildlife Service. This 1,998-acre property is open to public access and includes a hiking trail and viewing blind. The local ecotype prairie restorations and ongoing shallow playa wetland restorations provide a magnificent opportunity for sightseeing, exploration, and learning. The lands are managed with prescribed burning and grazing as well as water management. The nearby Funk Community Center supports educational outreach opportunities for the WPA, specifically for the endangered whooping crane.

Stresses affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure in uplands and wetlands.
- Invasive plant species in uplands and wetlands.

- Limited fire on the landscape.
- Lack of regular disturbance coupled with increased nitrogen inputs resulting in a lack of open water and mudflats and an excess of plant litter accumulation.
- Altered and/or reduced hydrologic function from draining, dams, dikes, pits, and accelerated sedimentation.
- Chemical runoff into wetlands from adjacent cropland and nutrient loading that affects plant communities.
- Inadequate protection and conservation of ephemeral wetlands.
- Conversion of native prairie to cropland.
- Lack of awareness about the benefits of wetland conservation easements.
- Energy development, including an increase in the number of transmission lines through bird migration routes and potential wind farm development.
- Limited applied science including research, assessment, and monitoring.
- Limited landowner awareness of management practices to improve habitats and manage invasive species.
- Impact of honeybees in native habitat types.

Conservation Strategies

- Continue to work with public and private landowners to develop an efficient system to conduct ecologically appropriate cattle grazing and the use of wildlife-friendly fencing in the basins.
- Develop and continue to implement best management practices to control and manage invasive plants.
- Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns.
- Restore the natural hydrology to wetlands and implement conservation strategies necessary to sustain biological diversity and ecosystem function (e.g., filling pits, reducing siltation).
- Continue to provide a reliable water source when necessary for priority wetland acres to assure sufficient water quantity, quality, and distribution.
- Create grassland buffers around basins and in uplands to reduce sedimentation and chemical runoff (e.g., promotion of CRP and other similar programs).
- Continue to promote the importance of wetlands and the benefits of wetland conservation programs. Coordinate with willing landowners to protect and restore important wetland and upland habitats with a variety of conservation strategies that are compatible with working lands.
- Work with energy companies to select sites for energy development that minimize fragmentation and impacts to wildlife. Take measures to reduce the negative impacts to migrating birds resulting from power lines (e.g., bird flight diverters).
- Implement research, monitoring, and inventory projects to track status and trends of SGCN and to determine best management practices.

- Continue to implement integrated public and private lands management. For example, work with private landowners with properties bordering public lands to manage larger habitat blocks.
- Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about collaborative conservation strategies and practices that improve habitats and their benefits.
- Offer trainings for identifying and treating invasive species.

Tier 1 Species:

Buff-breasted Sandpiper
Burrowing Owl
Henslow's Sparrow
Whooping Crane
Plains Minnow
American Burying Beetle
Iowa Skipper
Lakota Mayfly
Monarch
Regal Fritillary
Southern Plains Bumble Bee
Eastern Red Bat
Plains Spotted Skunk
Hoary Bat
Silver-haired Bat
Creeper
Fatmucket
Plain Pocketbook
Pondmussel
Rocky Mountain Bulrush
Woolly Milkweed

Aquatic Communities:

Headwater, Warm Water Stream

Terrestrial Communities:

Buckbrush Shrubland
Cattail Shallow Marsh*
Eastern Cordgrass Wet Prairie
Eastern Bulrush Deep Marsh*
Freshwater Seep
Wheatgrass Playa Grassland*
Playa Wetland*
Eastern Bulrush Deep Marsh*

Cattail Shallow Marsh*
Loess Mixed-grass Prairie
Lowland Tall-grass Prairie
Upland Tall-grass Prairie

* Priority for conservation in this BUL

Running Water

Biologically Unique Landscape Description

This BUL is composed of a mix of landscape types, including the watersheds of Verdigris Creek and Bazile Creek in Boyd, Knox, Holt, and Antelope counties. These watersheds are composed of a mosaic of cropland, restored native and non-native grasslands, and native tallgrass and mixed-grass prairie. The BUL also includes the Missouri River Valley in Knox County, the lower Niobrara River Valley from central Rock County eastward to its confluence with the Missouri River, and areas of sand dunes south of the Niobrara, and mixed-grass prairie north of the river.

The lower Niobrara River has a broad, braided, and somewhat shallow channel and has fairly natural flows. The river has only one dam on its upper reaches in western Nebraska and no irrigation diversions. The reach of the Missouri River within the BUL remains unchannelized and has a deep channel and many sandbars and wooded islands. Its natural hydrology, however, has been greatly altered by upstream dams and it no longer experiences natural spring floods or low summer flows that are critical to the many of the large river fish that inhabit it.

The valleys of both the Missouri and Niobrara rivers are composed mainly of cropland, though patches of wet meadow, marsh, and cottonwood woodland still remain. Deciduous woodlands and prairie occupy the bluffs, but most been degraded by cattle grazing, non-native plant encroachment, and tree invasion.

The Missouri River within this BUL is designated as the Missouri National Recreational River. Sandbars along this section, as well as on the Niobrara River, support colonies of the federally and state-threatened piping plover and the state-endangered interior least tern. The Santee Sioux Indian Reservation is located within the BUL, and the Verdigris-Bazile watershed is also of cultural significance to the Ponca Tribe. Protected areas within the landscape include Niobrara State Park, Lewis and Clark SRA, and several WMAs.

Natural Legacy Demonstration Sites

17. Grove Lake Wildlife Management Area – Nebraska Game and Parks Commission

Grove Lake WMA runs along a 3.5-mile reach of the east branch of the Verdigris Creek in Antelope County. The property has undergone some of the most extensive oak

woodland and grassland restoration efforts in the Running Water BUL. At the inception of the Nebraska Natural Legacy Project, Grove Lake WMA's oak savanna habitat was severely degraded by eastern red-cedar invasion and other undesirable trees and shrubs. With two decades of prescribed fire, timber stand improvement, and extensive mechanical brush removal across the property, Grove Lake WMA continues to serve as a key management site for bur oak woodland regeneration and grassland plant community health. Many Tier I and Tier II at-risk species have been detected in restored areas of the property.

18. Niobrara State Park – Nebraska Game and Parks Commission

Niobrara State Park spans approximately 1,236 acres at the confluence of the Niobrara and Missouri rivers and features a diverse mix of grasslands, riparian woodlands, wetlands, and river bluff habitats. Habitat management efforts include the control of invasive species, such as purple loosestrife, leafy spurge, Canada thistle, eastern red-cedar, and phragmites, conducted in-house and through partnerships. Managers are actively working to reduce the presence of cool-season grasses, like brome, and to increase the abundance of warm-season grasses and native forbs through timely prescribed burns, targeted grazing, selective pesticide applications, and drill seeding of native species. The unchannelized Missouri River adjacent to the park supports dynamic braided river habitat that provides essential nesting areas for interior least terns and piping plovers. Outreach and monitoring efforts at the park include interpretive programming, environmental education, and ongoing surveys for monarchs and other butterflies, bats, spotted skunks, and bumble bees, often in collaboration with conservation partners.

Stresses affecting species and habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant and animal species in sandbars, marshes, meadows, prairies, woodlands and streams.
- Proliferation of eastern red-cedar, Russian olive, and other woody species in floodplains, meadows, woodlands, and prairies.
- Lack of best management and sustainable logging practices for native woodlands. High-grade logging, especially harvest of mature cottonwoods reduces age-class diversity of native woodlands. Oak blight and other tree diseases affecting woodlands.
- Limited of prescribed fire on the landscape.
- Drainage and sedimentation of wetlands.
- Water diversions for center pivots.
- Conversion of native prairies to cropland.
- Continued cabin and home development on riverbanks and ranchettes on the landscape.
- Energy infrastructure development (e.g., wind, solar).
- Limited applied science including research, assessment, and monitoring.

- Limited awareness among absentee landowners about integrated, large-scale land management practices to improve the prairies for wildlife, grazing, and recreation.

Conservation Strategies

- Implement planned grazing strategies on public and private lands, in combination with prescribed fire and rest, to improve native plant diversity and reduce exotic cool-season grass dominance.
- Develop and implement best management practices to control and manage invasive plant and animal species.
- Increase the use of prescribed fire and invasive, woody species management on lands to reduce eastern red-cedar, and to improve native plant diversity and wildlife habitat.
- Implement forest stand improvement practices on public and private lands for oak regeneration. Develop and implement practices to combat the oak blight and other tree diseases.
- Facilitate the establishment and/or support of prescribed burn associations. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns and offer trainings.
- Restore and/or maintain river and wetland hydrology and backwater habitat necessary to sustain biological diversity and ecosystem function.
- Maintain stream flows and hydrology needed to meet biological needs and ecological conservation goals.
- Restore additional grassland habitat through high-diversity, local ecotype restorations, and landowner collaboration.
- Coordinate with interested landowners to protect undeveloped stretches of the river and other habitats, with a priority on habitat connectivity, through conservation programs, easements, or voluntary fee title acquisition.
- Work with energy companies to select sites for energy infrastructure that minimize fragmentation and impacts to wildlife.
- Implement research, monitoring, and inventory projects to track status and trends of SGCN and to determine best management practices.
- Continue to implement integrated public and private lands management. For example, work with private landowners with properties bordering public lands to manage larger habitat blocks.
- Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about collaborative conservation strategies and practices that improve habitats and their benefits.
- Offer trainings for identifying and treating invasive species.

Tier 1 Species:

Black-billed Cuckoo

Buff-breasted Sandpiper

Burrowing Owl

Interior Least Tern

Loggerhead Shrike
Piping Plover
Whooping Crane
Wood Thrush
Flathead Chub
Northern Pearl Dace
Pallid Sturgeon
Plains Minnow
Plains Topminnow
Silver Chub
Western Silvery Minnow
American Burying Beetle
Bucholz Black Dash
Elusive Clubtail
Iowa Skipper
Monarch
Ottoe Skipper
Regal Fritillary
Two-lined Stonefly
Two-spotted Skipper
Eastern Red Bat
Plains Spotted Skunk
Hoary Bat
Little Brown Myotis
Northern Long-eared Myotis
Silver-haired Bat
Tricolored Bat
Fatmucket
Plain Pocketbook
Blanding's Turtle
Rocky Mountain Bulrush
Woolly Milkweed

Aquatic Communities:

Headwater, Cold Water Stream*
Headwater, Warm Water Stream*
Mid-order, Warm Water River*

Terrestrial Communities:

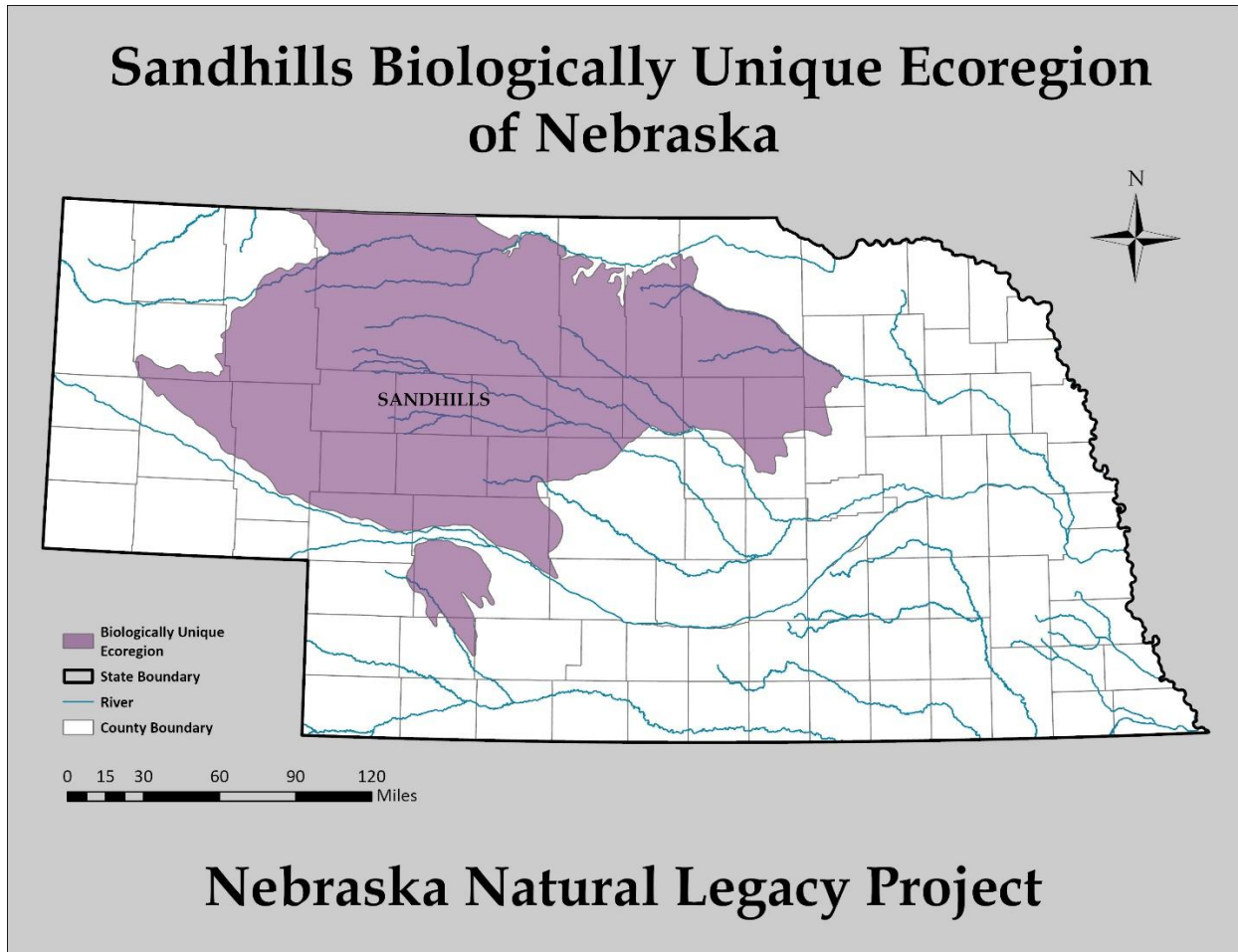
Buffaloberry Shrubland
Cattail Shallow Marsh*
Cottonwood-Peachleaf Willow Riparian Woodland*
Dry Upland Bur Oak Woodland*
Dry-Mesic Bur Oak Forest and Woodland*

Eastern Cordgrass Wet Prairie
Eastern Sand Prairie*
Eastern Sedge Wet Meadow
Freshwater Seep*
Great Plains Gravel-Cobble Prairie*
Green Ash- Elm- Hackberry Canyon Bottom Woodland
Lowland Tall-grass Prairie
Northern Chalk Bluff and Cliff*
Northern Loess/Shale Bluff Prairie*
Perennial Sandbar
Reed Marsh*
Riparian Dogwood-False Indigobush Shrubland
Sandbar Willow Shrubland
Sandbar/Mudflat
Upland Tall-grass Prairie*

* Priority for conservation in this BUL

Chapter 7

Sandhills Biologically Unique Ecoregion



Biologically Unique Ecoregion

Among the four ecoregions, the Sandhills is the most intact landscape. Unlike the other ecoregions, the land between the individual Sandhill BULs is primarily native prairie and represents the most likely areas to allow for movement of organisms between the BULs within this ecoregion. The Sandhills are the largest intact grassland within the United States and the importance of this ecoregion goes beyond the borders of the state of Nebraska. Feedback during the development of 3rd edition showed a clear preference to include the entire Sandhills ecoregion. The Nebraska Natural Legacy Science Team proposed two potential paths forward to achieve this inclusion: dissolve the previous Sandhills BULs to create a single BUL or keep the previous BULs and create a Biologically Unique Ecoregion. Given the history of prioritized conservation work within the previous BULs, conservation partners requested that current BULs

be maintained to continue work within these areas while still acknowledging the importance of this entire ecoregion.

Introduction

It's easy to be awestruck by the vastness of the Nebraska Sandhills and its unspoiled nature. Spanning 19,300 square miles in north-central Nebraska, the Sandhills Ecoregion includes the largest stabilized dune field in the Western Hemisphere and one of the largest intact native grasslands in North America.

Geologically, the Sandhills are young, with the dunes forming during the Pleistocene. Over the past 13,000 years, several major episodes of dune movement transformed the region into an open sea of sand, similar to today's Sahara Desert. Lesser periods of blowing sand and dune movement have taken place during the last millennium. Sandhill dunes are aligned primarily in a northwesterly to southeasterly direction, following the prevailing winter winds, and some reach over 400 feet in height.

The Sandhills climate is semiarid, with annual precipitation ranging from 23 inches in the east to less than 17 inches in the west. Average temperatures reach highs of about 89°F in summer and lows of around 13°F in mid-winter. The sandy dune soils have poorly developed, if any, topsoil due to sand movement and churning of the soil by burrowing rodents. High infiltration rates, up to 10 feet per day, allow rainwater and snowmelt to quickly percolate downward through the sand. This has led to the formation of extensive aquifers, up to 900 feet thick, in the sand and gravel deposits beneath the dunes. This underground reservoir is part of the Ogallala Aquifer, which holds an estimated 700–800 million acre-feet of groundwater, nearly twice the amount of water in Lake Erie.

Where the region's high groundwater table is exposed in valleys, nearly 2,000 shallow lakes and over a million acres of marshes and wet meadows have formed. Most lakes and large marshes are clustered near stream headwaters and in the western portion of the Sandhills. Only a few lakes exceed 1,000 acres in size, and all are relatively shallow, with only a few reaching depths of over 10 feet. Most Sandhill lakes and wetlands have a near neutral pH. However, alkaline lakes and wetlands, common in the western Sandhills, have higher pH levels due to the accumulation of salts and carbonates.

The Sandhills region contains some of the Great Plains' largest fens — groundwater-fed wetlands with peat or muck soils. These have mostly formed at stream headwaters and at the upper ends of Sandhill lakes and marshes, where groundwater discharge is abundant and constant over long periods. Their organic soils can be up to 21 feet thick, built up from the accumulation of undecomposed plant material over hundreds to thousands of years. These soils are often interspersed with layers of windblown sand.

Southeasterly flowing streams, such as the North Loup, Middle Loup, Calamus, Cedar, and Dismal rivers, drain much of the central and eastern Sandhills. Their flows come almost entirely from groundwater discharge, with very little runoff. As a result, they are remarkably steady throughout the year, with few floods or low-water periods. The Niobrara River is the only Sandhills river that originates outside the ecoregion. Its headwaters are in eastern Wyoming,

and it flows eastward through the northern Sandhills before entering the Missouri River in northeastern Nebraska. The Sandhills also contain many smaller streams, such as the Minnechadua, Pine, Boardman, and Birdwood Creeks.

Vegetation

Nearly 700 plant species have been recorded in the Sandhills, growing in two primary habitats: upland dune prairie and valley wetlands. Dune prairie is dominated by sand-loving grasses, such as sand bluestem, prairie sandreed, and hairy grama, along with grasses that grow in various soils, like little bluestem and needle-and-thread. Common prairie wildflowers include stiff sunflower, bush morning glory, gilia, annual buckwheat, and Plains gayfeather. Shrubs are also abundant and include sand cherry, leadplant, prairie rose, and yucca.

Blowouts, wind-excavated depressions on dune tops, are home to early-successional plants, including the federally and state-endangered blowout penstemon. This species grows only in the Nebraska Sandhills and in a few dune complexes in Wyoming. Once widespread, blowouts are now uncommon due to the lack of wildfires and grazing systems that once maintained open, shifting sand.

Native woodlands are uncommon in the region, occurring only in fire-protected river valleys and steep bluffs. Plains cottonwood, peachleaf willow, and coyote willow are the dominant tree species in riparian woodlands. The central Niobrara River's cool south bluff harbors the ecoregion's most diverse deciduous woodlands. Here, common trees include bur oak, basswood, black walnut and ironwood. Cool, spring-branch canyons also support glacial relict stands of aspen and paper birch, with a ground layer that includes disjunct northern mosses and herbaceous plants. Birch and aspen have declined in recent decades, possibly due to environmental factors.

The steep, rocky, north-facing bluffs along the Niobrara River support ponderosa pine woodlands, typical of the Rocky Mountains, as well as sandhills prairie and northern mixed-grass prairie. A 30-mile stretch of the Niobrara River Valley just east of Valentine is known as "The Biological Crossroads of the Midwest" because of its diverse mixture of plant communities and species that converge in the area.

Sandhill valleys support a mosaic of tallgrass prairie, wet meadows, marshes, and lakes. The prairies grow on higher, non-subirrigated ground and are dominated by big bluestem, switchgrass, little bluestem, and various wildflowers. Subirrigated freshwater meadows support lush growth of sedges, spikerushes, prairie cordgrass, and switchgrass. Shrubs like sandbar willow and false indigo-bush also occur in these meadows. Alkaline wet meadows are dominated by inland saltgrass, foxtail barley, alkali sacaton, and scratchgrass. Sandhills fens feature meadow-like vegetation made up of grasses, sedges, and shrubs. Their saturated organic soils support nearly twenty at-risk plant species. Sandhill freshwater marshes often have standing water in spring and throughout much of the year and often occur as zones or bands bordering lakes and streams. Common marsh plants include ripgut sedge, common reed, smartweeds, hard-stem bulrush, broad-leaf cattail, duckweeds, and coontail. Alkaline marshes

support sparser plant cover, with species such as Nevada bulrush, saltmarsh bulrush, and other salt-tolerant plants.

Since settlement, most Sandhill lakes and wetlands have been modified due to haying activities. Regional ditches have drained many wetlands and lowered the water table. Areas that were once lakes or marshes have become wet meadows suitable for haying. Most wet meadows have been interseeded with non-native forage species, including reed canary grass, Garrison creeping foxtail, timothy, smooth brome, and various clovers. Annual mid-summer haying stresses native warm-season plants and favors the spread of these non-native, cool-season species. In recent decades, narrow-leaf and hybrid cattails have invaded and overtaken large areas of marshes and lakes, displacing native plants and reducing habitat quality for wildlife. Currently, there are few, if any, efforts to control the non-native plants that now dominate much of the valleys.

Animals

More than 300 species of resident and migratory birds have been observed in the Sandhills. The region is a stronghold for sharp-tailed grouse and greater prairie-chicken, and it is an important breeding area for the long-billed curlew. The dunes also support large breeding populations of upland sandpiper, lark sparrow, lark bunting, grasshopper sparrow, and western meadowlark. The region hosts the highest concentration of northern harriers in the state, and ferruginous hawks breed in the western Sandhills.

In spring, over a quarter million migratory waterfowl use the Sandhills, with mallards, blue-winged teal, and northern pintails being common breeders. Other waterbirds that nest in the Sandhills include Wilson's phalarope, American avocet, western grebe, and black tern. Woodland nesters include black-and-white warbler, and rose-breasted grosbeak.

The Sandhills are home to 55 species of mammals. Small dune mammals include the plains pocket gopher, white-tailed jackrabbit, Ord's kangaroo rat, and prairie voles, while the masked shrew, jumping mouse, and meadow vole occupy wet meadows and marshes. A rare mammal of this ecoregion is Bailey's eastern woodrat, a subspecies found only in wooded habitats in the central Niobrara River valley.

The most abundant large ungulates in the Sandhills are mule deer and white-tailed deer, although elk herds are expanding in the region, and a few pronghorn inhabit more level areas of the dunes, particularly in the west. Although free-roaming bison no longer occur in the Sandhills, The Nature Conservancy's Niobrara Valley Preserve, Fort Niobrara National Wildlife Refuge (NWR), and several private ranges have fenced bison herds.

Large predators in the region include the coyote, which is common, and the bobcat, which is generally limited to wooded stream valleys. Mountain lions occasionally wander through the Sandhills, and a small breeding population inhabits the Niobrara River valley. Small predators in the ecoregion include the American badger, mink, and both long-tailed and least weasels.

Streams and lakes of the Sandhills are home to 75 species of fish. Common big-river generalists include the channel catfish, flathead chub, and river carpsucker. Cold, headwater streams are home to several northern disjunct species, including the blacknose shiner, northern pearl dace,

northern redbelly dace, and finescale dace. Sport fish, primarily yellow perch, northern pike, largemouth bass, bluegill, and carp have been introduced into many lakes in the Sandhills, while brown and rainbow trout have been introduced into several cold-water streams. Carp have degraded the water quality and vegetation of numerous Sandhills lakes, reducing their value as habitat for waterfowl, native plants and aquatic organisms.

Twenty-seven species of amphibians and reptiles are found in the Sandhills, including one salamander, three toads, four frogs, six turtles, four lizards, and nine snakes. The Great Plains toad, plains spadefoot, and Woodhouse's toad use wetlands for breeding while spending most of their adult lives in the upland dunes. The ornate box turtle is a widespread upland turtle in the Sandhills, while the Blanding's turtle, a northern species whose range extends eastward to New England and is rare over most of its range, is common in lakes and marshes.

Three common lizards inhabit the dunes: the six-lined racerunner, lesser earless lizard, and northern prairie lizard, each preferring slightly different habitats. The bullsnake and western hognose snake are the Sandhills' most common snakes, while the prairie rattlesnake is the region's only venomous snake. It inhabits prairie dog towns in dry valleys and the rocky Niobrara River valley.

Insects are important to the ecology and economy of the Sandhills, serving as pollinators, decomposers, grazers, and food for other wildlife. They are also the Sandhills' most diverse, abundant, and least-studied animal group. For example, 70 species of scarab beetles have been observed in Thomas County alone. The region's rarest insect is possibly the federally and state-threatened American burying beetle, which inhabits lowland prairies. The Sandhills are one of the species' last strongholds.

History and Dominant Land Use

Native American use of the Sandhills likely dates back at least 10,000 years, with the first inhabitants being nomadic hunter-gatherers who camped near lakes and streams. The first year-round settlements in the region likely appeared one to two thousand years ago. These people were also hunter-gatherers and may have practiced limited farming — growing corn, beans, and squash in stream valleys, especially in the eastern part of the region. Several tribes lived in or hunted across the Sandhills at or just prior to Euro-American exploration, including the Plains Apache, Pawnee, Comanche, Ponca, Omaha, Teton Sioux, Oglala, and Cheyenne.

James McKay was the first known Euro-American explorer to enter the Sandhills and record his journey. During his 1796 expedition, he wrote that the region was “a great desert of drifting sand.” In 1854, the Corps of Topographical Engineers assigned Lieutenant G.K. Warren to survey and map the trans-Mississippi West. As part of this effort, he traveled through the Sandhills and was not impressed, later writing that settlement of the region was unlikely due to its unfavorable climate, hilly topography, and sandy soils.

In the 1870s, cattlemen first brought herds into the Sandhills and discovered its potential as rangeland. One of the first ranches in the region was established in 1877, when E.S. Newman

founded a ranch along the Niobrara River to provide beef for the Pine Ridge Reservation. Newman initially kept his cattle out of the rugged dunes south of the river, believing them unfit for grazing, but later discovered that the dune grasses were excellent for fattening cattle. By the late 1880s, ranches had spread throughout much of the Sandhills, many of them unfenced, with cattle roaming freely.

In 1904, the Kincaid Act was passed, allowing homesteaders to claim 640 acres of land instead of the standard 160 acres. This act encouraged more settlement in the Sandhills, and between 1910 and 1917, nearly nine million acres were claimed by “Kinkaiders.” They struggled to farm the dry, sandy soils, and when the severe drought of the mid-1930s hit, many were forced to abandon their land, which was then converted to rangeland. Today, roughly 95% of the Sandhills remains native prairie used for grazing. Ranches vary widely in size, with some exceeding 50,000 acres. Collectively, Sandhill ranches support more than half a million beef cattle annually.

A resurgence of farming in the Sandhills began in the 1950s after the development of center-pivot irrigation. Crop production in the region peaked in the 1970s as center-pivot technology improved. Most of the prairie converted to farmland was located on the more level periphery of the Sandhills. However, it soon became clear that center-pivot farming on sandy soils was largely misguided. A period of low crop prices discouraged further efforts, and much of the former cropland was reseeded with native grasses. Conservationists and others fear that history may repeat itself, and the push to farm the Sandhills could someday return.

Nature-based Recreation

As one of the largest remaining intact grasslands, the Sandhills have a unique allure to those wishing to gain a glimpse of America’s prairie past. This region is ideally suited for nature-based recreation, from wildlife viewing and hunting to stargazing and paddling rivers. The region has thousands of acres of public land, including four NWRs, two national forests, and numerous state managed areas. The 56,000-acre Niobrara Valley Preserve, owned by The Nature Conservancy, is one of the organization’s largest preserves and lies on the border of the Sandhills and Mixed-grass Ecoregions. Increasingly, landowners and businesses in this region are catering to nature enthusiasts by offering lodging, canoe/kayak rentals, and access to private land for recreation.

The Sandhills Scenic Byway (State Highway 2) is a stunning drive from Grand Island to Alliance, showcasing rolling dunes, natural lakes, and a National Forest. The sparsely populated Sandhills also offers incredible stargazing. Merritt Reservoir State Recreation Area (SRA) is certified as an International Dark Sky Park and hosts the annual Nebraska Star Party, along with educational programs highlighting the benefits of dark skies to ecosystems and people.

Wildlife Viewing

The Sandhills support more than 300 bird species, including iconic prairie species like long-billed curlews. Breeding pairs of trumpeter swans can be seen on the lakes in this region, as well as many migratory waterfowl and shorebirds, including large concentrations of pintails, grebes,

and phalaropes. Springtime also brings the unforgettable sight of sharp-tailed grouse and greater prairie-chicken courtship displays. The Little Hay Road Wildlife Drive at Valentine NWR offers opportunities to view turtles, deer, ducks, grassland songbirds, and prairie grouse. Nearby, Fort Niobrara NWR offers chances to view a bison herd and a variety of grassland and woodland bird species.

Trails

The Cowboy Recreation and Nature Trail spans the northern Sandhills, offering free access to hikers, cyclists, and horseback riders. The region also boasts some of Nebraska's most iconic water trails. The Middle Loup River offers peaceful floats through the Sandhills. While the Dismal River, known for its isolation and challenge, is a destination for adventurous paddlers. The Niobrara National Scenic River lies mostly in the adjacent mixed-grass ecoregion but borders the Sandhills and remains a popular destination. Backcountry experiences are available on federal lands, including McKelvie National Forest and the Bessey Ranger District of the Nebraska National Forest. Both motorized and non-motorized trails lead through vast, undeveloped landscapes.

Fishing

Natural Sandhills lakes are known for bluegill, northern pike, yellow perch, and largemouth bass. Ice fishing is popular on numerous lakes in this region. Merritt and Calamus Reservoirs provide excellent fishing, as well as spectacular scenery. Although often overlooked, the rivers can offer quality fishing for catfish and other sport fish. Bullfrog angling is also available year-round throughout the region.

Hunting

Big game, upland game, and waterfowl hunting in the Sandhills offer an unparalleled experience of panoramic views and solitude made possible by low hunter density. Abundant populations of mule deer, white-tailed deer, wild turkey, and even an occasional pronghorn provide pleasure to nature enthusiasts. Shallow lakes offer excellent waterfowl hunting, while the region's uplands are among the best for hunting sharp-tailed grouse and greater prairie-chickens.

Challenges

Despite the high quality of recreational opportunities, the Sandhills face several challenges. Interpretive resources are limited, and promotion outside of the region and state is minimal. The Sandhills Journey National Scenic Byway website highlights local attractions, but broader promotion would help connect more people to the area's diverse offerings.

Trail development is complicated by the region's sandy soils, which are highly susceptible to erosion. To prevent long-term erosion on natural surface trails, it is crucial to follow proper trail design and layout principles. Invasive species are another pressing concern. Dense stands of phragmites hinder recreation access to lakes and reduce habitat quality. Invasive carp impact the water quality and submerged aquatic vegetation, which degrades sport fish and native wildlife habitats. For decades, partner organizations worked to remove carp populations, and

continued effort is needed to prevent their spread and sustain the unique recreational and ecological value of the Sandhills lakes.

Education

The Sandhills Ecoregion is home to residents with deep ties to the land, many of whom are ranchers with strong ecological knowledge. Partnerships like the Sandhills Task Force bring ranchers and conservation agencies together to promote sustainable practices, including educational programming and internships. The UNL Nebraska Ranch Practicum, hosted at the Gundmunson and Barta Brothers ranches, teaches students and landowners about sustainable ranching in the Sandhills. Ecotourism is another growing sector in the region, with private landowners offering unique education opportunities.

The Niobrara Valley Outdoor Education Partnership, a coalition of natural resource professionals including The Nature Conservancy, Natural Resources Districts, and the Northern Prairies Land Trust, focuses on environmental education related to the Niobrara National Scenic River. This partnership includes organizations, such as the National Park Service, U.S. Fish and Wildlife Service, Nebraska Game and Parks Commission, local school districts, and landowners. The Nebraska Star Party at Merritt Reservoir is a collaboration that includes programming on light pollution and ecology alongside astronomy education.

While some schools in the region incorporate ecoregion studies into their curriculum, there is significant demand for more environmental education resources. Post-secondary education is an underutilized tool for teaching sustainable agricultural practices. Programs in cooperation with the Cooperative Extension can help agricultural producers adopt habitat management techniques that benefit both conservation and production.

Representative species with educational and community science opportunities:

- Blowout Penstemon (*Penstemon haydenii*)
- Western Prairie Fringed Orchid (*Platanthera praeclara*)
- Long-billed Curlew (*Numenius americanus americanus*)
- Blanding's Turtle (*Emydoidea blandingii*)

Ecoregion-specific Stresses

Key Stresses

In addition to the stresses and conservation actions identified in this chapter for the Sandhills Ecoregion, statewide concerns are also identified in chapter four. Conservation practitioners identified the following stresses as the top threats in the ecoregion.

Altered frequency and intensity of fire, grazing, and other natural disturbances: Although the predominance of ranching in the Sandhills is responsible for sustaining a rich complement of biological diversity, grazing patterns do not exactly mirror grazing by

native herbivores. Lack of variation in grazing from year-to-year has resulted in decreased diversity of vegetative composition and structure. Decreased fire frequency and the loss of the synergistic relationship between fire and grazing has allowed for an increase in woody vegetation, including shrubs such as sumac. Eastern red-cedar, the primary species of concern, has increased along rivers and streams and into surrounding upland prairies.

Spread of invasive species: Invasive and noxious species are threatening the ecoregion's biological diversity. Exotic cool-season grasses, aggressive woody plants, and other species have competitively excluded native plants and degraded habitat for fish and wildlife. Many plant and aquatic invasive species can hitchhike on maintenance machinery, recreation equipment, vehicles, pets, and clothing without being detected. Other causes of invasive species spread include interbasin water transfer, addition of non-native species to seed mixes for pollinator plantings and dumping fish bait into aquatic systems. Early detection monitoring and rapid response are key to preventing invasive and noxious species from becoming established and altering ecosystems. Treatment of invasive species should be weighed for potential costs to ecosystem health.

Loss of pollinators: Pollinators are essential to a well-functioning ecosystem. Broadcast spraying of pesticides on fields harm pollinators and other native insects. There is a loss of large-scale, diverse, season-long habitats that contain a diversity of forbs. Pollinator habitat restoration should only use native species and avoid broad spectrum pesticides. Currently, there is limited availability of local ecotype, forb-heavy, high-diversity seed mixes. Additionally, more monitoring efforts are needed to establish baseline population estimates for many of the pollinators in this ecoregion and across the state. More communication is needed to inform beekeepers about the negative impact that honeybee parasites can have on native pollinator populations.

Limited awareness about the region's biological diversity and ecological processes: Many residents have a desire to increase their knowledge and understanding of ecological processes and management that can help maintain biological diversity, but educational resources are often not available. Funding and collaboration among conservation agencies is essential to develop and implement relevant environmental education opportunities about native ecosystems and best management practices for conserving them. There is a lack of trusted advisors and community ambassadors who can provide peer-to-peer learning opportunities and share their experiences and knowledge about the financial relevance of ecosystem conservation. Increases in nonresident landowners and younger residents will require the use of new communication channels to deliver informational materials. Additionally, there is little school curriculum that teaches students about Nebraska's native species, habitats, and conservation issues. Although the region's remaining native grasslands, woodlands, and wetlands are unique and of high value, many of the ecoregion's residents have limited awareness of the importance of these habitats to biological diversity.

Alteration of hydrology, channel degradation and sedimentation of rivers, streams, and wetlands: Large-scale export of Sandhills groundwater would significantly alter the

region's natural hydrology by lowering the water table, impacting wetlands, and reducing stream and river flows. Groundwater and surface water withdrawals are depleting the Ogallala aquifer, further lowering water tables and decreasing surface water flows. Structures like dams and improperly sized culverts limit native fish and other aquatic species movement. Increasing and continuing communication and collaboration with counties on how to build fish-friendly culverts and other fish movement structures that facilitate movement and maintain connectivity of populations in small streams.

Large volumes of sediment are entering the ecoregion's water bodies. Sedimentation increases stream turbidity and changes bottom substrates. Increased sedimentation of wetlands alters storage capacity and changes plant composition, reducing habitat available to aquatic species, including waterfowl. There is limited awareness of the grassland buffer program and the importance of riparian buffers. Additionally, there are inadequate technical and financial incentives available to encourage the preservation of riparian buffers, especially next to crop fields where soil erosion and nutrient and chemical runoff are more prevalent.

Point and nonpoint source pollution: Point and nonpoint pollution negatively impacts biodiversity. The introduction of pesticides, storm-sewer runoff, fertilizers and nitrates, and industrial pollutants into rivers and streams impacts water quality, exposes fish and other species to harmful agents, and causes algal blooms. The loss of vegetative buffers around wetlands and riparian areas increases transport of chemicals into waterways. Advanced technology associated with pesticide development may create longer lasting chemicals in the environment and contribute to herbicide-resistant invasive weeds. Neonicotinoid seed treatments and disposal of treated seeds pollute surface waters and cause harm to insects, birds, and other wildlife. Wildlife, including birds, mammals, and insects, are increasingly threatened by light pollution. Artificial lights are impacting ecosystems and animal behaviors including their ability to find food, mates, and avoid predators.

Loss of natural areas because of local economics: Economic pressures are changing ownership patterns in this ecoregion. This may affect management decisions and stewardship of the land's natural resources. Ranching economics must be favorable for grazing practices that benefit biodiversity to be adopted. Generational transitions of livestock operations are also affected by changes in local economics. This in turn may affect the long-term stewardship of large remnant prairies.

Poorly sited utility-scale energy infrastructure development: Utility-scale energy infrastructure development (e.g., solar farms, wind turbines, Co2 sequestration plant and pipelines, fracking waste, power lines) is expanding in the Great Plains. When poorly sited, such infrastructure can cause ecological harm. For example, construction of an oil pipeline across the Sandhills could pollute the Ogallala aquifer due to the region's porous, sandy soils, which increase the risk of contamination from leaks. The pipeline would also fragment habitats and likely facilitate the spread of invasive species, which are often

transported via heavy machinery and readily establish in disturbed soils typical of construction sites.

To conserve biodiversity in the ecoregion, it is important to carefully consider the placement of energy infrastructure, such as transmission lines and pipelines, to minimize negative impacts on wildlife and native habitats. Poorly sited energy infrastructure can fragment intact ecosystems, negatively impact important migratory corridors, harm migratory birds and bats, and disturb wildlife. See Game and Parks' Environmental Review (Visit OutdoorNebraska.gov and search for Environmental Review) and TNC's Site Renewables Right (Search The Nature Conservancy Site Renewables Right: A Clean and Green Energy Future) webpages for guidelines.

Wetland and wet meadow drainage: Drainage of wetlands has ongoing impacts for aquatic resources in the Sandhills. Wet meadows are biologically diverse communities, but composition changes when natural hydrology is altered. Unique wetlands, such as fens, are often highly degraded when ditched. As the groundwater table becomes lower, it becomes harder to restore wetlands. Invasive species and woody encroachment are also negatively impacting wetlands and reducing habitat availability for native species.

Need for greater collaboration between the agricultural and conservation communities: Past contention and misunderstandings between the agriculture and conservation communities on issues related to water and threatened and endangered species have sometimes left deep divisions. Although there is often common ground on many issues related to conserving biological diversity, there remains some lack of trust and resolve to collaborate on issues important to all stakeholders. Staff turnover at conservation agencies has made it difficult to build meaningful relationships and has contributed to the lack of trust and communication with the agricultural communities. Opportunities exist to merge firsthand knowledge of the land with newly developed conservation practices that benefit producers and ecosystems alike. While progress is being made, there is still a need for improved communication with agricultural communities about current and changing contracts and their impacts on agricultural and conservation communities.

Limited assessment, monitoring, and applied science to inform species and habitat conservation efforts: Conservation organizations and universities have limited capacity to monitor and assess many species, especially nongame and at-risk wildlife, and their habitats. There is a need for more baseline population estimates to better inform conservation decisions and listings of at-risk species. The lack of species and habitat monitoring overtime, especially in response to management efforts, hinders the understanding of an area and ways to best manage and conserve it. An increase in applied science efforts in this area could greatly enhance our understanding of this ecoregion. Additionally, wildlife diseases impacting wild populations of birds and mammals should be monitored and researched further.

Primary Invasive Plant Species by Habitat Type

Note: This list highlights key invasive species of concern in the ecoregion and is not exhaustive.

<u>Habitat Type</u>	<u>Invasive Plant Species</u>
Upland Prairie	Kentucky bluegrass, smooth brome, Japanese brome, downy brome, leafy spurge, and eastern red-cedar
Woodlands	eastern red-cedar, garlic mustard
Wet Meadows	Smooth brome, Kentucky bluegrass, Garrison creeping foxtail, reed canary grass, timothy, redtop, yellow gallium, Canada thistle, and non-native clovers
Lakes and Marshes	European phragmites, reed canary grass, narrow-leaf/hybrid cattail, purple loosestrife

Biologically Unique Landscapes of the Sandhills Ecoregion

One main goal of the Nebraska Natural Legacy Project is to identify priority landscapes that, when properly managed, will help conserve most of the state's biological diversity. These areas, called Biologically Unique Landscapes (BULs), were selected based on the presence of at-risk species and natural communities. See Chapter 3 for a full description of the selection methods.

The map shows the BULs for the Sandhills Ecoregion. Brief descriptions of each BUL follow the map, including information about the stresses affecting species and habitats, proposed conservation actions, and natural communities found in each landscape.

In this ecoregion, some BULs are truncated by the Nebraska state boundary. We suggest opportunities for wildlife conservation in these areas based on review of corresponding adjacent state wildlife action plans (SWAPs).

Sandhills Biologically Unique Landscapes:

- Cherry County Wetlands
- Dismal River Headwaters
- Elkhorn River Headwaters
- Middle Niobrara
- Platte Confluence (see Mixed-grass Ecoregion for description)
- Sandhills Alkaline Lakes
- Snake River
- Upper Loup Rivers and Tributaries (includes Calamus, Middle Loup and North Loup landscapes)

Demonstration Sites of the Sandhills Ecoregion

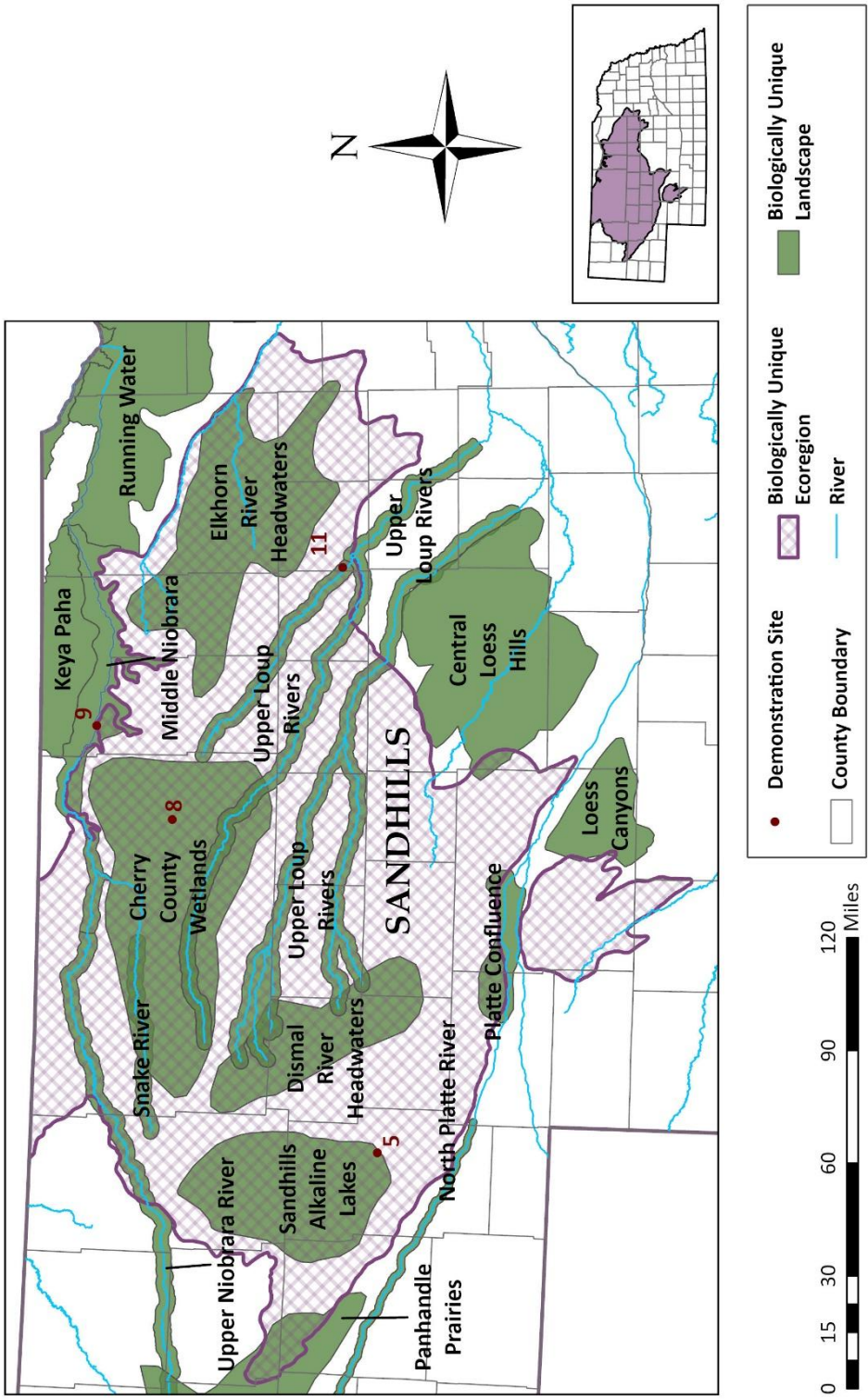
Demonstration sites are locations across the state with potential for showcasing conservation projects and the results of sustainable management to the public. They provide opportunities for learning about the site's unique qualities and importance to at-risk species. See Chapter 4 for information on selecting demonstration sites. The Sandhills Ecoregion map shows the location of demonstration sites in the area.

<u>Site name</u>	<u># on map</u>	<u>BUL</u>
Calamus Wildlife Management Area (WMA) and SRA	11	Upper Loup Rivers and Tributaries
Crescent Lake NWR	5	Sandhills Alkaline Lakes
Niobrara Valley Preserve	9	Middle Niobrara
Valentine NWR	8	Cherry County Wetlands

Descriptions of each site are found in the write-up for the BUL in which the site is found.

Nebraska Natural Legacy Project: Sandhills

Biologically Unique Ecoregion



Cherry County Wetlands

Biologically Unique Landscape Description

This landscape occurs in Cherry County in the northern Sandhills. The area consists mostly of high, long linear dunes with interdunal valleys. Many valleys contain numerous lakes, marshes, wet meadows, and fens that form one of the Sandhills' largest wetland complexes. The upland dune grasslands remain intact, with only limited cropland in the BUL, primarily center-pivot irrigated in the drier valleys.

The North Loup River and its tributaries originate in this region, while the Snake River flows through the northern portion of the landscape. This BUL is important for nesting and migratory waterbirds, and the wetlands support large populations of reptiles and amphibians. Wet meadows support a large population of the federally and state-threatened western prairie fringed orchid. The area is also habitat for several other federally and state-listed species, including the American burying beetle and whooping crane. The area's many cold-water streams support assemblages of rare fish, including the northern pearl dace, the state- and federally listed Topeka shiner, and the state-listed northern redbelly dace, blacknose shiner, and finescale dace. The Valentine NWR is one of the largest protected areas within the BUL.

Natural Legacy Demonstration Site

8. Valentine National Wildlife Refuge - U.S. Fish and Wildlife Service

The 72,000-acre Valentine NWR was established by Congress in 1935 "as a breeding ground for migratory birds and other native wildlife." The sandhill prairie and wetlands found here support a diversity of native wildlife and refuge staff manage the land using grazing, prescribed fire, and invasive species control. The Refuge is home to 270 species of birds, 59 species of mammals, and 22 species of reptiles and amphibians. The refuge provides a wide range of recreational opportunities, including hunting, fishing, and wildlife viewing and photography.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Loss of active blowouts on dunes as habitat for the blowout penstemon. Some present-day range management practices have greatly reduced blowouts.
- Invasive species.
- Eastern red-cedar and other woody encroachment in uplands.
- Interbasin water transfer, which can affect water supply, hydrology, aquatic organism movement, and enable the spread of invasive species.
- Wetland drainage, which can also lead to lower groundwater levels and stream channel downcutting.

- Loss of native riparian vegetation from stream downcutting and excessive grazing leading to increased runoff, sedimentation, and a lack of stream shading that results in altered water temperatures harmful to fish.
- Increased chemical runoff and nutrient loading into ground and surface waters from adjacent livestock confinements.
- Stream channelization, extreme weather events, and in-stream structures that obstruct fish movement.
- Stocking sport fish into streams with native, at-risk fish species.
- Energy infrastructure development (e.g., wind, solar, communications).

Conservation Strategies

- Continue to improve implementation of biodiversity management, including increased use of prescribed fire and planned livestock grazing on the landscape. This is especially critical in meadows and wetlands where excessive thatch accumulation causes exotic cool-season grass dominance and loss of diversity. Continue to work with partners (e.g., Sandhills Task Force) to promote and encourage conservation programs.
- Work with partners (e.g., Natural Resources Conservation Services, extension office, and agronomists) to enhance education efforts and collaborate with private landowners to implement effective methods of forage utilization on wet meadows that avoid ditching.
- Where feasible, create and maintain blowout complexes as habitat for the blowout penstemon through use of intense livestock grazing.
- Implement integrated noxious weed control strategies that do not negatively impact western prairie fringed orchid populations nor wetland plant diversity.
- Work with extension agencies and agronomists to prevent the promotion and planting of exotic forage grasses, such as Garrison creeping-foxtail and reed canary grass, and forbs in Sandhills wet meadows.
- Undertake eastern red-cedar and other tree and shrub clearing to maintain open prairie habitat.
- Discourage interbasin water transfer.
- Continue to collaborate with the USDA to ensure wetlands enrolled in their programs allow occasional moderate grazing, burning, or haying to reduce vegetative litter accumulation and to promote biodiversity.
- Implement measures to site livestock confinements away from sensitive habitats and watersheds. Create and maintain natural grassland buffers around riparian areas to reduce sedimentation and filter chemical runoff. Coordinate with NRDs and utilize watershed planning to address potential water quality problems.
- Restore and maintain the natural hydrology of streams, wet meadows and other wetlands through ditch plugging and water control structures (ensure that in-stream structures allow for fish passage).
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that in-stream structures allow for aquatic passage when culverts get washed out (e.g., fish ladders).

- Discontinue sport fish stocking in streams with native, at-risk fish species. Work with public and private landowners to limit the movement (e.g., carp barriers) and impact of carp in lakes and streams.
- Work with energy companies to select sites for energy infrastructure development that minimize fragmentation and impacts to wildlife.

Tier 1 Species:

Black Tern
Burrowing Owl
Ferruginous Hawk
Loggerhead Shrike
Long-billed Curlew
Whooping Crane
Potassium-loving Fairy Shrimp
Finescale Dace
Flathead Chub
Northern Pearl Dace
Northern Redbelly Dace
Plains Minnow
Plains Topminnow
Topeka Shiner
Western Silvery Minnow
American Burying Beetle
Ghost Tiger Beetle
Hourglass Drone Fly
Kohler's Fritillary
Monarch
Mottled Duskywing
Regal Fritillary
Sandy Tiger Beetle
Smoky-eyed Brown
Southern Plains Bumble Bee
Two-spotted Skipper
Eastern Red Bat
Plains Spotted Skunk
Hoary Bat
Silver-haired Bat
Creeper
Fatmucket
Plain Pocketbook
Blanding's Turtle
Blowout Penstemon
Sand Fame-flower

Western Prairie Fringed Orchid
Woolly Milkweed

Aquatic Communities:

Alkaline Lake*
Freshwater Lake*
Headwater, Cold Water Stream*
Headwater, Warm Water Stream
Mid-order, Warm Water Stream
Mid-order, Cold Water Stream

Terrestrial Communities:

Chokecherry-Plum Shrub Thicket
Freshwater Seep
Sandhills Fen*
Sandhills Wet Meadow*
Spikerush Vernal Pool*
Cattail Shallow Marsh*
Sandhills Hardstem Bulrush Marsh*
Reed Marsh*
Western Alkaline Marsh
Northern Pondweed Aquatic Wetland*
Water-lily Aquatic Wetland*
Saline/Alkaline Aquatic Wetland
Eastern Sand Prairie
Sandhills Mesic Tall-grass Prairie*
Sandhills Dune Prairie
Sandhills Dry Valley Prairie
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

Dismal River Headwaters

Biologically Unique Landscape Description

This landscape includes the Dismal River and its headwaters region in Cherry, Grant, Arthur, McPherson, and Hooker counties in the west-central Sandhills. The BUL consists of high, prairie-covered dunes with interdunal valleys. The region contains numerous lakes, marshes, wet meadows, and fens. Cropland, primarily center-pivot irrigated, occurs only occasionally in the valleys.

The Middle Loup River and the north and south forks of the Dismal River originate in this region. Many waterbird species use the rivers, surrounding floodplains, and marshes for nesting and migration habitat. The landscape also supports large populations of reptiles and amphibians and includes populations of the federally and state-endangered blowout penstemon. The only protected areas within the landscape are Frye Lake and DeFair Lake WMAs.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Loss of active blowouts on dunes as habitat for the blowout penstemon. Some present-day range management practices have greatly reduced blowouts.
- Invasive plants.
- Limited prescribed fire on the landscape; shelter belts are a seed bank and can also lead to the expansion of woody encroachment.
- Wetland ditching, which can also lead to lower groundwater levels and stream channel downcutting.
- Loss of native riparian vegetation from excessive grazing leads to increased runoff and sedimentation.
- Stream channelization and in-stream structures barring fish movement.
- Stocking of exotic and sport fish in streams with native, at-risk fish species.
- Conversion of prairie and groundwater depletions resulting from center-pivot irrigation development.
- Energy infrastructure development.

Conservation Strategies

- Continue to improve implementation of biodiversity management, including increased use of prescribed fire and strategic livestock grazing, on the landscape — especially in meadows and wetlands.
- Work with partners to enhance education efforts and collaborate with private landowners to implement effective methods of forage utilization on wet meadows that avoid ditching. Work with private landowners to implement strategic grazing on uplands.

- Where feasible, create and maintain blowout complexes as habitat for the blowout penstemon through use of intense livestock grazing.
- Implement integrated noxious weed control strategies that do not negatively impact western prairie fringed orchid populations nor wetland plant diversity.
- Work with extension agencies, the Nebraska Department of Transportation, the NRCS, and agronomists to prevent the promotion and planting of exotic forage grasses, such as Garrison creeping-foxtail and reed canary grass, and forbs in Sandhills wet meadows and public roadsides. Enhance education efforts about the value of native forbs.
- Increase tree thinning, removal of unused shelter belts, and use of prescribed fire to reduce encroachment by eastern red-cedar and other species into prairies. Enhance efforts to educate landowners about the benefits and practices of prescribed fire and offer trainings.
- Work with partners to ensure that wetlands enrolled in their programs allow occasional intensive grazing, burning, or haying to reduce vegetative litter accumulation and to promote biodiversity.
- Work with landowners to install livestock watering facilities away from the stream channel. Create and maintain natural grassland buffers around riparian areas to reduce sedimentation and filter chemical runoff.
- Restore and maintain the natural hydrology of streams, wet meadows and other wetlands through ditch plugging and water control structures.
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that in-stream structures allow for aquatic passage when culverts get washed out (e.g., fish ladders). Continue to innovate low-cost fish passage structures.
- Discontinue sport fish stocking in streams with native, at-risk fish species.
- Coordinate with interested landowners to protect high-quality sites, with a priority on habitat connectivity, using a variety of conservation strategies that are compatible with working lands. Restore additional grassland habitat through high-diversity, local ecotype restorations, and landowner collaboration.
- Work with energy companies to select sites for energy development that minimize fragmentation and impacts to wildlife.

Tier 1 Species:

Black Tern
Burrowing Owl
Loggerhead Shrike
Long-billed Curlew
Finescale Dace
Northern Pearl Dace
Northern Redbelly Dace
Plains Topminnow
Ghost Tiger Beetle
Monarch
Regal Fritillary

Sandy Tiger Beetle
Eastern Red Bat
Hoary Bat
Silver-haired Bat
Blanding's Turtle
Blowout Penstemon
Sand Fame-flower
Woolly Milkweed

Aquatic Communities:

Freshwater Lake*
Alkaline Lake*
Headwater, Cold Water Stream*
Headwater, Warm Water Stream
Mid-order, Warm Water River
Mid-order, Cold Water River

Terrestrial Communities:

Chokecherry-Plum Shrub Thicket
Freshwater Seep
Sandhills Fen*
Sandhills Wet Meadow*
Spikerush Vernal Pool*
Cattail Shallow Marsh*
Reed Marsh*
Western Alkaline Marsh
Northern Pondweed Aquatic Wetland*
Water-lily Aquatic Wetland*
Saline/Alkaline Aquatic Wetland
Sandhills Dune Prairie
Sandhills Dry Valley Prairie
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

Elkhorn River Headwaters

Biologically Unique Landscape Description

This landscape occurs in the northeastern Sandhills and includes large portions of Brown, Rock, Holt, Garfield, and Wheeler counties. The BUL consists mainly of level sand plains and low rolling dunes, with extensive wet meadows and scattered lakes and marshes. Center-pivot-irrigated crop fields are locally common.

The South Fork and North Fork of the Elkhorn River originate in this region. The BUL's wet meadows support the state's largest populations of the federally and state-threatened western prairie fringed orchid. The area is also habitat for several other federally and state-listed species, including the small white lady's-slipper orchid, American burying beetle, and whooping crane. Waterfowl and other waterbirds make extensive use of the region's wetlands. Protected areas in the BUL include Goose Lake, South Pine, Swan Lake, Dry Creek, and other WMAs.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and heterogeneous habitat structure; limited implementation of sustainable grassland management strategies.
- Invasive species.
- Herbicide application in meadows to control leafy spurge and timing of haying and grazing threaten western prairie fringed orchid populations and plant diversity.
- Lack of cottonwood regeneration along riparian corridors, and increasing density of eastern red-cedar in the understory.
- Limited prescribed fire on the landscape and interruption of natural fire frequency have led to increased tree (primarily eastern red-cedar) and shrub densities, litter accumulation, and exotic plant invasion; shelterbelts are a seed source and can lead to the expansion of woody encroachment into prairies.
- Loss of native riparian vegetation from excessive utilization (e.g., grazing, recreation use) in riparian zones may lead to soil compaction, erosion, and increased sediment and nutrient transfer into streams.
- Wetland and meadow drainage and dewatering of the Elkhorn during droughts, which can also lead to lower groundwater levels and channel downcutting.
- Stream channelization, extreme weather events, and in-stream structures (e.g., culverts) that obstruct fish movement.
- Stocking of exotic and sport fish in streams with native, at-risk fish.
- Conversion of prairie to cropland, and groundwater depletions resulting from center-pivot irrigation development.
- Energy infrastructure development.
- Limited applied science including research, assessment, and monitoring.
- Limited awareness of management practices to improve habitats and to manage invasive species.

Conservation Strategies

- Continue to improve implementation of biodiversity management, including increased use of prescribed fire and strategic livestock grazing — especially in meadows and wetlands.
- Work with partners to enhance education efforts and collaborate with private landowners to implement effective methods of forage utilization on wet meadows that avoids ditching. Work with private landowners to implement strategic grazing on uplands.
- Implement integrated noxious weed control strategies that do not negatively impact western prairie fringed orchid populations or plant diversity.
- Work with Nebraska Extension, NDOT, and agronomists to prevent the promotion and planting of exotic forage grasses, such as Garrison creeping-foxtail and reed canary grass, and non-native forbs in Sandhills wet meadows and public roadsides. Enhance education efforts about the value of native forbs.
- Seek and implement methods to control noxious and other invasive species that do not require broadcast spraying and that minimize impacts to Species of Greatest Conservation Need (SGCN; e.g., western prairie fringed orchid) and native plant diversity.
- Increase tree thinning, removal of unused shelter belts, and use of prescribed fire to control woody encroachment and the spread of eastern red-cedar.
- Restore native riparian flora.
- Work with landowners to install livestock watering facilities away from streams. Create and maintain natural grassland buffers around riparian areas to reduce sedimentation and filter chemical runoff.
- Continue to work with the USDA and private landowners to ensure that wetlands enrolled in conservation programs allow grazing, burning, or haying to reduce vegetative litter accumulation and to promote biodiversity and management of invasive plants.
- Restore and maintain the natural hydrology of streams, wet meadows, and other wetlands through ditch plugging and water control structures.
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that in-stream structures allow for aquatic passage when culverts get washed out (e.g., fish ladders). Continue to innovate low-cost fish passage structures.
- Discontinue sport fish stocking in streams with native, at-risk fish.
- Coordinate with interested landowners to protect high-quality sites, with a priority on habitat connectivity, using a variety of conservation strategies that are compatible with working lands. Restore additional grassland habitat through high-diversity, local ecotype restorations, and landowner collaboration.
- Work with energy companies to select sites for energy infrastructure development that minimize fragmentation and impacts to wildlife.
- Implement research, monitoring, and inventory projects to determine best management practices for SGCN. Promote community science monitoring.

- Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about collaborative conservation strategies and practices that improve habitats and their benefits.
- Offer trainings for identifying and treating invasive species.

Tier 1 Species:

Black Tern
Burrowing Owl
Loggerhead Shrike
Whooping Crane
Ornate Fairy Shrimp
Finescale Dace
Northern Pearl Dace
Plains Minnow
Plains Topminnow
Shoal Chub
Silver Chub
Western Silvery Minnow
American Burying Beetle
Bucholz Black Dash
Ghost Tiger Beetle
Monarch
Nebraska Fritillary
Platte River Caddisfly
Regal Fritillary
Smoky-eyed Brown
Two-spotted Skipper
Eastern Red Bat
Hoary Bat
Silver-haired Bat
Plain Pocketbook
Blanding's Turtle
Blowout Penstemon
Hall's Bulrush
Sand Fame-flower
Small White Lady's Slipper
Western Prairie Fringed Orchid
Woolly Milkweed

Aquatic Communities:

Freshwater Lake*
Headwater, Warm Water Stream
Mid-order, Warm Water Stream

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood-Diamond Willow Woodland*
Sandbar Willow Shrubland*
Chokecherry-Plum Shrub Thicket
Freshwater Seep
Sandhills Fen*
Sandhills Wet Meadow*
Spikerush Vernal Pool
Cattail Shallow Marsh*
Sandhills Hardstem Bulrush Marsh*
Reed Marsh*
Northern Pondweed Aquatic Wetland*
Water-lily Aquatic Wetland
Eastern Sand Prairie*
Sandhills Mesic Tall-grass Prairie*
Sandhills Dune Prairie
Perennial Sandbar
Sandbar/Mudflat

* Priority for conservation in this BUL

Middle Niobrara

Biologically Unique Landscape Description

This landscape includes a 76-mile stretch of the Niobrara River in Cherry, Keya Paha, Rock, and Brown counties, designated as a National Wild and Scenic River. The BUL also includes sections of cold-water streams with deep, wooded valleys that flow into the river from the south, including Fairfield, Plum, and Long Pine creeks, as well as areas of sand dunes and gravel prairies to the south of the river.

The Middle Niobrara River valley is deeply incised and marks the intersection of five diverse plant communities: northern mixed-grass prairie, Sandhills prairie, Rocky Mountain pine woodland, northern boreal woodland, and eastern deciduous woodland. As a result, the valley is home to an incredible diversity of native animal and plant species, including many glacial relict species. The Nature Conservancy's 56,000-acre Niobrara Valley Preserve alone contains 581 species of plants, 213 birds, 86 lichens, 70 butterflies, 44 mammals, 25 fish, 17 reptiles, and 8 amphibians. The valley also provides habitat for many at-risk species, including the whooping crane, piping plover, interior least tern, and Bailey's eastern woodrat, a subspecies endemic to the area. Primary protected areas within the landscape include the Niobrara Valley Preserve, Fort Niobrara NWR, Smith Falls State Park, and several WMAs and SRAs.

Natural Legacy Project Demonstration Site

9. Niobrara Valley Preserve - The Nature Conservancy

The 56,000-acre Niobrara Valley Preserve (NVP) includes a variety of habitat types, including extensive Sandhills prairie, deciduous woodland with boreal relict species, dry, rocky slopes with bur oak and ponderosa pine trees, riverine habitats, and more. Two large herds of bison graze on 22,000 acres of the preserve and a similar number of acres are grazed through cattle leases. Prescribed fire is used extensively to suppress eastern red-cedars, to focus grazing, and for other ecological purposes. NVP conducts and hosts many research projects, collaborating with a variety of universities and other organizations. In addition, preserve staff emphasize experimentation and innovation in their land management approaches, developing and testing new ideas for sustaining ecological resilience. Those ideas and results are shared with a broad audience through numerous workshops and field tours, in addition to presentations and written publications. The preserve hosts a long public hiking trail and multiple access points where people floating the Niobrara River can visit waterfalls. In addition, open access hunting is available in some portions of the site.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plants in stream channels, wetlands, woodlands, and grasslands.
- Limited prescribed fire and interruption of natural fire frequency leading to increased densities of trees and shrubs, litter accumulation, exotic plant invasion, and risk of stand-replacing wildfires.
- Upstream dams and water diversion.
- Stream and river channelization and in-stream structures barring fish movement.
- Conversion of natural habitats to cropland.
- Infrastructure development (e.g., homes, cabins, ranchettes, roads, recreational facilities, animal confinements).
- Limited applied science including research, assessment, and monitoring.
- Recreational use of the river that degrades habitat for wildlife.
- Limited awareness of management practices to improve habitats and to manage invasive species.

Conservation Strategies

- Continue to implement planned grazing and haying strategies on public and private lands, in combination with prescribed fire and rest, to improve native plant diversity and reduce exotic grass dominance.

- Work with partners (e.g., Middle Niobrara Weed Awareness Group, National Park Service) to develop and implement best management practices to control, manage and remove invasive plants.
- Increase tree thinning, use of prescribed fire, and creation of fuel breaks in the valley and the draws on private and public lands to reduce cedars, manage for healthy woodlands, and improve wildlife habitat.
- Facilitate the establishment and/or support of prescribed burn associations. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns and offer trainings.
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that in-stream structures allow for native aquatic organism movement (e.g., fish ladders), especially when culverts get washed out. Continue to innovate low-cost fish passage structures.
- Work with interested landowners to use conservation programs, easements, or voluntary fee title acquisition to protect important habitats within the valley from development.
- Work with counties to implement zoning ordinances that minimize fragmentation and impacts to wildlife in the valley.
- Implement research, monitoring, and inventory projects to determine best management practices for SGCN.
- Expand education programs on invasive species identification, prevention, and inadvertent transfer along with communication about responsible recreation to minimize impacts to SGCN and habitats.
- Continue to work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about collaborative conservation strategies and practices that improve habitats and their benefits.
- Offer trainings for identifying and treating invasive species.

Tier 1 Species:

Black-billed Cuckoo
Black-billed Magpie
Burrowing Owl
Interior Least Tern
Long-billed Curlew
Piping Plover
Whooping Crane
Flathead Chub
Northern Pearl Dace
Northern Redbelly Dace
Plains Topminnow
Western Silvery Minnow
American Burying Beetle
Elusive Clubtail

Iowa Skipper
Monarch
Mottled Duskywing
Ottoe Skipper
Regal Fritillary
Smoky-eyed Brown
Southern Plains Bumble Bee
Two-lined Stonefly
Two-spotted Skipper
Bailey's Eastern Woodrat
Eastern Red Bat
Plains Spotted Skunk
Hoary Bat
Little Brown Myotis
Northern Long-eared Myotis
Silver-haired Bat
Tricolored Bat
Blanding's Turtle
Blowout Penstemon
Large-spike Prairie-clover
Prairie Moonwort
Sand Fame-flower
Small White Lady's Slipper
Western Prairie Fringed Orchid
Woolly Milkweed

Aquatic Communities:

Headwater, Cold Water Stream*
Headwater, Warm Water Stream
Mid-order, Warm Water River*

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Dry Upland Bur Oak Woodland*
Paper Birch Springbranch Canyon Forest*
Basswood-Ironwood Springbranch Canyon Forest*
Green Ash-Elm-Hackberry Canyon Bottom Woodland
Green Ash-Eastern Red-cedar Scarp Woodland
Dry Ponderosa Pine Open Woodland and Savanna*
Sandbar Willow Shrubland
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep*

Northern Cordgrass Wet Prairie
Sandhills Wet Meadow
Cattail Shallow Marsh*
Reed Marsh
Eastern Sand Prairie
Sandhills Mesic Tall-grass Prairie
Sandhills Dune Prairie*
Sandhills Dry Valley Prairie
Threadleaf Sedge Western Mixed-grass Prairie
Great Plains Gravel-Cobble Prairie*
Perennial Sandbar*
Sandbar/Mudflat*

* Priority for conservation in this BUL

Sandhills Alkaline Lakes

Biologically Unique Landscape Description

This landscape occurs in Sheridan, Morrill, and Garden counties in the western Sandhills. The area consists of prairie-covered high dunes and interdunal valleys. It has a poorly developed drainage system, and many of the region's wetlands and lakes are highly alkaline.

This is the largest alkaline wetland complex in the state and provides vital nesting and migratory habitat for shorebirds and other waterbirds, including American avocets and black-necked stilts. The landscape supports the largest populations of the federally and state-endangered blowout penstemon in Nebraska. Conservation lands in the BUL include Crescent Lake NWR and Smith Lake WMA.

Natural Legacy Demonstration Site

5. Crescent Lake National Wildlife Refuge - U.S. Fish and Wildlife Service

This NWR, located in the Nebraska Panhandle, encompasses over 45,000 acres of rolling sandhills and numerous wetlands. The grasslands range from the densely-vegetated meadows to the sparsely vegetated dune tops. Managers are challenged with management of several at-risk species, including those that need open sand blowouts. Natural communities within the refuge include wet meadow, hardstem bulrush marsh, alkaline meadow, alkaline marsh, and sandhill dune prairie.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure; some present-day range management practices have greatly reduced blowout habitat for the blowout penstemon.
- Invasive species.
- Encroachment by eastern red-cedar and other woody species in prairies.
- Wetland drainage, which can also lead to lower groundwater levels and stream channel downcutting.
- Increased water alkalinity.
- Stream channelization and in-stream structures barring fish movement.
- Stocking of exotic sport fish in streams with native, at-risk fish species.
- Conversion of prairie to cropland, and groundwater depletions resulting from center-pivot irrigation.
- Energy infrastructure development.
- Limited applied science, including research, assessment, and monitoring.

Conservation Strategies

- Continue to improve implementation of biodiversity management, including increased use of prescribed fire and strategic livestock grazing on the landscape. This is especially critical in meadows and wetlands where excessive thatch accumulation causes exotic cool-season grass dominance and loss of diversity.
- Work with partners (e.g., extensions, NRCS) to enhance education efforts and collaborate with private landowners to implement effective methods of forage utilization on wet meadows that avoid ditching. Also, work with private landowners to implement strategic grazing on uplands.
- Where feasible, create and maintain blowout complexes as habitat for the blowout penstemon through use of intense livestock grazing.
- Implement integrated noxious weed control strategies that have minimum impacts to plant diversity. Work with extension, department of roads, and agronomy groups to prevent the promotion and planting of exotic forage grasses, such as Garrison creeping-foxtail and reed canary grass, and non-native forbs in Sandhills wet meadows and public roadsides. Enhance education efforts about the value of native forbs.
- Undertake eastern red-cedar and other tree clearing to maintain open prairie habitat.
- Work with the partners to ensure that wetlands enrolled in their programs allow occasional intensive grazing, burning, or haying to reduce vegetative litter accumulation and to promote biodiversity.
- Restore and maintain the natural hydrology of streams, wet meadows, and other wetlands through ditch plugging and water control structures (ensure that in-stream structures allow for fish passage).
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that in-stream

structures allow for native aquatic organism movement (e.g., fish ladders), especially when culverts get washed out. Continue to innovate low-cost fish passage structures.

- Work with interested landowners to use conservation programs, easements, or voluntary fee title acquisition to protect important habitats.
- Work with energy companies to select sites for energy infrastructure development that minimize fragmentation and impacts to wildlife.
- Implement research, monitoring, and inventory projects to determine best management practices for shorebirds and SGCN.

Tier 1 Species:

Black Tern
Burrowing Owl
Loggerhead Shrike
Long-billed Curlew
Potassium-loving Fairy Shrimp
Plains Topminnow
Kohler's Fritillary
Monarch
Nine-spotted Ladybird Beetle
Regal Fritillary
Sandy Tiger Beetle
Southern Plains Bumble Bee
Two-spotted Skipper
Eastern Red Bat
Hoary Bat
Silver-haired Bat
Swift Fox
Blowout Penstemon
Large-spike Prairie-clover

Aquatic Communities:

Alkaline Lake*
Freshwater Lake*
Headwater, warm water stream
Mid-order, warm water river

Terrestrial Communities:

Chokecherry-Plum Shrub Thicket
Freshwater Seep
Western Alkaline Meadow*
Cattail Shallow Marsh
Reed Marsh
Western Alkaline Marsh*
Northern Pondweed Aquatic Wetland

Water-lily Aquatic Wetland
Saline/Alkaline Aquatic Wetland*
Sandhills Dune Prairie*
Sandhills Dry Valley Prairie

* Priority for conservation in this BUL

Snake River

Biologically Unique Landscape Description

This landscape includes the upper reaches of the Snake River, six miles from Merritt Reservoir westward to the stream's headwaters. The BUL covers the river channel and a two-mile buffer on each side. The Snake River begins as a small, spring-fed stream flowing through Sandhills meadows. As it gains flow, its valley becomes deeply incised, with bluffs that support pine woodlands and Sandhills prairies.

The Snake River is a pristine, cold-water stream that maintains a near-constant flow throughout the year due to its spring-fed origin. It supports an assemblage of rare fish, including the plains topminnow, northern pearl dace, northern redbelly dace, and finescale dace. Merritt Dam, located on the lower Snake River, blocks fish movement into the upper reaches. There are currently no protected areas in this landscape.

Stresses Affecting Species and Habitats

- Specific grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive species.
- Interruption of natural fire frequency leading to increased tree and shrub densities, litter accumulation, exotic plant invasion, and risk of stand-replacing wildfires.
- Ditching and channel straightening in the upper reaches of the Snake River lead to stream downcutting, lower groundwater levels, and bars native aquatic organism movement.
- Increased ground and surface water pollution.
- Stocking exotic sport fish into the river and tributary streams with native, at-risk fish species.
- Conversion of prairie to cropland, and groundwater depletions resulting from center-pivot irrigation development.
- Energy infrastructure development (e.g., wind, solar, power line).
- Limited applied science, including research, assessment, and monitoring.

Conservation Strategies

- Work with partners (e.g., extensions, NRCS, agronomists) to enhance education efforts and to collaborate with private landowners to develop and implement effective methods of forage utilization on wet meadows that avoid repeated annual mid-summer haying and do not require ditching. Also, work with private landowners to implement strategic grazing on uplands.
- Implement integrated undesirable weed control strategies that have minimal impacts to plant diversity.
- Increase tree thinning, use of prescribed fire, and creation of fuel breaks in the valley and the draws on private and public lands to reduce cedar, manage for healthy woodlands, and improve wildlife habitat.
- Restore and maintain the natural hydrology of streams, wet meadows, and other wetlands through ditch plugging and water control structures. Ensure that in-stream structures allow for fish passage.
- Create and maintain natural grassland buffers around riparian areas to reduce sedimentation and filter chemical runoff. Coordinate with NRDs and utilize watershed planning to address potential water quality problems.
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that in-stream structures allow for aquatic passage when culverts get washed out (e.g., fish ladders).
- Discontinue exotic and sport fish stocking in the river and tributary streams. Continue to monitor at-risk stream fish to determine range and population trends and competition with exotic fish.
- Coordinate with landowners interested in using conservation programs to protect high-quality habitats.
- Work with energy companies to select sites for energy infrastructure development that minimize fragmentation and impacts to wildlife.
- Implement research, monitoring, and inventory projects to determine best management practices for SGCN.

Tier 1 Species:

Finescale Dace

Northern Pearl Dace

Northern Redbelly Dace

Plains Topminnow

Western Silvery Minnow

Monarch

Regal Fritillary

Bailey's Eastern Woodrat

Eastern Red Bat

Hoary Bat

Silver-haired Bat

Blanding's Turtle

Aquatic Communities:

Headwater, Cold Water Stream*

Terrestrial Communities:

Green Ash-Elm-Hackberry Canyon Bottom Woodland

Sandbar Willow Shrubland

Chokecherry-Plum Shrub Thicket

Freshwater Seep

Northern Cordgrass Wet Prairie*

Sandhills Wet Meadow*

Cattail Shallow Marsh

Reed Marsh

Eastern Sand Prairie

Sandhills Dune Prairie

Sandhills Dry Valley Prairie

Perennial Sandbar

Sandbar/Mudflat

* Priority for conservation in this BUL

Upper Loup Rivers and Tributaries

Biologically Unique Landscape Description

This landscape includes the upper reaches of the Middle Loup, Dismal, North Loup, and Calamus rivers, from their headwaters in the central Sandhills southeastward to where the rivers enter the loess hills. The BUL covers the river channels and a two-mile buffer on each side.

These rivers begin as spring-fed, narrow streams flowing through Sandhills meadows. In many places, the meadows have been ditched, and the streams channelized. As the streams gain flow, their channels become meandering and braided. The valley bottoms support wet meadows with some cottonwood woodlands, marshes, and isolated cropland. The surrounding bluffs are primarily Sandhills dune prairie.

The rivers maintain a near-constant flow due to their spring-fed nature. The Calamus Reservoir on the Calamus River is the only impoundment in the region. Downstream diversions for irrigation on the Loup rivers within the loess hills block fish movement into the upper reaches. Many small, cold-water tributary streams also flow into these rivers.

The upper reaches and some tributaries support rare fish assemblages, including the Topeka shiner, blacknose shiner, and finescale dace. Federally and state-endangered whooping cranes use the braided stream channels and adjacent meadows as migratory stopover sites. The federally and state-threatened western prairie fringed orchid occurs in wet meadows within the

valleys, and the American burying beetle is also found in this landscape. Protected areas include parts of the Nebraska National Forest and several smaller WMAs.

Natural Legacy Demonstration Site

11. Calamus Wildlife Management Area and State Recreation Area – Nebraska Game and Parks Commission

Calamus Reservoir and the adjacent Calamus WMA consist of 11,477 acres of land and water, including 4,818 acres of WMA, 1,188 acres of SRA, and 5,124 acres of surface water. The area exhibits a variety of habitats including sandhills dune prairie, sandhills freshwater marsh, and wet meadows. Management activities on the area include prescribed grazing, prescribed fire, eastern red-cedar removal, food plots, and invasive plant control. Numerous conservation groups have conducted plant identification tours on the area in the past. Visitation rates are high in this relatively central location in the state, making it beneficial for demonstrating habitat projects.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive species.
- Limited prescribed fire on the landscape and interruption of natural fire frequency have led to increased tree and shrub densities, litter accumulation, exotic plant invasion, and risk of stand-replacing wildfires.
- Ditching and channel straightening in the upper stream reaches that often leads to channel degradation, reduced groundwater levels, and inhibits native aquatic organism movement.
- Increased ground and surface water pollution.
- Water diversion on the rivers, extreme weather events, and in-stream structures (e.g., dams, culverts) that impede fish movement.
- Stocking exotic sport fish into tributary streams with native, at-risk fish.
- Conversion of prairie to cropland. Groundwater depletion resulting from center-pivot irrigation.
- Infrastructure development (e.g., homes, cabins, ranchettes, roads, recreational facilities), particularly along the Calamus River.
- Energy infrastructure development (e.g., wind, solar, power line).
- Excessive recreational use (e.g., ATV) that is incompatible with the habitat needs of native wildlife.

Conservation Strategies

- Work with partners (e.g., Nebraska and South Dakota extensions, NRCS, agronomists) to enhance education efforts and collaborate with private landowners to implement

effective methods of forage utilization on wet meadows that avoid repeated annual mid-summer haying and do not require ditching. Also, work with private landowners to implement strategic grazing on uplands.

- Continue to improve implementation of biodiversity management, including increased use of prescribed fire and planned livestock grazing.
- Work with partners (e.g., Nebraska Forest Service, Nebraska Department of Transportation) to prevent the promotion, propagation, and planting of exotic plants. Enhance education efforts about the value of native forbs.
- Increase monitoring for early detection and control of invasive plants. Implement integrated invasive weed control strategies that have minimal impacts on meadow and wetland plant diversity, including programs to reduce eastern red-cedar encroachment into grasslands.
- Increase tree thinning, use of prescribed fire, and creation of fuel breaks in the valley and the draws on private and public lands to reduce cedar, manage for healthy woodlands, and improve wildlife habitat.
- Facilitate the establishment and/or support of prescribed burn associations. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns and offer trainings.
- Restore and maintain the natural hydrology of streams, wet meadows and other wetlands through ditch-plugging and water control structures. Ensure that in-stream structures allow for native fish passage.
- Create and maintain natural buffers around riparian areas to reduce sedimentation and filter chemical runoff. Coordinate with NRDs and utilize watershed planning to address potential water quality problems.
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that in-stream structures allow for native aquatic organism movement (e.g., fish ladders), especially when culverts get washed out. Continue to innovate low-cost fish passage structures.
- Discontinue exotic and sport fish stocking in the river and tributary streams. Continue to monitor at-risk stream fish to determine range, population trends, and competition with exotic fish.
- Coordinate with landowners interested in using conservation programs to protect high-quality habitats and undeveloped stretches of the river valley.
- Work with energy companies to select sites for energy infrastructure development that minimize fragmentation and impacts to wildlife.
- Expand education programs on invasive species identification, and inadvertent transfer along with communication about responsible recreation to minimize wildfire risks and impacts to SGCN and habitats.

Tier 1 Species:

Black-billed Cuckoo

Black Tern

Burrowing Owl
Interior Least Tern
Loggerhead Shrike
Long-billed Curlew
Piping Plover
Whooping Crane
Finescale Dace
Flathead Chub
Northern Pearl Dace
Northern Redbelly Dace
Plains Minnow
Plains Topminnow
Shoal Chub
Silver Chub
Topeka Shiner
Western Silvery Minnow
American Burying Beetle
Elusive Clubtail
Ghost Tiger Beetle
Hourglass Drone Fly
Iowa Skipper
Kohler's Fritillary
Monarch
Ottoe Skipper
Platte River Caddisfly
Regal Fritillary
Sandy Tiger Beetle
Smoky-eyed Brown
Two-lined Stonefly
Two-spotted Skipper
Eastern Red Bat
Hoary Bat
Northern Long-eared Myotis
Silver-haired Bat
Tricolored Bat
Creeper
Blanding's Turtle
Blowout Penstemon
Hall's Bulrush
Sand Fame-flower
Small White Lady's Slipper
Western Prairie Fringed Orchid
Woolly Milkweed

Aquatic Communities:

Headwater, cold water stream
Headwater, warm water stream*
Mid-order, warm water river*

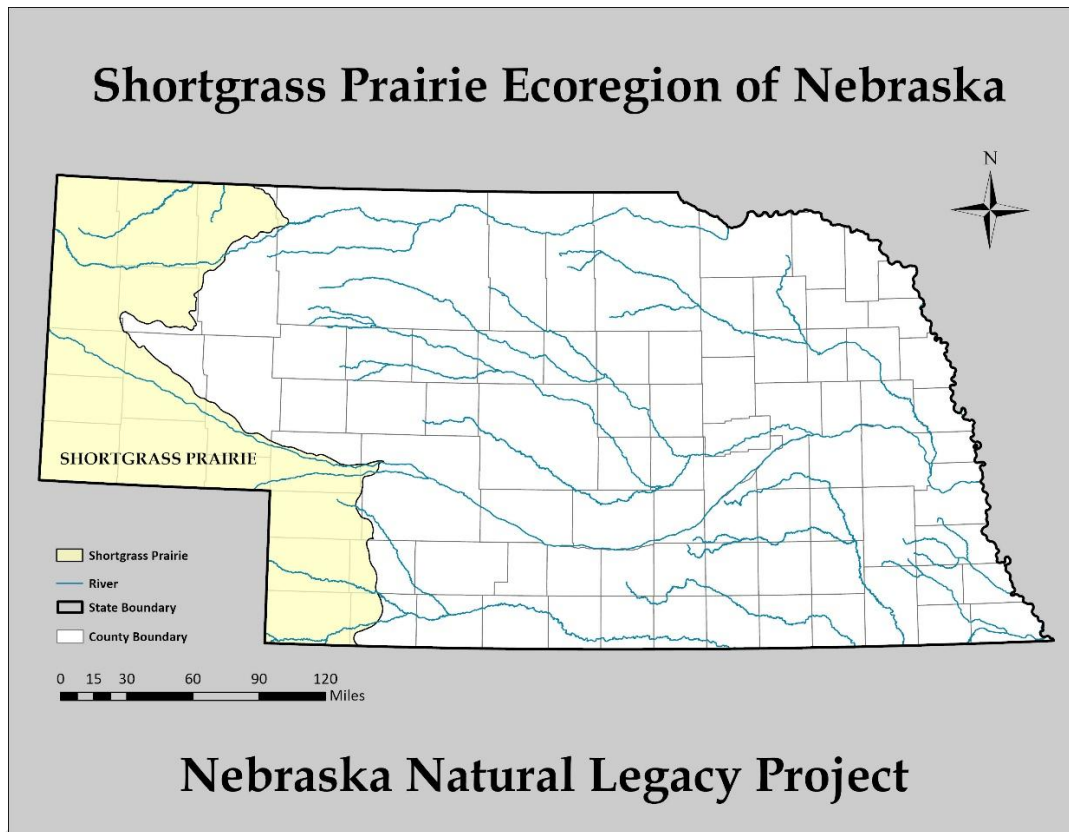
Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood-Diamond Willow Woodland*
Cottonwood Riparian Woodland
Dry Upland Bur Oak Woodland*
Green Ash-Elm-Hackberry Canyon Bottom Woodland
Green Ash-Eastern Red-cedar Scarp Woodland*
Sandbar Willow Shrubland*
Riparian Dogwood-False Indigobush Shrubland*
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep*
Northern Cordgrass Wet Prairie*
Sandhills Wet Meadow
Eastern Bulrush Deep Marsh
Cattail Shallow Marsh
Sandhills Hardstem Bulrush Marsh*
Reed Marsh*
Northern Pondweed Aquatic Wetland*
Water-lily Aquatic Wetland*
Loess Mixed-grass Prairie
Eastern Sand Prairie
Sandhills Mesic Tall-grass Prairie*
Sandhills Dune Prairie
Sandhills Dry Valley Prairie
Perennial Sandbar*
Sandbar/Mudflat*

* Priority for conservation in this BUL

Chapter 8

Shortgrass Prairie Ecoregion



Introduction

Geographers and botanists have long included the Nebraska Panhandle in a north-to-south band of the western Great Plains known as the shortgrass prairie region. Perhaps, in the distant past, bison kept the Panhandle prairies closely grazed and giving them the appearance of shortgrass prairie, a plant community which dominates uplands westward and southward of Nebraska. In reality, most uplands in western Nebraska support mixed-grass prairie — a mosaic of short, mid, and some tall grasses. Today in western Nebraska, true shortgrass prairie — dominated by short grasses like blue grama, buffalograss, and threadleaf sedge — is limited to heavily grazed clayey hilltops and ridges.

The topography of Nebraska's Shortgrass Ecoregion is diverse, as are its soils, which include gravels, sands, loams, and clays. Scattered across the vast prairie-covered hills and plains are

rocky, pine-covered escarpments. The two main ones are the Wildcat Hills, south of the North Platte River, and the Pine Ridge in the Panhandle's northwest corner. Bordering the Pine Ridge to the north is a wide band of highly eroded, clayey badlands. Lush, grass- and shrub-covered sand dunes are scattered throughout the region.

Annual precipitation in the region ranges from about 20 inches in the east to less than 16 inches in the west, much lower than in other parts of the state. Most rainfall occurs in May and June. Near Scottsbluff, average winter highs are about 41°F, with lows near 17°F. Summer highs average about 87°F, with lows near 57°F. Humidity is generally lower than it is farther east in Nebraska.

Several rivers traverse this ecoregion, each contributing to its diverse hydrology. In the southwest corner of the state, the upper Republican River cuts across the landscape. In the north, the upper reaches of the Niobrara and White rivers flow through the region. The shallow, braided South Platte and North Platte are the two main rivers that flow through the southern and central Panhandle. Many North Platte tributaries are cold-water streams. Some of the smaller creeks in the ecoregion, such as Lodgepole Creek, have been largely pumped dry for irrigation. The Frenchman creek, for example, has suffered greatly reduced flows due to groundwater depletion from irrigation.

Natural wetlands are limited in the region and some natural playas are common on level uplands in the southeast and scattered farther northward. Five large reservoirs and several smaller artificial lakes provide habitat for fish, amphibians, invertebrates, and waterbirds.

Southwestern Playas

In southwestern Nebraska, there are approximately 13,689 playas. These playas are found predominantly within loess mixed-grass prairie, sandhills dune prairie, sandsage prairie, and threadleaf sedge mixed-grass prairie upland types. The playas are small (average size +1.2 acres), round, geographically-isolated recharge wetlands that support high biodiversity and are a primary source of recharge to the Ogallala aquifer. Playas have an extreme wet and dry cycle; on average, they are wet once every 10 years. When dry, cracks form in the clay soil at the bottom of the playa. During rainstorms, runoff flows into the playa and through the cracks toward the aquifer. As the soil becomes saturated, the cracks close and the playas fill with water. Once full, seeds begin to germinate, aquatic invertebrates hatch, and wildlife increase their use of the playa.

Distinct wetland plants are found in playas that provide food for migrating waterfowl. Several native obligate and facultative wetland plants can be found in playas, such as bearded flatsedge, bearded sprangletop, blue mudplantain, bushy knotweed, cuman ragweed, disk waterhyssop, dwarf spikerush, eared redstem, foxtail barley, Pennsylvania smartweed, prairie cordgrass, and spreading yellowcress.

While playas provide critical wetland habitat for wildlife, they also provide important benefits for the people who live in this region. Playas, when healthy, provide a sustainable water source

for domestic use and rain-fed operations, water filtration, flood control, livestock forage, and recreation.

A healthy playa has an intact basin without excavated pits or ditches, and the clay layer that allows groundwater recharge is not buried by soil from nearby fields. Water from the surrounding watershed freely enters the playa through a native vegetative buffer and is not diverted by roads, terraces or other impediments.

In Nebraska, the primary threat to playas is culturally-accelerated sediment accumulation. Because playas are small depressions in relatively flat landscapes, they are easy to cultivate. Farming through playas can impair their function in two ways. First, the equipment mixes upland soil types with the clay layer reducing the ability of the soils to swell and shrink, thus limiting the recharge function of playas. Second, farming the playa and surrounding uplands increases the amount of sediments deposited through culturally-accelerated sedimentation. The additional sediment accumulation fills the playa, reducing the volume of water held and can bury seeds and eggs of macroinvertebrates – both important food sources for migrating wetland birds.

Vegetation

Mixed-grass prairie dominates the region's uplands. Northwestern mixed-grass prairie is abundant north of the Pine Ridge, while threadleaf sedge western mixed-grass prairie prevails south of the escarpment. The most abundant grasses and sedges in these prairies are blue grama, prairie sandreed, needle-and-thread, green needlegrass, little bluestem, western wheatgrass, and threadleaf sedge. Common shrubs include skunkbush sumac, rubber rabbitbrush, sagebrushes, snowberry, yucca, and broom snakeweed. Common wildflowers include scarlet gaura, dotted gayfeather, skeletonplant, cutleaf ironplant, lemon scurf-pea, and scarlet globemallow.

Shortgrass prairie often composed of blue grama, buffalograss, and threadleaf sedge occupies dry, clayey uplands. Wildflowers here include milk-vetches, scarlet gaura, cutleaf ironplant, prickly pear, purple locoweed, slender-flower scurf-pea, prairie coneflower, and scarlet globemallow. Sandsage prairie covers sand dunes in the southern half of the region. Sand sagebrush is a dominant shrub, while abundant grasses include blue grama, prairie sandreed, and needle-and-thread. Common wildflowers are yucca, sand lily, desert goosefoot, plains sunflower, bush morning-glory, and showy ipomopsis. In the northern part of the region, sandhills dune prairie is the dominant community on the dunes. It shares many species with sandsage prairie, but lacks the sandsage cover.

Western alkaline meadows and marshes are scattered throughout the floodplains of the North Platte River, Niobrara River, and Pumpkin Creek. Common species include inland saltgrass, alkali sacaton, clustered field sedge, foxtail barley, bluegrass, sparscale, rayless alkali aster, viscid camphor-daisy, and entire-leaf thelypody. Freshwater meadows and marshes also occur in the floodplains, where various grasses, sedges, bulrushes, and cattails prevail.

Cottonwood woodlands, where peachleaf willow sometimes co-dominates in the canopy, occur scattered in stream floodplains. The communities' sub-canopy often includes green ash, box

elder, Russian olive (a non-native), and eastern red-cedar. The ground layer is usually sparse, with species such as field horsetail, Emory's sedge, woolly sedge, marsh muhly, and prairie cordgrass. Shrubs like sandbar willow, American plum, chokecherry, and silver buffaloberry are also common in and about these woodlands.

Ponderosa pine is the dominant canopy tree on escarpments, with Rocky Mountain juniper as a common secondary species. A pine stand in Kimball County also contains Nebraska's only limber pine population. Eastern red-cedar and juniper hybrids have been expanding into the pine woodlands in recent decades due to the lack of wildfires. Common shrubs in the woodlands include Saskatoon serviceberry, chokecherry, dwarf juniper, skunkbush sumac, mountain mahogany, and wolfberry. Abundant herbaceous species include sun sedge, needlegrasses, prairie sandreed, bog buckbean, fragile fern, white sage, and yucca. Rock outcrop communities are common on escarpments and often have high plant diversity. Common species include milk-vetches, Hood's phlox, stemless tetraeneuris, grama grasses, and thick-spike wheatgrass.

Badlands are sparsely vegetated, with shrubs such as saltbush and rubber rabbitbrush, along with forbs like silver orache, and Russian thistle. Mixed-grass prairie commonly grows on the clay flats bordering these badlands.

Animals

More than 300 species of resident and migratory birds have been recorded in the shortgrass prairie ecoregion. Some upland prairie species include thick-billed and chestnut-collared longspurs, Brewer's sparrow, horned lark, burrowing owl, western meadowlark, grasshopper sparrow, lark bunting, and the state-threatened mountain plover. Pine forest species include red crossbill, pygmy nuthatch, ovenbird, and mountain bluebird. Wetlands in the region support many waterfowl species including northern pintail, along with shorebirds such as American avocet.

Ungulates of the region include white-tailed and mule deer, elk, pronghorn, and bighorn sheep. Coyotes and bobcats are the most common large predators, while mountain lions have established localized populations in the Wildcat Hills and Pine Ridge. The region is also one of the remaining strongholds for the state-endangered swift fox. Prairie dogs remain locally abundant despite a general decline in population. The federally endangered black-footed ferret, which relies heavily on prairie dogs for food, once inhabited the region but has since been extirpated. Other mammals found here include river otter, black-tailed jackrabbit, American badger, plains pocket gopher, and northern grasshopper mouse.

The region's lakes and reservoirs are stocked with sport fish, such as walleye, largemouth bass, white bass, cutthroat trout, brook trout, and bluegill. Brown and rainbow trout are stocked in cold-water streams and ponds. River-associated fish include channel catfish, river carpsucker, western silvery minnow, suckermouth minnow, the state-threatened finescale dace, and the state-endangered blacknose shiner.

Common amphibians in the region include the western tiger salamander, boreal chorus frog and Woodhouse's toad. Some of the reptiles in this region include bullsnake, common lesser

earless lizard, mountain short-horned lizard, and ornate box turtle. The prairie rattlesnake is the region's only venomous snake.

History and Dominant Land Use

At the time of settlement, nomadic bands of Pawnee, Sioux, and Northern Cheyenne hunted and gathered in the shortgrass ecoregion. Beginning in the mid-1840s, thousands of Euro-Americans traveled westward along the Oregon Trail and Mormon Trail through the North Platte River valley, though few chose to settle in the area.

The first cattle ranch in the region was established in 1862. It was soon discovered that the nutritious short and mid grasses made cattle fat, and the word spread, attracting more ranchers to the area. Many herds grazed the open range on public lands.

The Homestead Act of 1864 drew the first farmers to the ecoregion; they first settled and plowed the rich, moist soils along stream bottoms. The completion of the transcontinental railroad in the late 1860s accelerated settlement. The Kincaid Act of 1904 allowed homesteaders to claim up to 640 acres, making dryland farming in this arid region more practical. As farms began appearing across the open range, conflicts often arose between farmers and ranchers.

Between 1888 and 1889, the Farmers' Canal Company in Cheyenne County built the region's first irrigation canals — Winter Creek, Minatare, and Enterprise — with more following in the coming decades. With irrigation, growing sugar beets and potatoes was now practical in the region. Other key crops in the early 1900s were wheat and dry beans.

The 1920s saw increased prairie-to-cropland conversion, but the Dust Bowl of the 1930s, along with the Great Depression, brought economic hardship to many farmers and ranchers and slowed the plowing of prairies. The region's farming economy recovered from the drought in the 1940s.

The introduction of center-pivot irrigation in the 1970s and 1980s, again stimulated conversion of prairie to cropland. Today, roughly 87% of the land in the northwestern part of the ecoregion is rangeland, while about 88% of the southeastern portion is under crop production. As in much of Nebraska, the current trend in the ecoregion is toward fewer, but larger, farms and ranches. Scotts Bluff is the largest city in the region.

Nature-based Recreation

The shortgrass ecoregion is rich in natural amenities that attract nature enthusiasts, hunters, anglers, hikers, birders, and visitors drawn to its diverse landscapes and rich natural history. Many of these features rank among Nebraska's top tourist attractions and contribute significantly to local economies.

On the eastern edge of the region is Lake McConaughy, Nebraska's largest reservoir. It's a prime destination for anglers, boaters, bird watchers, hunters, and campers. In the southern

Panhandle, the Wildcat Hills rise above the North Platte River and offer dramatic views, pine forests, and diverse wildlife. In the northwest, the Pine Ridge features some of the most scenic landscapes in Nebraska. Fort Robinson State Park offers jeep and horseback tours, hiking, fishing, and wildlife viewing. Nearby recreational areas include Chadron State Park, several wildlife management areas (WMAs), the Nebraska National Forest, and Soldier Creek Wilderness. North of Pine Ridge, Oglala National Grassland and Toadstool Geologic Park provide unique habitats and outdoor recreation experiences.

Wildlife Viewing

Lake McConaughy boasts more than 340 recorded bird species, more than any other site in Nebraska. During winter, hundreds of bald eagles can be observed from a heated viewing facility below Kingsley Dam. The Wildcat Hills Nature Center, with its bird feeders and water features, attracts pygmy nuthatches, red crossbills, pine siskins, and unique western bird species. During fall migration, the Bird Conservancy of the Rockies operates bird-banding stations at the nature center and Chadron State Park, welcoming visitors to observe and learn about bird conservation. Oliver Reservoir in the southern Panhandle is one of the best birding locations during migration. The shrubby, wooded riparian area offers crucial stopover habitat for songbirds amid the vast grasslands landscape. Year-round, bighorn sheep can be viewed at Williams Gap and Cedar Canyon WMAs. Fort Robinson's Smiley Canyon Scenic Drive provides a chance to see bison from the comfort of a vehicle. Prairie dog colonies offer a glimpse at burrowing owls, badgers, and raptors, while pronghorn, deer and elk can be observed throughout the region.

Trails

The Wildcat Hills State Recreation Area (SRA) offers a system of multi-use trails for hikers, equestrians, and mountain bikers through a rugged pine forest escarpment. Scotts Bluff National Monument provides multiple hiking trails, including a scenic three-mile trek to the summit. A 6.3-mile greenway and trail system connects the monument to the cities of Scottsbluff and Gering. Annual gravel bike races draw cyclists from across the country to the area.

In the Pine Ridge, Fort Robinson State Park offers over 100 miles of hiking and equestrian trails. The White River Trail is a flat route ideal for walking, biking, and wildlife viewing. The Northern Cheyenne Tribe is developing a "Healing Trail" from Fort Robinson to a memorial commemorating the Cheyenne Breakout tragedy. This accessible trail will offer cultural reflection, as well as nature viewing opportunities. The Cowboy Trail is also expanding in the region, with completed segments between Gordon and Rushville and an upcoming 24.5-mile extension between Rushville and Mile Marker 400, five miles east of Chadron scheduled to open in 2026. Efforts are underway to connect Chadron to the western terminus of Cowboy Trail.

Fishing

Lake McConaughy supports hybrid striped bass, smallmouth bass, and trophy walleye, while the adjacent Lake Ogallala is known as one of the best rainbow trout fisheries in the Great Plains.

Coldwater streams in the panhandle also offer quality trout fishing. Bullfrog angling is permitted year-round throughout the region.

Hunting

This region provides unique hunting opportunities for species not commonly found elsewhere in Nebraska, including elk, mule deer, pronghorn, mountain lion, and bighorn sheep. Hunters also enjoy opportunities to hunt turkey, white-tailed deer, pheasants, and other game species found in the region.

Challenges

As economic conditions evolve, nature-based recreation is becoming a more integral part of the Panhandle's economy. With rural populations declining and traditional agricultural opportunities shifting, the region is seeing an increased focus on tourism centered on its natural assets. However, balancing recreational use with wildlife conservation remains a challenge. For example, portions of Lake McConaughy's beaches are closed during nesting season to protect piping plovers, a state- and federally threatened species. Recreationists may disturb nesting birds, leading to nest abandonment or even direct harm. Recognizing the social carrying capacity was exceeded in some locations of the lake, the Central Nebraska Public Power and Irrigation District has adopted the Lake McConaughy Lake Ogallala Master Plan to limit human disturbance and educate the public. These efforts include max visitor limits and piping plover educational campaigns, which have helped alleviate conflicts (Nebraska Game and Parks Commission, 2016). Continued stakeholder engagement will be vital for minimizing negative impacts and improving the social acceptance of the piping plovers (Jorgensen & Brown, 2015).

Other challenges include wildfire risk, especially during prolonged dry periods. Visitors unfamiliar with fire-prone ecosystems may unintentionally spark wildfires through unattended campfires or off-road vehicle use. Increasing public education, posting fire safety signage, and enforcing local restrictions are essential to minimize these risks.

The region offers numerous high-quality nature-based recreation opportunities; however, some access points are poorly marked, interpretive information is lacking, and promotion of outdoor opportunities is limited. Increasing the number of individuals and groups, like the Northwest Nebraska Trails Association, with expertise in nature-based recreation and tourism could help guide community leaders and residents in expanding and promoting these opportunities. By fostering partnerships among the business, tourism, conservation, and agricultural sectors, the region can ensure that natural amenities continue to support both economic vitality and ecological health.

Education

This ecoregion offers rich opportunities for environmental education, thanks to its unique topography and diverse ecosystems. Several partners, including local, state, federal, and nonprofit organizations, collaborate to provide both indoor and outdoor educational

experiences. These programs connect a wide range of audiences — from students to community members — with the natural and cultural heritage of the region.

Key educational sites include Wildcat Hills Nature Center, Scotts Bluff National Monument, and Agate Fossil Beds National Monument, all of which offer immersive experiences that highlight the region's biodiversity. Educational Service Unit #13 collaborates with area schools and educators to provide annual programs like "Water Education for Tomorrow," "Branch Out," and "Outdoor Discovery Program."

Despite these efforts, the geographic isolation of many schools in the panhandle presents challenges for environmental education. Limited resources, teacher training, and funding hinder the ability to provide students with hands-on outdoor learning experiences. Increased collaboration with local ranchers, farmers, and landowners can help bridge this gap, as these individuals often possess deep knowledge of the region's ecology and wildlife.

Representative species with educational and/or community science opportunities:

- Rocky Mountain Bighorn Sheep (*Ovis canadensis*)
- Northern Long-eared Myotis (*Myotis septentrionalis*)
- Ute Ladies'-tresses (*Spiranthes diluvialis*)
- Burrowing Owl (*Athene cunicularia*)

Ecoregion-specific Stresses

Key Stresses

In addition to the stresses and conservation actions identified in this chapter for the Shortgrass Prairie Ecoregion, statewide concerns are also identified in chapter four. Conservation practitioners identified the following stresses as the top threats in the ecoregion.

Altered frequency and intensity of fire and grazing: Short- and mixed-grass prairie, wetland, and forest habitats in the ecoregion were maintained historically by periodic fires and grazing. The interaction from these disturbances promoted structural heterogeneity and floristic diversity. Fire suppression in forests and underutilization of fire as a management tool in grasslands and wetlands has altered stand diversity and density in forests, and species composition in grasslands. Heavy fuel loading resulting from fire suppression has increased the negative impact of wildfires when they occur. The loss of the beneficial, synergistic relationship between fire and grazing has affected the ability of livestock grazing to mirror grazing by native herbivores.

Spread of invasive species: Invasive and noxious species are threatening the ecoregion's biological diversity. Exotic cool-season grasses, aggressive woody plants, and other species have competitively excluded native plants and degraded habitat for fish and wildlife. Many plant and aquatic invasive species can hitchhike on maintenance machinery, recreation equipment, vehicles, pets, and clothing without being detected. Other causes of invasive species spread include interbasin water transfer and dumping fish bait into aquatic systems. Early detection monitoring and rapid response is key to

preventing invasive and noxious species from becoming established and altering ecosystems. Treatment of invasive species should be weighed for potential costs to ecosystem health. Free-ranging cats are a major cause of anthropogenic mortality for birds and mammals. There is a need for improved communication, greater awareness, and education about the harmful effects that free-ranging cats can have on wildlife populations.

Loss of pollinators: Pollinators are essential to a well-functioning ecosystem. Broadcast spraying of pesticides on fields harm pollinators and other native insects. There is a loss of large-scale, diverse, habitats that contain a diversity of forbs. Pollinator habitat restoration should only use native species and avoid broad spectrum pesticides. Currently, there is limited availability of local ecotype, forb-heavy, high-diversity seed mixes. Additionally, more monitoring efforts are needed to establish baseline population estimates for many of the pollinators in this ecoregion and across the state. More communication is needed to inform beekeepers about the negative impact that honeybee parasites can have on native pollinator populations.

Limited awareness about the region's biological diversity and ecological processes: Many residents have a desire to increase their knowledge and understanding of ecological processes and management that can help maintain biological diversity, but educational resources are often not available. Funding and collaboration among conservation agencies are essential to develop and implement relevant environmental education opportunities about native ecosystems and best management practices for conserving them. There is a lack of trusted advisors and community ambassadors that can provide peer-to-peer learning opportunities and share their experiences and knowledge about the financial relevance of ecosystem conservation. Increases in nonresident landowners and younger residents will require the use of new communication channels to deliver informational materials. Additionally, there is little school curriculum that teaches students about Nebraska's native species, habitats, and conservation issues. Although the region's remaining native grasslands, woodlands, and wetlands are unique and of high value, many of the ecoregion's residents have limited awareness of the importance of these habitats to biological diversity.

Alteration of hydrology, channel degradation and sedimentation of rivers, streams, and wetlands: Rivers, streams, and wetlands in the ecoregion are being stressed by surface water diversions, groundwater withdrawals, and water demands downstream. Reduced water flows in the Frenchman and Republican rivers threatens ecosystem function. Center-pivot irrigation, particularly in sandy soil areas has contributed significantly to the groundwater withdrawals. The declines in beaver populations has also contributed to a loss of wetlands, especially in the Pine Ridge region. Intense grazing around the remaining streams and creeks is impacting water quality. A lowering of the water table along rivers and streams changes plant composition and often promotes the spread of invasive species, which contribute further to the lowering water table. Irrigation in this ecoregion is changing the flow regime of rivers and streams with higher flows during mid-summer irrigation season instead of spring and fall and the quick emptying of

canals into streams after large rain events. Dams and diversions are causing silt to build up in the North Platte River, causing more floods and bank erosion. Additionally, structures like dams and improperly sized culverts limit native fish and other aquatic species movement. Increasing and continuing communication and collaboration with counties on how to build fish friendly culverts and other fish movement structures that facilitate movement and maintain connectivity of populations in small streams.

The proximity of development, construction sites, and annual row-crop fields to rivers, streams, and wetlands has resulted in large volumes of sediment entering the ecoregion's water bodies. Fewer cover crops are planted to hold soil over winter. Sedimentation increases stream turbidity and changes bottom substrates. Increased sedimentation of wetlands alters storage capacity and changes plant composition, reducing habitat available to aquatic species including waterfowl.

Point and nonpoint source pollution: Point and nonpoint pollution negatively impacts biodiversity. The introduction of pesticides, storm-sewer runoff, fertilizers and nitrates, and industrial pollutants into rivers and streams impacts water quality, exposes fish and other species to harmful agents, and causes algal blooms. The loss of vegetative buffers around wetlands and riparian areas increases transport of chemicals into waterways. Advanced technology associated with pesticide development may create longer lasting chemicals in the environment and contribute to herbicide-resistant invasive weeds. Neonicotinoid seed treatments and disposal of treated seeds pollute surface waters and cause harm to insects, birds, and other wildlife. Wildlife, including birds, mammals, and insects, are increasingly threatened by light pollution. Artificial lights are impacting ecosystems and animal behaviors, including their ability to find food, mates, and avoid predators.

Loss of natural areas because of local economies: The agricultural community in the ecoregion is driven by a high level of pride and personal responsibility for sustaining the region's unique natural resources. Economic pressures are changing ownership patterns (e.g., more nonresident owners, larger corporate farming operations), which could affect management decisions and ultimate stewardship of the land. Changes in local economies that encourage subdivision and land use change lead to fragmentation and loss of habitats that threaten biodiversity.

Loss of lands enrolled in conservation programs: Lands enrolled in conservation programs, such as the Conservation Reserve Program (CRP), provide significant benefits to wildlife, including at-risk species. Shifting agricultural economics and programmatic challenges may result in large tracts of conservation lands being converted to agricultural cropland. Retention of previously enrolled acres in programs such as General and Continuous CRP is vital to ensure that the benefits of these programs for local economies and wildlife populations persist. Placement of Grassland CRP in areas prone to conversion or implemented in a way to provide and manage habitat for targeted wildlife benefits will also be key to ensure benefits of the program are realized. The loss of even a modest percentage of these lands will result in impacts to terrestrial and aquatic species.

Poorly sited utility-scale energy infrastructure development: Utility-scale energy infrastructure development (e.g., solar farms, wind turbines, Co2 sequestration plant and pipelines, fracking waste, power lines) is expanding in the Great Plains. To conserve biodiversity in the ecoregion, it is important to carefully consider the placement of energy infrastructure, such as transmission lines and pipelines, to minimize negative impacts on wildlife and native habitats. Poorly sited energy infrastructure can fragment intact ecosystems, negatively impact important migratory corridors, harm migratory birds and bats, and disturb wildlife. Focus on siting energy development in already disturbed areas (e.g., cultivated lands, old railway/road corridors). Encourage companies to temporarily halt turbines during peak migration periods for bats and birds. Pre-and post-construction monitoring should be implemented. See Game and Parks' Environmental Review (Visit OutdoorNebraska.gov and search for Environmental Review) and TNC's Site Renewables Right (Search The Nature Conservancy Site Renewables Right: A Clean and Green Energy Future) webpages for guidelines.

Need for greater collaboration between the agricultural and conservation communities: Past contention and misunderstandings between the agriculture and conservation communities on issues related to water and threatened and endangered species have sometimes left deep divisions. Although there is often common ground on many issues related to conserving biological diversity, there remains some lack of trust and resolve to collaborate on issues important to all stakeholders. Staff turnover at conservation agencies has made it difficult to build meaningful relationships and has contributed to the lack of trust and communication with the agricultural communities. Opportunities exist to merge firsthand knowledge of the land with newly developed conservation practices that benefit producers and ecosystems alike. While progress is being made, there is still a need for improved communication with agricultural communities about current and changing contracts and their impacts on agricultural and conservation communities.

Limited assessment, monitoring, and applied science to inform species and habitat conservation efforts: Conservation organizations and universities have limited capacity to monitor and assess many species, especially nongame and at-risk wildlife, and their habitats. There is a need for more baseline population estimates to better inform conservation decisions and listings of at-risk species. The lack of species and habitat monitoring overtime, especially in response to management efforts, hinders the understanding of an area and ways to best manage and conserve it. An increase in applied science efforts in this area could greatly enhance our understanding of this ecoregion. Additionally, wildlife diseases impacting wild populations of birds and mammals, like bighorn sheep and pronghorn, should be monitored and researched further.

Primary Invasive Plant Species by Habitat Type

Note: This list highlights key invasive species of concern in the ecoregion and is not exhaustive.

<u>Habitat Type</u>	<u>Invasive Plant Species</u>
Upland Prairie	Kentucky bluegrass, smooth brome, Japanese brome, downy brome, ventenata, medusahead, crested wheatgrass, sickleweed, St. John's wort, hound's-tongue, leafy spurge, yellow and white sweet clover, halogeton (fringe of badlands), eastern red-cedar and cedar hybrids
Lowland Deciduous Woodlands	Smooth brome, Kentucky bluegrass, reed canary grass, eastern red-cedar
Pine Woodlands	Kentucky bluegrass, smooth brome, Japanese brome, downy brome, eastern red-cedar/cedar hybrids
Wet Meadows	Smooth brome, Kentucky bluegrass, reed canary grass, timothy, tall wheatgrass, quack grass/intermediate wheatgrass, Canada thistle, leafy spurge, non-native clovers
Lakes and Marshes	European phragmites, reed canary grass, narrow-leaf/hybrid cattail, curly-leaf pondweed, Eurasian watermilfoil

Biologically Unique Landscapes of the Shortgrass Prairie Ecoregion

One main goal of the Nebraska Natural Legacy Project is to identify priority landscapes that, when properly managed, will help conserve most of the state's biological diversity. These areas, called Biologically Unique Landscapes (BULs), were selected based on the presence of at-risk species and natural communities. See Chapter 3 for a full description of the selection methods.

The map shows the BULs for the Shortgrass Prairie Ecoregion. Brief descriptions of each BUL follow the map, including information about the stresses affecting species and habitats, proposed conservation actions, and natural communities found in each landscape.

In this ecoregion, some BULs are truncated by the Nebraska state boundary. We suggest opportunities for wildlife conservation in these areas based on review of corresponding adjacent state wildlife action plans (SWAPs).

Shortgrass Biologically Unique Landscapes:

- Kimball Grasslands
- North Platte River

- Oglala Grasslands
- Panhandle Prairies
- Pine Ridge
- Platte Confluence (see Mixed-grass Ecoregion for description)
- Sandsage Prairie(North and South combined)
- Upper Niobrara River
- Wildcat Hills (North and South combined)

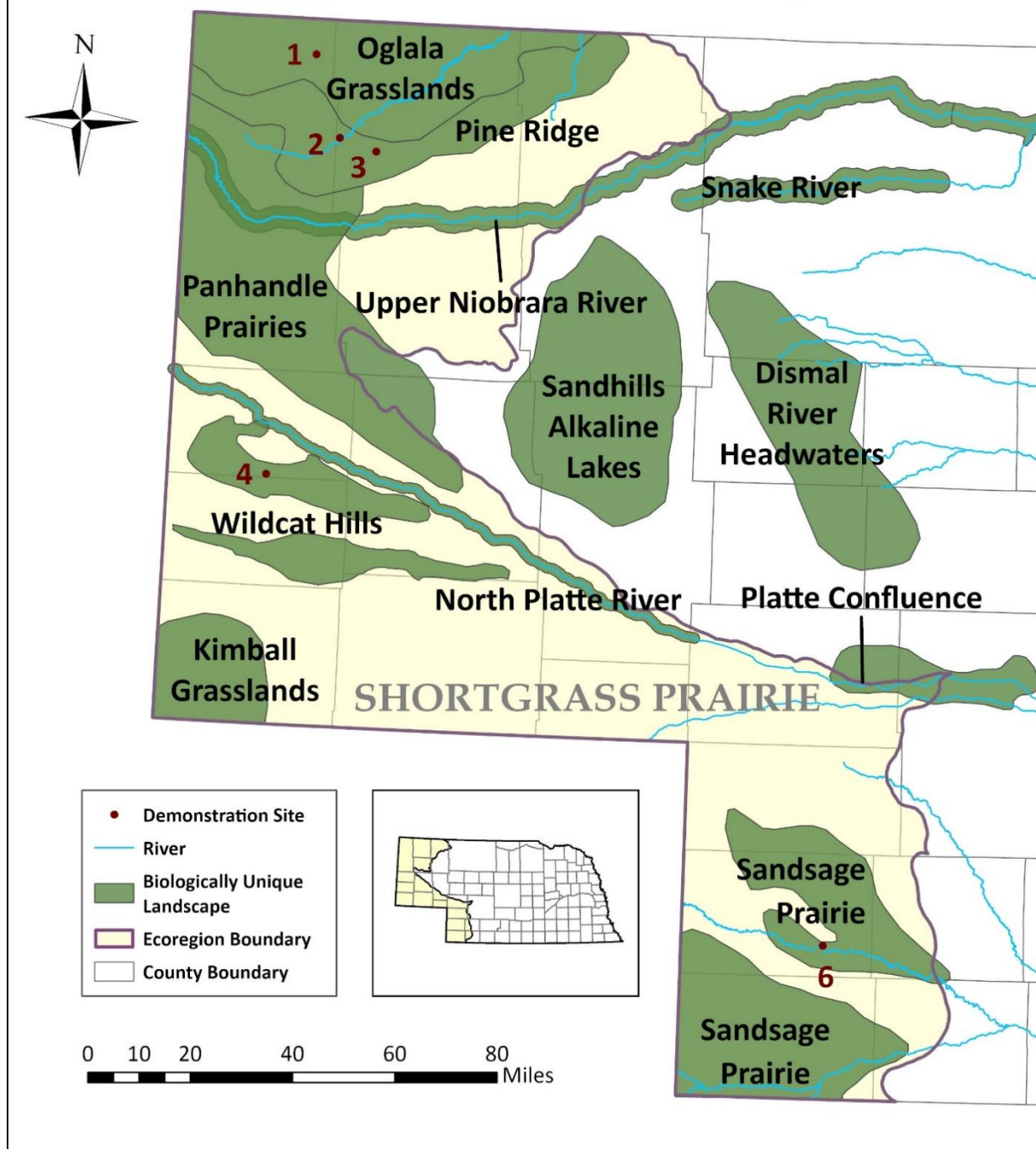
Demonstration Sites of the Shortgrass Prairie Ecoregion

Demonstration sites are locations across the state with potential for showcasing conservation projects and the results of sustainable management to the public. They provide opportunities for learning about the site's unique qualities and importance to at-risk species. See Chapter 4 for information on selecting demonstration sites. The Shortgrass Prairie Ecoregion map shows the location of demonstration sites in the area.

<u>Site name</u>	<u># on map</u>	<u>BUL</u>
Enders Reservoir SRA & WMA	6	Sandsage Prairie
Fort Robinson State Park	2	Pine Ridge
Oglala National Grasslands	1	Oglala Grasslands
Ponderosa WMA	3	Pine Ridge
Wildcat Hills	4	Wildcat Hills

Descriptions of each site are found in the write-up for the BUL in which the site is found.

Nebraska Natural Legacy Project: Shortgrass Prairie Ecoregion



Kimball Grasslands

Biologically Unique Landscape Description

This landscape includes level-to-rolling hills and stream breaks in southwest Kimball County. Most level areas are planted in dryland crops, mainly wheat. Native mixed-grass prairie still covers the shallow-soil breaks along Lodgepole Creek and other stream valleys. Rock outcrops are found in rougher areas, such as stream bluffs. Lodgepole Creek is the BUL's largest stream, though its flow has been greatly reduced by groundwater pumping for irrigation.

This landscape is unique because it supports the state's only population of the state-listed Colorado butterfly plant, found in the Lodgepole Creek valley (recent surveys show this population is nearing extirpation in Nebraska). The state-listed mountain plover nests in heavily grazed native grasslands and croplands, such as short wheat stubble and millet. Migrating shorebirds and waterfowl use the many playas located on level plains throughout Kimball County. The South Platte Natural Resources District's Oliver Reservoir Recreation Area is the only protected area in the BUL.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species.
- Canada thistle invasion, herbicide spraying, and lowered groundwater levels in meadows where the Colorado butterfly plant occurs.
- Tilling in fallow millet and wheat fields that destroy mountain plover nests and the increasing no-till dryland farming practices that reduce the availability of bare ground habitat that is required by nesting mountain plovers.
- Sedimentation and hydrological alteration of playa wetlands.
- Conversion of native prairie to cropland.
- Decline in CRP enrollment.
- Infrastructure development (e.g., roads, energy development, housing) in native grasslands.

Conservation Strategies

- Implement ecologically sensitive grazing and haying strategies on native prairies on private lands, in combination with prescribed fire and rest. In appropriate areas, these strategies can be designed to benefit nesting shortgrass prairie birds.
- Develop and continue to implement best management practices to control and manage invasive plants.
- Work with private landowners to identify areas with Colorado butterfly plant populations to help reduce impacts from herbicides.

- Conduct voluntary nest clearing of millet and wheat fields to prevent damage to mountain plover nests.
- Restore and maintain the hydrology of Lodgepole Creek needed to sustain floodplain biodiversity and ecosystem function.
- Prevent sedimentation and restore the hydrology of the playa wetlands.
- Develop management agreements with landowners to implement grazing and burning strategies on native grasslands that favor mountain plover and native plant diversity.
- Re-enrollment of CRP lands
- Work with companies and agencies to select sites for development that minimize fragmentation and impacts to wildlife.

Tier 1 Species:

Brewer's Sparrow
Burrowing Owl
Chestnut-collared Longspur
Ferruginous Hawk
Loggerhead Shrike
Mountain Plover
Thick-billed Longspur
Plains Topminnow
Colorado Rita Dotted Blue
Lichen Grasshopper
Monarch
Regal Fritillary
Southern Plains Bumble Bee
Cheyenne Northern Pocket Gopher
Eastern Red Bat
Fringed Myotis
Hoary Bat
Silver-haired Bat
Swift Fox
Colorado Butterfly Plant

Aquatic Communities:

Headwater, Warm Water Stream

Terrestrial Communities:

Pine-Juniper Scarp Woodland
Sandbar Willow Shrubland
Buckbrush Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep
Wheatgrass Playa Grassland
Cattail Shallow Marsh

Western Sand Prairie
Threadleaf Sedge Western Mixed-grass Prairie*
Wheatgrass Western Mixed-grass Prairie
Western Floodplain Terrace Grassland
Perennial Sandbar
Sandbar/Mudflat
Rock Outcrop*

* Priority for conservation in this BUL

North Platte River

Biologically Unique Landscape Description

This landscape includes the North Platte River channel and a two-mile buffer on each side of the channel, from the upper end of Lake McConaughy to the Wyoming border. The river is shallow and braided, with tree-lined banks. Most of the floodplain is farmed. Woodlands dominated by cottonwood, eastern red-cedar, and Russian olive often form narrow to wide bands on accretion land. Low-lying areas often contain mosaics of both alkaline and freshwater wet meadows and marshes. Most freshwater wetlands are heavily invaded by exotic grasses and cattails, while the alkaline meadows support a more native flora. These meadows support unique groups of insects, including tiger beetles, dragonflies, and butterflies. The valley wetlands are an important migratory stopover for waterfowl and shorebirds. Protected areas in this landscape include Kiowa and Chet and Jane Fleisbach WMAs, as well as the Platte River Basin Environment's Spotted Tail Complex, Diamond Bit, and other properties.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species in sandbars, meadows, and woodlands.
- Limited prescribed fire on the landscape.
- Altered natural hydrology, particularly lack of high spring flows, low summer flows, and reduced sediment transport to maintain sandbars.
- Ditching and draining of wetlands.
- Sedimentation and draining of backwater sloughs.
- Groundwater pumping and reduced instream flows that impact water levels in valley wetlands.
- Conversion of meadows to cropland.
- Urban and second home development.

Conservation Strategies

- Implement planned grazing and haying strategies on public and private lands, in combination with prescribed fire and rest, to improve native plant diversity and vigor.
- Work with agronomists to discontinue use of tall, intermediate and crested wheatgrasses, reed canary grass, Kentucky bluegrass, and Garrison creeping-foxtail in plantings.
- Develop and implement best management practices to control and manage invasive plants. Clear eastern red-cedar and Russian olive and undertake other tree clearings to maintain open meadow habitat for waterbirds and grassland birds.
- Support prescribed burn associations and enhance efforts to educate landowners about the benefits and practices of prescribed burns, aiming to increase their acceptance and adoption of this land management technique.
- Enhance the North Platte River hydrology that is necessary to sustain biological diversity and ecosystem function. Restore natural hydrology to other important streams in the BUL.
- Restore wetland hydrology and connect backwater habitats to the river.
- Coordinate with interested landowners to restore strategic areas of cropland to grassland through conservation programs or voluntary fee title acquisition, enhancing connectivity and establishing core habitats. Restore additional grassland habitat through high-diversity, local ecotype restorations, and landowner collaboration.
- Encourage and implement zoning ordinances to address development to minimize habitat fragmentation and impacts to wildlife. Coordinate with landowners interested in using conservation programs and voluntary acquisitions on undeveloped reaches of the river and wet meadows to protect them from development.

Tier 1 Species:

Black-billed Magpie
Burrowing Owl
Whooping Crane
Flathead Chub
Plains Minnow
Plains Topminnow
Western Silvery Minnow
Lichen Grasshopper
Monarch
Regal Fritillary
Eastern Red Bat
Hoary Bat
Little Brown Myotis
Silver-haired Bat
Creeper
Fatmucket

Large-spike Prairie-clover
Platte River Dodder

Aquatic Communities:

Headwater, Warm Water Stream
Mid-order, Warm Water River

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood Riparian Woodland
Sandbar Willow Shrubland
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep
Western Alkaline Meadow*
Western Subirrigated Alkaline Meadow*
Western Sedge Wet Meadow*
Cattail Shallow Marsh
Reed Marsh
Western Alkaline Marsh*
Perennial Sandbar*
Sandbar/Mudflat*
Riverine Gravel Flats*

* Priority for conservation in this BUL

Oglala Grasslands

Biologically Unique Landscape Description

This landscape covers the plains and rolling hills and plains in the northwestern Panhandle, north of the Pine Ridge. The region's uplands support mixed-grass prairie with very limited cropland making it one of Nebraska's largest intact grasslands. Rock outcrops and badlands are scattered throughout the prairie, along with small stream valleys. The soils are mostly clays formed from Pierre Shale, and the prairie is dominated by blue grama, green needlegrass, and western wheatgrass.

Other Nebraska plant communities found only in this region include western floodplain terrace grassland, silver sagebrush shrub prairie, greasewood shrub prairie, and northwestern mixed-grass prairie. Small playas are scattered across level uplands. The region's grasslands support extensive prairie dog towns, swift fox populations, and habitat for grassland birds. The Oglala National Grassland occupies a large portion of this landscape.

Natural Legacy Demonstration Site

1. Oglala National Grasslands – U.S. Forest Service

The Oglala National Grassland spans 94,520 acres and consists of shortgrass prairie, badlands, ponderosa pine forest, and hardwood riparian corridors in the northwest corner of Nebraska. These public lands, administered by the U.S. Forest Service, are managed for active, sustainable, multiple-use purposes, with grazing, recreation, and restoration being the primary public uses of the lands. Two world-renowned areas, Toadstool Park and Hudson-Meng Education and Research Center, provide opportunities to share both historical and current management techniques with the visiting public.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species, primarily exotic cool-season annual grasses.
- Russian olive and other woody encroachment along streams.
- Limited prescribed fire on the landscape.
- Energy leases and infrastructure development in native grasslands.
- Human-induced eradication of entire prairie dog colonies or the spread of diseases within prairie dog populations that can rapidly decimate an entire colony.
- Fence type and placement that significantly hinder wildlife.

Conservation Strategies

- Work with private landowners and the U.S. Forest Service to implement ecologically sensitive grazing strategies that reduce exotic cool-season annual grasses and promote native plant diversity and diverse wildlife habitats.
- Restore sagebrush communities on selected sites.
- Undertake Russian olive and other tree clearing to maintain stream corridors.
- Increase the use of prescribed fire to enhance forb diversity in grasslands.
- Work with energy companies to select sites for energy infrastructure development that minimize fragmentation and impacts to wildlife.
- Manage public lands to maintain black-tailed prairie dog towns at an ecologically functional population level.
- Promote fencing methods that are less obstructive to pronghorn antelope and other wildlife.

Tier 1 Species:

Black-billed Magpie

Brewer's Sparrow

Burrowing Owl

Chestnut-collared Longspur

Ferruginous Hawk
Loggerhead Shrike
Long-billed Curlew
Pinyon Jay
Thick-billed Longspur
Whooping Crane
Flathead Chub
Plains Minnow
Large Marble
Monarch
Nine-spotted Ladybird Beetle
Regal Fritillary
Simius Roadside-Skipper
Southern Plains Bumble Bee
Western Bumble Bee
Eastern Red Bat
Plains Spotted Skunk
Fringed Myotis
Hoary Bat
Little Brown Myotis
Pierre Northern Pocket Gopher
Silver-haired Bat
Swift Fox
Blanding's Turtle
Barr's Milkvetch
Rocky Mountain Bulrush

Aquatic Communities:

Headwater, Warm Water Stream
Mid-order, Warm Water River*

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood Riparian Woodland
Sandbar Willow Shrubland
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep
Western Alkaline Meadow
Western Sedge Wet Meadow*
Playa Wetland

Spikerush Vernal Pool
Cattail Shallow Marsh
Threadleaf Sedge Western Mixed-grass Prairie*
Northwestern Mixed-grass Prairie*
Western Floodplain Terrace Grassland*
Silver Sagebrush Shrub Prairie*
Greasewood Shrub Prairie*
Perennial Sandbar
Sandbar/Mudflat
Rock Outcrop*
Badlands*

* Priority for conservation in this BUL

Panhandle Prairies

Biologically Unique Landscape Description

This landscape occupies the plains and rolling hills of the northern Panhandle from the Pine Ridge south to the North Platte River valley. It includes the rough breaks and rocky outcrops associated with the Niobrara River in central Sioux County and the North Platte River in Scotts Bluff and Morrill counties. The plains include isolated sand dunes in west-central Sioux County that support sandhills dune prairie and sandsage prairie. The BUL has only scattered cropland and the intact grasslands support swift fox, prairie dog towns, and grassland birds. Protected lands in the BUL include the North Platte National Wildlife Refuge (NWR) and several small WMAs.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species, primarily exotic cool-season annuals.
- De-watering of the Niobrara River.
- Conversion of prairie to cropland (e.g., in the Niobrara River valley).
- Potential losses in CRP enrollment and re-enrollment.
- Infrastructure development (e.g., roads, energy development) in native grasslands.
- Human-induced eradication of entire prairie dog colonies or the spread of diseases within prairie dog populations that can rapidly decimate an entire colony.
- Fence type and placement that significantly hinders wildlife.

Conservation Strategies

- Implement ecologically sensitive grazing and haying strategies on native prairies on private lands, in combination with prescribed fire and rest. In appropriate areas, these strategies can be designed to benefit nesting shortgrass prairie birds.
- Increase the use of prescribed fire to enhance forb diversity in grasslands.
- Environmental education to address water conservation strategies.
- Coordinate with interested landowners to protect high-quality sites using conservation strategies that are compatible with working lands. Restore additional grassland habitat through high-diversity, local ecotype restorations, and landowner collaboration.
- Re-enrollment of CRP lands and/or establishment of grazing strategies appropriate to the local flora on lands coming out of CRP enrollment.
- Work with companies and agencies to select sites for development that minimize fragmentation and impacts to wildlife.
- Manage public lands to maintain black-tailed prairie dog towns at an ecologically functional population level.
- Promote fencing methods that are less obstructive to pronghorn antelope and other wildlife.

Tier 1 Species:

Black-billed Magpie
Brewer's Sparrow
Burrowing Owl
Chestnut-collared Longspur
Ferruginous Hawk
Loggerhead Shrike
Long-billed Curlew
Thick-billed Longspur
Whooping Crane
Finescale Dace
Northern Pearl Dace
Northern Redbelly Dace
Plains Topminnow
Large Marble
Lichen Grasshopper
Monarch
Nine-spotted Ladybird Beetle
Regal Fritillary
Sandy Tiger Beetle
Simius Roadside-Skipper
Southern Plains Bumble Bee
Suckley's Cuckoo Bumble Bee
Two-spotted Skipper
Western Bumble Bee

Eastern Red Bat
Hoary Bat
Little Brown Myotis
Silver-haired Bat
Swift Fox
Sagebrush Lizard
Blowout Penstemon
Large-spike Prairie-clover
Meadow Lousewort
Ute Ladies'-tresses

Aquatic Communities:

Headwater, Warm Water Stream

Terrestrial Communities:

Pine-Juniper Scarp Woodland
Rocky Mountain Juniper Woodland
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep
Western Alkaline Meadow
Western Sedge Wet Meadow*
Cattail Shallow Marsh
Sandsage Prairie
Western Sand Prairie*
Threadleaf Sedge Western Mixed-grass Prairie*
Wheatgrass Western Mixed-grass Prairie*
Western Floodplain Terrace Grassland
Rock Outcrop*

* Priority for conservation in this BUL

Pine Ridge

Biologically Unique Landscape Description

The Pine Ridge is a rocky escarpment that rises several hundred feet from the surrounding plains in Sioux, Dawes, and Sheridan counties in northwest Nebraska. The escarpment is composed of sandstone, siltstones, and volcanic ash. Ponderosa pine woodlands and forest occupy many of the north- and east-facing slopes, and bottoms. Pine woodlands and mixed-grass prairie occupy the south- and west-facing slopes. Several streams, including the White River, Hat Creek, and Soldier Creek, originate in the Pine Ridge. The valleys of these northward flowing streams support deciduous woodlands and meadows in their floodplains.

As a pine-dominated escarpment within the Great Plains grasslands, the Pine Ridge supports many at-risk species at the edge of their range, including a small population of Rocky Mountain bighorn sheep. There are several, large, protected areas within this landscape, including the Nebraska National Forest (Pine Ridge District), Fort Robinson State Park and several WMAs.

Natural Legacy Demonstration Sites

2. Fort Robinson State Park - Nebraska Game and Parks Commission

The majority of Fort Robinson is rolling prairie uplands, but this large park has riparian areas and towering buttes and rock outcrops. Pine woodlands characteristic of the Pine Ridge provide habitat for the bighorn sheep and other at-risk species. A large part of the park was burned in 1989. Areas of the Pine Ridge have western mixed-grass prairie, ponderosa pine forest, dry-mesic ponderosa pine woodland, dry ponderosa pine open woodland and savanna. There is much potential for a variety of management types at the park.

3. Ponderosa Wildlife Management Area - Nebraska Game and Parks Commission

Ponderosa WMA is adjacent to U.S. Forest Service property. The WMA is primarily coniferous forest, with deciduous forest along Squaw Creek, which flows through the site. Natural communities within the WMA include western mixed-grass prairie, ponderosa pine forest, dry-mesic ponderosa pine woodland, dry ponderosa pine open woodland, and savanna. Prescribed fire and other management techniques are implemented on the WMA and other nearby properties.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species.

- Lack of best management practices on private lands and commercial logging practices that disturb groundcover, create logging roads, and take old-growth trees, creating even-aged stands of trees.
- Limited use of prescribed fire has led to excess fuel accumulation and increased densities of ponderosa pine, eastern red-cedar, and Rocky Mountain juniper, which can lead to catastrophic fires.
- Housing and ranchette development.
- Tree pest infestations and diseases impacting forest health.
- Disease transmission affecting Rocky Mountain bighorn sheep.

Conservation Strategies

- Implement planned grazing strategies on public and private lands to improve native plant diversity and vigor.
- Develop and implement best management practices to control and manage invasive plant species.
- Provide incentives for the development and use of local, environmentally sound pine wood products from sustainable harvest.
- Conduct prescribed thinning of mixed age, mixed health trees on private and public land that will ensure resilient forests.
- Enhance efforts to educate public and private landowners about the benefits and practices of prescribed burns and work with them to implement prescribed, low-intensity surface fires to control exotic plants, reduce Ponderosa pine and eastern red-cedar densities, and reduce frequency of catastrophic fires.
- Encourage and implement zoning ordinances to minimize habitat fragmentation and impacts to wildlife. Coordinate with landowners interested in using conservation programs and voluntary acquisitions to protect areas for conservation.
- To avoid disease transmission, enhance outreach efforts and work with private landowners to limit interactions with domestic sheep and goats in areas used by bighorn sheep.

Tier 1 Species:

Black-billed Magpie
Brewer's Sparrow
Burrowing Owl
Ferruginous Hawk
Pinyon Jay
Hourglass Drone Fly
Kohler's Fritillary
Large Marble
Monarch
Mottled Duskywing
Nine-spotted Ladybird Beetle

Regal Fritillary
Simius Roadside-Skipper
Southern Plains Bumble Bee
Suckley's Cuckoo Bumble Bee
Tawny Crescent, Western Bumble Bee
Eastern Red Bat
Plains Spotted Skunk
Fringed Myotis
Hoary Bat
Little Brown Myotis
Northern Long-eared Myotis
Pierre Northern Pocket Gopher
Rocky Mountain Bighorn Sheep
Silver-haired Bat
Swift Fox
Blanding's Turtle

Aquatic Communities:

Headwater, Coldwater Stream*
Headwater, Warmwater Stream*

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood Riparian Woodland
Peachleaf Willow Woodland
Green Ash-Elm-Hackberry Canyon Bottom Woodland*
Ponderosa Pine Forest*
Dry-Mesic Ponderosa Pine Woodland*
Dry Ponderosa Pine Open Woodland and Savanna*
Pine-Juniper Scarp Woodland*
Buckbrush Shrubland
Buffaloberry Shrubland
Skunkbrush Sumac Shrubland
Chokecherry-Plum Shrub Thicket
Mountain Mahogany Shrubland
Freshwater Seep*
Western Sedge Wet Meadow*
Cattail Shallow Marsh
Western Sand Prairie*
Threadleaf Sedge Western Mixed-grass Prairie*
Northwestern Mixed-grass Prairie
Wheatgrass Western Mixed-grass Prairie
Western Floodplain Terrace Grassland
Northern Chalk Bluff and Cliff*

Western Sandstone Cliff*
Rock Outcrop*

* Priority for conservation in this BUL

Sandsage Prairie

Biologically Unique Landscape Description

This landscape is made up of low rolling sand dunes and stream breaks across a four-county area in far southwest Nebraska. Loess mixed-grass prairie and western mixed-grass prairie occur on the breaks and bluffs of the Republican and Frenchman rivers, while sandsage prairie is found on the rolling sand dunes. Playas are found throughout the counties included in this BUL. The mixed-grass prairies are partly fragmented by cropland and are degraded in some areas due to livestock grazing that reduces plant diversity.

Center-pivot irrigation has caused heavy fragmentation of the sandsage prairies. Before groundwater pumping for irrigation began, some valleys in this dune complex contained lakes, marshes, and wet meadows. These areas have since turned into dry valleys because of the lowering of the groundwater table.

Irrigation in the region has also greatly reduced the flow of groundwater-fed streams, such as Frenchman Creek. However, several high-quality small streams that flow into the Republican River still remain, including Buffalo Creek and Rock Creek. The Republican River above Swanson Reservoir is less degraded than its lower stretches and still has a braided channel and open sandbars. This landscape is important for its large areas of sandsage prairie and high-quality loess mixed-grass prairies. The largest protected area in the ecoregion is Enders Reservoir SRA and WMA.

Natural Legacy Demonstration Site

6. Enders Reservoir Wildlife Management Area and State Recreation Area - Nebraska Game and Parks Commission

Enders WMA spans 4,599 acres and includes a 1,707-acre reservoir. Approximately 2,150 acres are designated as a wildlife refuge. The landscape surrounding the reservoir ranges from gently rolling slopes of 0%–20% to steeper, more irregular terrain exceeding 20%. Soils in the area vary, with fine sand and loamy fine sand found in sandsage prairie, and silt loam in the lowland, riparian woodland, and upland regions. The area supports three primary cover types: sandsage prairie, characterized by sand sagebrush, needle and thread, and bush morning glory; lowland and riparian woodland areas, featuring species such as switchgrass, willows, and western chokecherry; and upland zones, where little bluestem, skunkbush sumac, prickly pear cactus, and prairie coneflower are common. Numerous wildlife species can frequently be observed in the area, including prairie dogs.

Habitat management goals focus on controlling eastern red-cedar encroachment in the sandsage prairie, using prescribed fire to enhance prairie health and wildlife habitat, and planting food plots to further support diverse wildlife populations. Enders SRA and WMA offer a variety of recreational activities, including hunting, fishing, camping, wildlife viewing, and boating. Responsible management of this area is essential to ensure that future generations can continue to enjoy these outdoor experiences.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure in prairies, which can lead to exotic plant invasion.
- Invasive plant species, primarily smooth brome and cheatgrass and woody encroachment in prairies and riparian areas.
- Broadcast spraying of sandsage prairies to reduce sand sagebrush abundance, which greatly reduces native plant diversity and degrades wildlife habitat.
- Limited prescribed fire on the landscape.
- Erosion and contamination from livestock watering in the river.
- Groundwater withdrawal for center-pivot irrigation, which affects water levels in wetlands and streams.
- Loss of native sandsage prairie to cropland.
- Infrastructure development (e.g., roads, energy, housing) in native grasslands.

Conservation Strategies

- Implement ecologically sensitive grazing strategies and intervals of prescribed fire on native prairies, specifically sandsage prairie. These strategies can be designed to eliminate the need to spray these sites to reduce sand sagebrush densities and control exotic cool-season grasses.
- Work with conservation agencies, chemical companies, and crop consultants to eliminate the practice of herbicide spraying on private lands as a method of reducing sandsage abundance.
- Facilitate the establishment and/or support of prescribed burn associations. Continue to enhance efforts to educate landowners about the benefits and practices of prescribed burns and offer trainings.
- Remove invasive woody species, restore wetlands, and implement ecologically sensitive grazing within the Republican River valley upstream from Swanson Reservoir. Work with landowners to install livestock watering facilities in uplands to manage cattle watering away from streams.
- Restore groundwater levels and wetlands in the sandsage prairie.

- Coordinate with interested landowners to protect high-quality sites using conservation strategies that are compatible with working lands. Restore additional grassland habitat through high-diversity, local ecotype restorations, and landowner collaboration.
- Work with companies and agencies to select sites for development that minimize fragmentation and impacts to wildlife.

Tier 1 Species:

Black-billed Magpie
Burrowing Owl
Ferruginous Hawk
Loggerhead Shrike
Plains Minnow
Plains Topminnow
Western Silvery Minnow
Ghost Tiger Beetle
Monarch
Ottoe Skipper
Regal Fritillary
Smoky-eyed Brown
Eastern Red Bat
Hoary Bat
Silver-haired Bat
Creeper
Glossy Snake
Large-spike Prairie-clover
Sandhill Goosefoot
Woolly Milkweed

Aquatic Communities:

Headwater, Cold Water Stream*
Headwater, Warm Water Stream*
Mid-order, Warm Water River

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood Riparian Woodland
Sandbar Willow Shrubland
Buckbrush Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep
Western Sedge Wet Meadow
Cattail Shallow Marsh
Loess Mixed-grass Prairie*

Sandhills Dune Prairie
 Sandsage Prairie*
 Wheatgrass Western Mixed-grass Prairie
 Perennial Sandbar
 Sandbar/Mudflat
 Rock Outcrop

* Priority for conservation in this BUL

Upper Niobrara River

Biologically Unique Landscape Description

This landscape includes the Niobrara River channel and a two-mile-wide buffer on each side, stretching from eastern Cherry County west to the Nebraska/Wyoming border. In its western reaches, the Niobrara River is a narrow, cold-water stream flowing through an open, gently sloping valley with few trees. Here, rock outcrops are common along the valley bluffs, along with threadleaf sedge western mixed-grass prairie. Farther east, as the river gains flow, the valley becomes deeply entrenched, reaching several hundred feet deep where the river enters the Sandhills in western Cherry County. Here, ponderosa pine woodlands cover parts of the bluffs, and cottonwood-dominated woodlands grow in parts of the floodplain. Cropland is mostly limited to small areas along the valley bottom.

Box Butte Reservoir is the only impoundment on this stretch of the Niobrara River. Otherwise, river flows remain fairly natural, although they have been reduced due to groundwater pumping for pivot irrigation. The upper Niobrara River supports a unique group of cold-water fish, including the northern pearl dace, the state-listed blacknose shiner and finescale dace. Alkaline wet meadows in the Niobrara River valley in western Sioux County support the state's only known population of the Ute lady's-tresses orchid. Protected areas in this BUL include Agate Fossil Beds National Monument, The Nature Conservancy's Cherry Ranch, and Prairie Plains Resource Institute's Guadalcanal Memorial Prairie.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure in both uplands and riparian areas.
- Invasive plant and aquatic species.
- Reduced river flows resulting from irrigation development and undesirable woody vegetation. This threat is most prevalent in the western reaches of the river.
- Erosion and contamination from livestock watering in the river.
- Increased chemical runoff and nutrient loading into the rivers and streams from adjacent croplands.

- Stream channelization, extreme weather events, and instream structures (e.g., culverts) that obstruct fish movement.
- Conversion of valley bottom and meadows to cropland.
- Housing and ranchette development and limited zoning ordinance enforcement.

Conservation Strategies

- Implement ecologically sensitive grazing and haying strategies on native prairies on private and public lands, in combination with prescribed fire and rest.
- In meadows containing the Ute lady's-tresses orchid, adjust timing of haying and grazing to benefit the orchid and reduce competition from cool-season invasive.
- Develop and implement best management practices to control invasive plants.
- Increase education efforts about aquatic invasive species control methods, water quality, and water conservation.
- Maintain the natural hydrology of the Niobrara River and implement conservation strategies necessary to sustain biological diversity and ecosystem function (e.g., restoring center pivot lands to native grassland).
- Work with landowners to install livestock watering facilities in uplands to manage cattle watering away from streams.
- Create and maintain natural grassland buffers around riparian areas to reduce sedimentation and filter chemical runoff.
- Work with counties to properly size and set culverts that facilitate native fish movement in small streams and promote stream connectivity. Find ways to ensure that instream structures allow for native aquatic organism movement (e.g., fish ladders), especially when culverts get washed out. Continue to innovate low-cost fish passage structures.
- Restrict stocking of sport fish in the Niobrara River.
- Coordinate with interested landowners to restore strategic areas of cropland to grassland through conservation programs or voluntary fee title acquisition, enhancing connectivity and establishing core habitats. Restore additional grassland habitat through high-diversity, local ecotype restorations, and landowner collaboration.
- Encourage and implement zoning ordinances to address development to minimize habitat fragmentation and impacts to wildlife.

Tier 1 Species:

Black-billed Magpie
Brewer's Sparrow
Burrowing Owl
Ferruginous Hawk
Long-billed Curlew
Finescale Dace
Flathead Chub
Northern Pearl Dace

Northern Redbelly Dace
Plains Topminnow
Western Silvery Minnow
American Burying Beetle
Fox Mayfly
Kohler's Fritillary
Large Marble
Monarch
Nine-spotted Ladybird Beetle
Pawnee Stonefly
Regal Fritillary
Smoky-eyed Brown
Southern Plains Bumble Bee
Two-spotted Skipper
Bailey's Eastern Woodrat
Eastern Red Bat
Hoary Bat
Little Brown Myotis
Northern Long-eared Myotis
Silver-haired Bat
Swift Fox
Fatmucket
Plain Pocketbook
Blowout Penstemon
Large-spike Prairie-clover
Meadow Lousewort
Rocky Mountain Bulrush
Ute Ladies'-tresses

Aquatic Communities:

Headwater, Cold Water Stream*
Headwater, Warm Water Stream
Mid-order Warm Water River*

Terrestrial Communities:

Cottonwood-Peachleaf Willow Riparian Woodland
Cottonwood Riparian Woodland
Green Ash-Elm-Hackberry Canyon Bottom Woodland
Sandbar Willow Shrubland
Buckbrush Shrubland
Buffaloberry Shrubland
Chokecherry-Plum Shrub Thicket
Freshwater Seep
Western Alkaline Meadow

Western Subirrigated Alkaline Meadow*
Western Sedge Wet Meadow*
Cattail Shallow Marsh
Reed Marsh
Western Sand Prairie*
Threadleaf Sedge Western Mixed-grass Prairie*
Wheatgrass Western Mixed-grass Prairie
Western Floodplain Terrace Grassland*
Perennial Sandbar
Sandbar/Mudflat
Rock Outcrop*

* Priority for conservation in this BUL

Wildcat Hills

Biologically Unique Landscape Description

The Wildcat Hills is a rocky escarpment that rises several hundred feet on the south side of the North Platte River in Scotts Bluff, Banner, and Morrill counties. The escarpment is made up mainly of sandstone, siltstone, and volcanic ash. Its steep north-facing bluff and deep canyons support ponderosa pine woodlands. Threadleaf sedge mixed-grass prairie, western sand prairie, rock outcrops, and scattered patches of mountain mahogany shrubland, skunkbrush sumac shrubland, and badlands cover the rest of the escarpment.

The Wildcat Hills are important for supporting an intact mix of pine woodlands and mixed-grass prairie, as well as the largest stands of mountain mahogany shrubland in the state. Two of Nebraska's populations of Rocky Mountain bighorn sheep also live here. Several raptor species nest on the area's rock cliffs. Protected lands in the Wildcat Hills include Scotts Bluff National Monument, several Platte River Basin Environment's properties, The Nature Conservancy's Murphy Ranch, Wildcat Hills SRA and several WMAs.

Natural Legacy Demonstration Site

4. Wildcat Hills Complex

The Wildcat Hills contain many properties that are open to the public, including Buffalo Creek, Cedar Canyon, Montz Point, Wildcat Hills, and William's Gap WMAs, Platte River Basin Environments, Inc.'s Bead Mountain, Montz Point, and Carter Canyon ranches, Scotts Bluff National Monument, and The Nature Conservancy's Murphy Ranch. The entire wildlands complex encompasses approximately 30,000 acres and features rugged topography with ravines separated by steep, eroded rocky outcrops. This complex contains all the plant communities of the BUL. Ongoing land management at these sites

seek to improve wildlife habitat through a variety of techniques, including grazing, tree thinning, and invasive species control. The Wildcat Hills Nature Center provides educational opportunities for the public to learn about the area's wildlife and habitats. Many of sites offer recreational opportunities, such as hunting, wildlife viewing, and hiking.

Stresses Affecting Species and Habitats

- Specific livestock grazing and haying practices that may reduce native plant diversity and promote uniform habitat structure.
- Invasive plant species.
- Lack of forest stand improvement practices.
- Limited grazing and prescribed fire have led to excess fuel accumulation and increased densities of ponderosa pine, eastern red-cedar, and Rocky Mountain juniper, which can lead to catastrophic fires.
- Housing and ranchette development.
- Infrastructure development (e.g., roads, energy development).
- Limited awareness of native wildlife and the unique habitats in this landscape.
- Limited landowner awareness of management practices to improve habitats, manage invasive species, and navigate the wildland urban interface.
- Tree pest infestations and disease impacting forest health.
- Transmission of diseases between domestic sheep, goats, and Rocky Mountain bighorn sheep.
- Fence type and placement that significantly hinders wildlife movement.

Conservation Strategies

- Implement strategic grazing strategies on public and private lands to improve native plant diversity and vigor.
- Develop and implement best management practices to control invasive plants.
- Provide incentives for the development and use of local, environmentally sound pine wood products from sustainable harvest.
- Conduct prescribed thinning of mixed age, mixed health trees on private and public land that will ensure resilient forests.
- Work with public and private landowners to implement prescribed, low-intensity surface fires and planned grazing systems to control exotic plants, reduce Ponderosa pine, juniper, and eastern red-cedar densities, and reduce the threat of intense or devastating fires.
- Carry out zoning ordinance enforcement to address ranchettes and fragmentation.
- Coordinate with landowners interested in using conservation easements and voluntary acquisitions to protect important areas for conservation.
- Work with companies and agencies to select sites for development that minimize fragmentation and impacts to wildlife.

- Continue to implement integrated public and private lands management. For example, work with private landowners with properties bordering public lands to manage larger habitat blocks.
- Work with partners to offer educational programs and landowner workshops to encourage peer-to-peer learning and increase awareness about collaborative conservation strategies and practices that improve habitats and their benefits.
- Offer training for identifying and treating invasive species.
- To avoid disease transmission, enhance outreach efforts and work with private landowners to limit interactions with domestic sheep and goats in areas used by bighorn sheep.
- Promote fencing methods that are less detrimental to pronghorn antelope and other wildlife.

Tier 1 Species:

Black-billed Magpie
Brewer's Sparrow
Burrowing Owl
Ferruginous Hawk
Long-billed Curlew
Pinyon Jay, Plains Topminnow
Large Marble
Lichen Grasshopper
Monarch
Morrison's Bumble Bee
Nine-spotted Ladybird Beetle
Regal Fritillary
Eastern Red Bat
Plains Spotted Skunk
Fringed Myotis
Hoary Bat
Rocky Mountain Bighorn Sheep
Silver-haired Bat
Swift Fox
Sagebrush Lizard

Aquatic Communities:

Headwater, Warm Water Stream

Terrestrial Communities:

Ponderosa Pine Forest*
Dry Ponderosa Pine Open Woodland and Savanna*
Pine-Juniper Scarp Woodland*
Rocky Mountain Juniper Woodland
Buckbrush Shrubland

Chokecherry-Plum Shrub Thicket
Mountain Mahogany Shrubland*
Freshwater Seep*
Western Alkaline Meadow
Western Sedge Wet Meadow
Sandsage Prairie*
Western Sand Prairie*
Threadleaf Sedge Western Mixed-grass Prairie*
Wheatgrass Western Mixed-grass Prairie*
Western Floodplain Terrace Grassland
Western Sandstone Cliff*
Rock Outcrop*
Badlands*
Riverine

* Priority for conservation in this BUL

Chapter 9

Aquatic Conservation

Over 16,000 miles of rivers and streams flow through Nebraska supporting a diverse array of aquatic species, offering habitat for important life stages of many other wildlife, and providing a necessary resource for our agriculturally dominated and increasingly urbanized state. The interconnectedness of these systems provides numerous challenges and opportunities for conservation. Unfortunately, compounding threats and stressors jeopardize these systems' abilities to provide necessary ecosystem functions to support agricultural practices, urbanization, and aquatic communities. Because over 98% of waterways in Nebraska occur on private lands, addressing these threats requires coordinated conservation efforts, improved land-use practices, and public awareness to ensure the long-term sustainability of our state's freshwater resources.

Key Stresses and Actions

Agricultural runoff and pollution: Runoff from agricultural fields introduces excess nutrients, pesticides, and sediments into waterways. This pollution can lead to harmful algal blooms and oxygen depletion. The degradation of riparian habitats facilitates increased runoff by reducing the buffer between land and water resources. Water quality impairments and pollutants (e.g., E. coli bacteria, blue-green algae, ammonia, pesticides, metals and inorganics, nitrogen, phosphorus, etc.) should meet Title 117 Surface Water standards. Supporting best management practices can aid in restoring or maintaining water quality in systems. Additionally, it is important to assess species specific limits to pollutants.

Increased severity and frequency of floods and droughts: Nebraska experienced catastrophic flooding events in 2011 and 2019, breaching levees and damaging properties over thousands of acres. While flooding events naturally occurred in the state historically, they alter stream channels and increased opportunities for aquatic non-native and invasive species expansion. Conversely, prolonged drought conditions also significantly reduced stream flows and fragmented aquatic systems. To maintain their working lands, farmers and ranchers increased groundwater pumping and water diversion for irrigation. Groundwater reductions influence stream baseflow, water conditions, and water supply. Demands on groundwater have ultimately resulted in reduced stream flows in many areas. Shifts in precipitation and temperature affect flow timing and water temperature, respectively, altering aquatic Species of Greatest Conservation Need (SGCN) migration and reproduction cycles. It is important to understand the vulnerabilities of aquatic SGCN to these variable environmental conditions and how they respond to rapidly changing flows and temperatures.

Habitat alteration: Habitat alteration is among the most pressing issues that negatively impacts aquatic SGCN. The construction of levees, dams, and channelization projects

significantly changes natural hydrology and greatly reduces habitat heterogeneity. These modifications reduce the frequency and extent of seasonal flooding, disconnect waterways from their floodplain, and eliminate crucial backwater and side-channel habitats that once supported spawning and nursery areas for fish SGCN. Understanding the optimal and suitable habitats for aquatic SGCN will aid in determining where conservation efforts will be most impactful.

Aquatic non-native and invasive species: The introduction and spread of aquatic non-native and invasive species places significant stress on native ecosystems. Invasive carp and western mosquitofish compete with native fish for food, while zebra mussels disrupt ecological balance and increase maintenance burdens. Sportfish that are stocked into lakes and reservoirs across the state occasionally migrate into surrounding waterways, increasing the likelihood of predation on fish SGCN. The looming threat of black carp into the southeastern corner of the state jeopardizes remnant populations of freshwater mussels and could significantly impact areas where mussel reintroduction efforts are taking place.

Urban development: Many of the populated cities in Nebraska occur along waterways. A shift from rural to urban living has placed an increased demand on development in these areas. Such development degrades riparian areas for housing developments, increases human-wildlife conflicts, and leads to increased stormwater runoff and pollution.

Species hybridization: Some fish SGCN are prone to hybridization. Finescale and northern redbelly dace occur in many Sandhills streams and display characteristics that are diagnostic of both species, increasing the difficulty of field identification and risk of hybridizing genetics from distinct source populations. Additionally, shovelnose and federally endangered pallid sturgeon hybridize in the Missouri River Basin. If efforts to propagate and reintroduce populations of these species are to occur or continue, necessary precautions, like those currently taking place at Gavins Point National Fish Hatchery, are needed to avoid producing hybrid individuals in hatcheries.

Conservation Strategies

Evaluation of priority watersheds: To focus aquatic conservation at the system level, aquatics experts selected systems that could best conserve and recover the diverse array of aquatic SGCN identified in the Natural Legacy Project. There is a need to evaluate whether the priority watersheds selected will accurately meet this objective and refine the list as necessary for the next edition of the project.

Improving habitat along the riparian corridor: Wetlands, woodlots, and other riparian buffers can reduce pollution, sedimentation and erosion that deteriorate waterways across the state. Revegetating banks can stabilize them and retain heterogeneity of the system. Careful planning with terrestrial and wetland habitat managers can ensure that restoration efforts extend from upland habitats to the stream channel.

At-risk aquatic species monitoring: Our understanding of the current distribution and population trends for many aquatic SGCN is quite limited. From 2003 to 2018, Nebraska Game and Parks Commission's Missouri River Program monitored riverine fish SGCN as part of pallid sturgeon recovery efforts. Modifications to that protocol have resulted in the removal of several sampling methods that could detect other SGCN; renewing those sampling efforts will allow researchers to evaluate the status of riverine SGCN. Game and Parks' Rivers and Streams program and Nebraska Department of Water, Energy, and Environment (NDWEE) inventory fish and aquatic invertebrates annually across the state. Efforts are underway to evaluate the effectiveness of using environmental DNA (eDNA) as it may be useful to prioritize sampling efforts. A comprehensive survey of freshwater mussels is greatly needed in the state; to date, most records are anecdotal. For other aquatic SGCN including aquatic plants, crayfish, fairy shrimp, and other macroinvertebrates, our understanding of the natural history of these species is severely limited. A long-term, standardized monitoring program is essential to track population trends, assess the effectiveness of management actions, and respond to emerging threats such as invasive species and climate-driven changes in flow and temperature regimes. Increased research on life history, habitat use, and reproductive success, especially for imperiled species, will help guide conservation efforts.

Increased emphasis on freshwater mussel conservation: With nearly half of Nebraska's extant freshwater mussel species identified as SGCN, coordinated conservation efforts are necessary to restore populations. Restorations involve many steps, including species prioritization, stream selection, and propagation. A Technical Committee comprised of biologists and researchers from Game and Parks and the University of Nebraska-Lincoln developed a *Nebraska Freshwater Mussel Restoration Plan* (NFMRP) in 2019 to help managers move forward with restorations and navigate complexities of the processes. The NFMRP provided a framework for mussel management and overall transparency of conservation, including the need to hire a state malacologist to coordinate, build, and run the mussel program. This plan needs to be reviewed and revised, and a malacologist needs to be hired to coordinate the plan and provide science-based direction to mussel culture staff to prioritize propagation and reintroduction efforts. A statewide mussel survey and inventory would also be needed to help update our current out-of-date information.

Identification and monitoring of barriers: The development of an aquatic connectivity team to inventory stream barriers statewide using protocols like those of the Southeast Aquatic Resources Partnership (SARP) can aid in determining which barriers could be removed or altered to promote SGCN fish passage or, conversely, where to maintain barriers to prevent passage by aquatic non-native and invasive species. Studying the movement patterns of aquatic SGCN in response to habitat alteration could be used to inform stream restoration planning.

Habitat suitability models and management plans: Many aquatic systems across the state have been degraded to a point that native aquatic SGCN have been extirpated from historic parts of their distribution. Combining historic data with recent data, researchers have

begun to develop early models for predicting estimated occupancy and likelihood for species presence, while also determining environmental factors that may influence species distributions across river basins. These models allow researchers to predict where populations may still exist or where reintroduction would be most successful. Collaborations with state hatcheries could aid in reintroducing or augmenting populations of aquatic SGCN into these suitable systems.

Propagation and reintroduction of aquatic SGCN: As many aquatic SGCN populations have experienced significant declines, intervention via reintroductions and population augmentation may be necessary for recovery. Through collaborations and networking with other hatcheries across the country, techniques can be developed and refined to propagate aquatic SGCN in captivity.

Habitat improvement along the Missouri River: Many native species, including the endangered pallid sturgeon, rely on diverse and dynamic river habitats that have been lost or degraded due to decades of channelization, dam construction, and flow regulation. Reconnecting the river to its floodplain, restoring side channels, and reintroducing shallow-water habitats are critical for supporting spawning, nursery, and foraging needs. Continued engagement with state and federal partners is needed to recover some of the lost aquatic and terrestrial habitats.

Assess movement patterns and the effect of fish passage structures on fish SGCN: Fish movement patterns vary depending on the species, time of year, and availability of suitable habitat. Evaluating when, where, and how far fish move can aid in determining how barriers could impact the persistence of a population. The installation of fish passage structures has recently been implemented in Nebraska, but their use by fish SGCN still needs to be studied.

Improved communication with stakeholders and the public: Collaborative efforts among federal and state agencies, tribes, nongovernmental organizations, and local stakeholders will be vital to ensure coordinated implementation of recovery and management strategies. Advancing public education and stakeholder engagement will be important for fostering support for stewardship and sustainable use of aquatic systems into the future.

Impact of aquatic non-native and invasive species: Many aquatic systems have been colonized by non-native and invasive species. In addition to preventing the spread of these species and eradicating them from existing locations, it is important to assess how their presence or absence impacts native SGCN.

Monitor ecological stream function: Due to significant alterations to stream conditions, it is important to measure the availability of water and microhabitat and the movement and transportation of sediment. By collecting this baseline data, researchers can evaluate variances from normal hydrological conditions.

Genetic analyses of aquatic SGCN: Volatile environmental conditions and anthropogenic changes have significantly altered the connectivity of aquatic systems. The results of such fragmentation have likely influenced gene flow across populations. Assessing and

maintaining genetic diversity is imperative for sustaining healthy and resilient SGCN populations. Additionally, with potential hybridization of aquatic species, genetic analyses are needed to differentiate between hybrids and non-hybrids and their prevalence in various systems across the state.

Priority Watersheds for Conservation

One shortcoming of the Biologically Unique Landscapes (BULs) since the first edition of the Nebraska Natural Legacy Project has been their terrestrial focus. While nine of the current BULs do include larger riverine systems, they are simply buffered from the main river channel and do not include important tributaries and other systems that are necessary spawning habitats for many aquatic SGCN. Additionally, because of the connectedness among aquatic systems, the protection of headwaters, tributaries, and upstream habitats can be imperative for overall water quality and the health of the system.

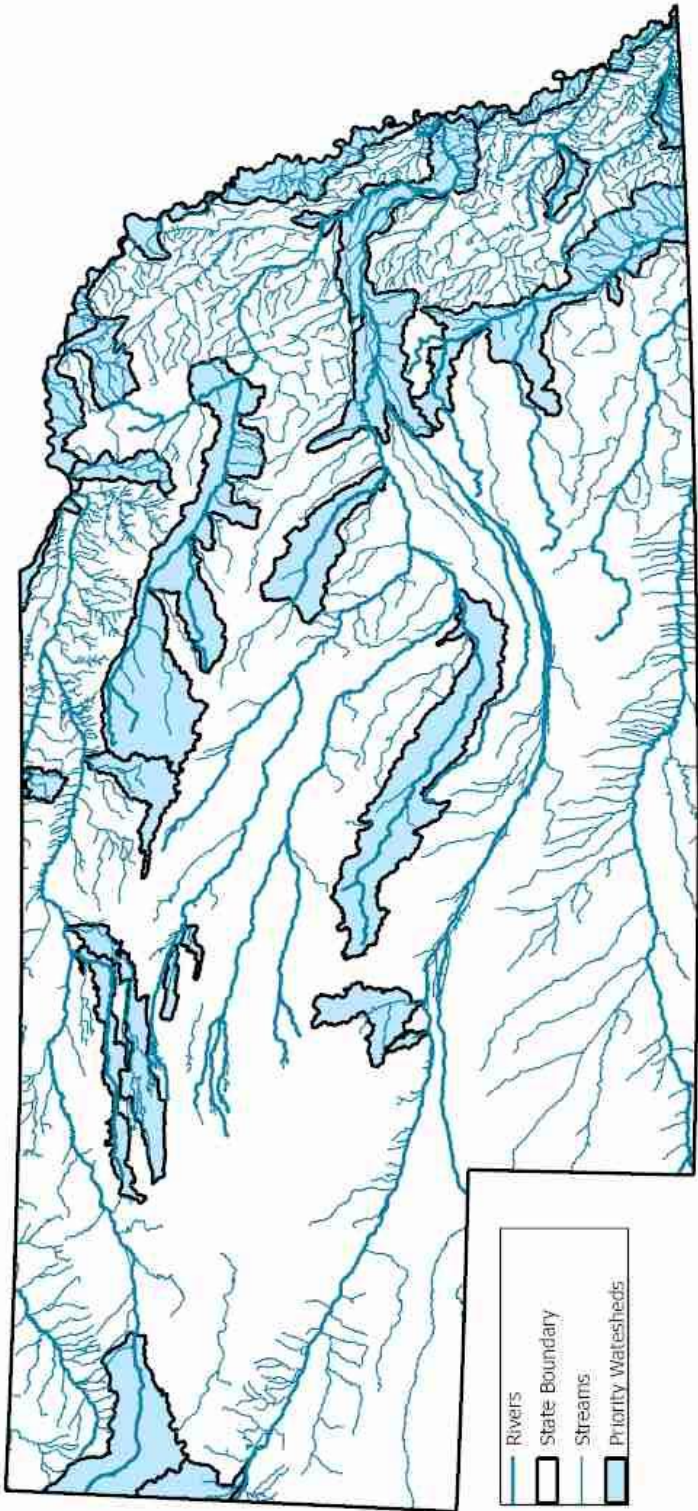
In this third edition of the Nebraska Natural Legacy Project, we attempted to address this issue by identifying priority waterways for at-risk species conservation. These differ from the BULs because the focus will be placed on the aquatic systems rather than the entire land area depicted within the boundary. Additionally, some segments of these systems have low diversity or abundance of SGCN; however, the conservation of the larger watershed is intended to improve the entire system and thereby the SGCN that occur there.

In the fall of 2024, a team of aquatics system experts (hereafter the Aquatics Team) was formed to determine the criteria for establishing priority waterways and the spatial scale at which they would be assessed. They determined that the Hydrological Unit Code (HUC) 10 was the most effective scale to use. From there, the Aquatics Team was tasked with identifying candidate waterways in the state for at-risk species conservation. They considered a variety of factors including SGCN richness, habitat quality, connectivity, and flow when making these determinations. Once identified, those systems were mapped and distributed to the Nebraska Chapter of the American Fisheries Society for comments and opinions.

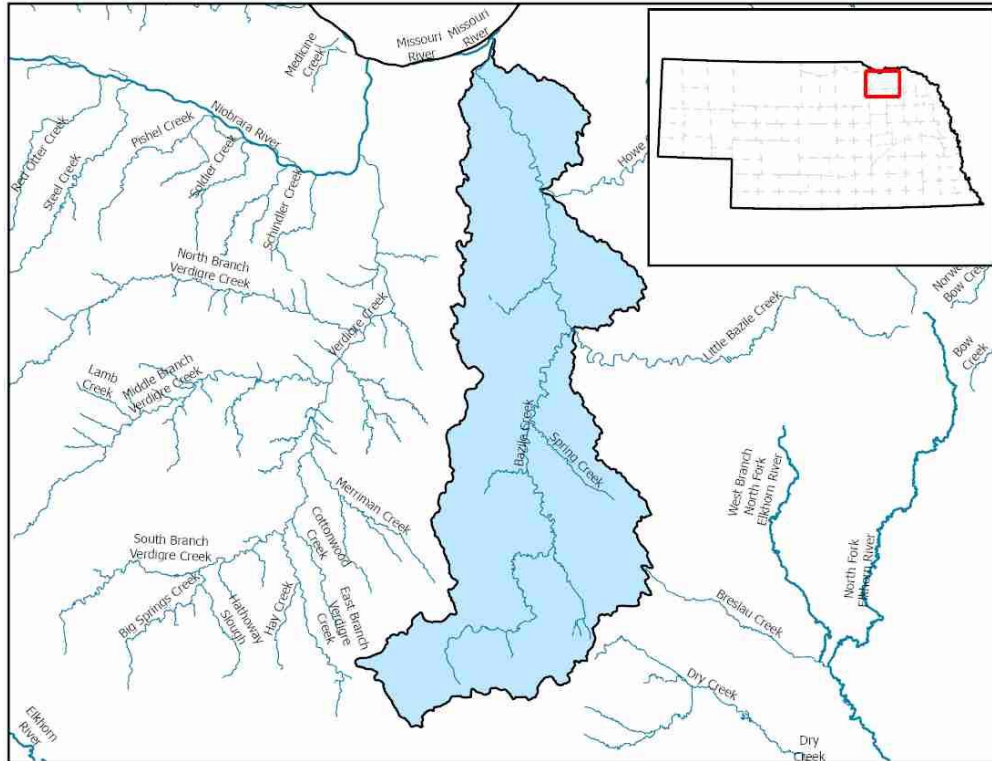
In February 2025, the Aquatics Team met to review the feedback and make final determinations of which waterways to include as Priority Watersheds in the third edition of the Nebraska Natural Legacy Project. In total, 63 HUC10 watersheds were accepted by the Aquatics Team (see map below). Three systems, Big Creek, East Clear Creek, and Pass Creek, were buffered at the HUC12 level due to their smaller size. For large river systems (Big Blue with West Fork of Big Blue, Elkhorn, Lower Platte, Missouri), we asked local experts to identify stretches (at the HUC12 level) that were most significant for at-risk species. These included areas with important spawning habitat, locations where mussel reintroductions were ongoing, or places where ongoing habitat work was already taking place.

This new chapter will include information about the priority watersheds in a similar format as the BULs (description, at-risk species, threats, and conservation actions). There will likely be overlaps with some of the current BULs; however, these watersheds will not be mapped together with the BULs. Instead, there will be separate maps for depicting the priority watersheds.

Priority Watersheds



Bazile Creek



Priority Watershed Description

The Bazile Creek watershed includes one HUC10 unit. This watershed flows north, from its headwaters near Brunswick on Highway 20 to its confluence at the Missouri River, where it is a major tributary to the larger river system. The habitat quality in this system is average to high with good sinuosity and riffle/run/pool sequences. The substrate is sand in most areas with some gravel cobble in the upstream reaches. The system is well connected with few barriers and a good connection to the surrounding floodplain. Continued collaborations with the Santee Sioux Nation and local landowners could help improve and maintain this high-quality system.

Stresses Affecting the Watershed

- Aquatic non-native and invasive species present in the system.
- Agricultural runoff and other forms of pollution.

Conservation Strategies

- Control the spread of phragmites throughout with herbicide application.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Identify opportunities to reintroduce native aquatic species.

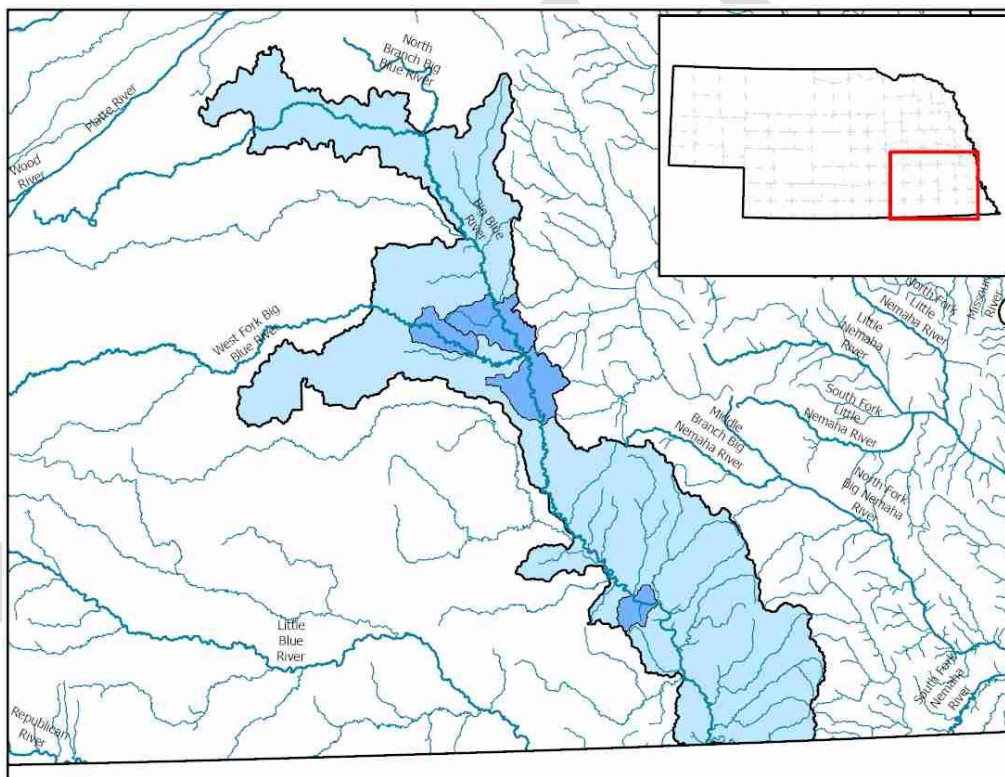
- Preserve existing habitats to sustain current aquatic SGCN community assemblage.
- Identify direct source areas that consistently exceed state regulation limits (Total Maximum Daily Loads TMDLs - NDWEE's Integrated Reports) and determine areas where there is overlap with at-risk species distribution.

Species of Greatest Conservation Need

Tier 1: Flathead Chub, Northern Pearl Dace, Plains Topminnow

Tier 2: Bluntnose Minnow, Common Shiner, Western Blacknose Dace

Big Blue with West Fork Big Blue River



Priority Watershed Description

The Big Blue River watershed consists of seven HUC10 units extending from Osceola to the Kansas border. This system also includes the confluence of the West Fork Big Blue River. While the system has been highly modified resulting in an entrenched system with poor water quality and clarity, it historically boasted a significant number of aquatic SGCN and has been a focal area for freshwater mussel reintroduction efforts. Due to the challenges associated with dams, poor access, highly incised banks, and poor water quality, full-scale restoration of the system would be very difficult, but with the success and continuation of mussel reintroduction efforts, the system represents one of the best opportunities to conserve and restore populations in

southeastern Nebraska. At present, the area also does not have invasive zebra mussels, but monitoring efforts should continue.

Spotlight Areas

Four HUC12 units are highlighted within this system for their significance to at-risk species conservation. Beginning in 2018, reintroduction efforts began for the plain pocketbook and the fatmucket on Game and Parks properties and city grounds.

Stresses Affecting the Watershed

- Aquatic non-native and invasive species present in the system.
- Agricultural runoff.
- High alteration from dams.

Conservation Strategies

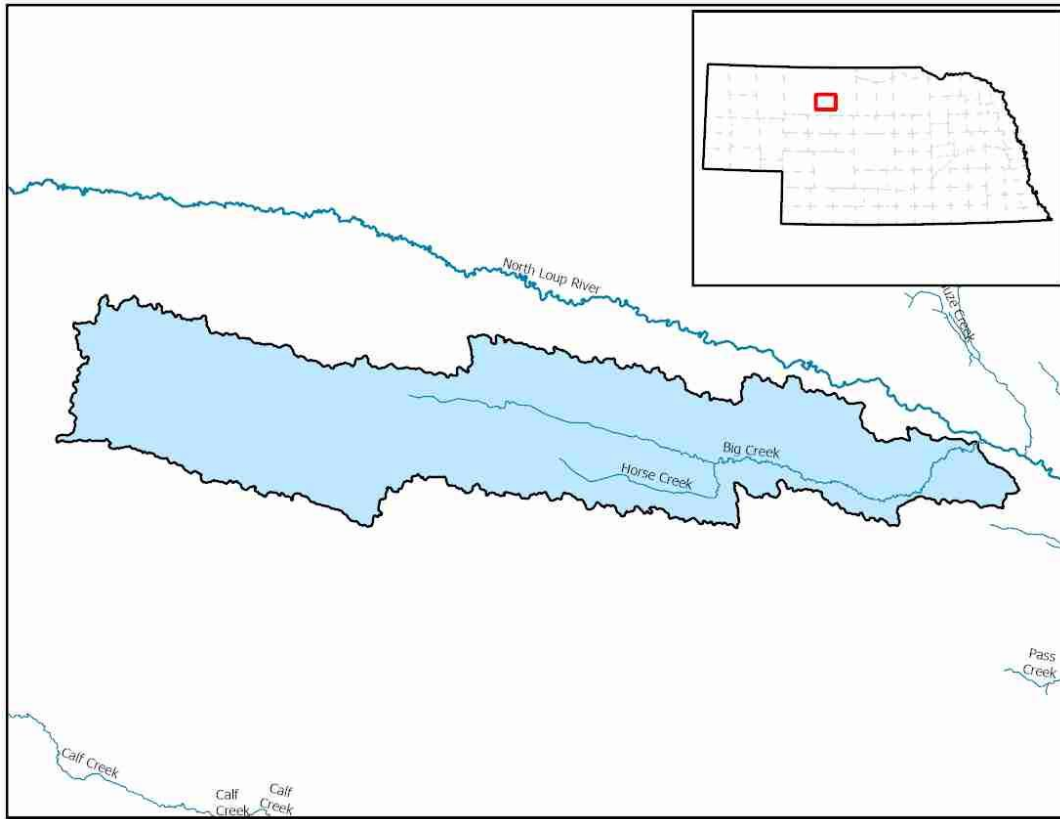
- Continue to monitor for the presence of zebra mussels and take measures to prevent them from entering the system.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Conduct surveys of tributaries to identify important areas for SGCN conservation.
- Continue to monitor the distribution and abundance of naturally occurring and reintroduction/population augmentation stocking of freshwater mussels.

Species of Greatest Conservation Need

Tier 1: Fatmucket, Pistolgrip, Plain Pocketbook, Western Prairie Fringed Orchid, Yellow Sandshell

Tier 2: Bluntnose Minnow, Common Shiner, Tadpole Madtom

Big Creek



Priority Watershed Description

The Big Creek watershed is a tributary of the North Loup River and contains two waterways: Big Creek and Horse Creek. It consists of a single HUC12 unit. This is a very sinuous, high-quality system with lateral pools and instream vegetation that flows predominantly through open rangeland. Occurring in the sandhills, this system contains a high diversity of glacial relict fish SGCN. Overall, the system is largely intact; maintaining the system should allow SGCN to persist.

Stresses Affecting the Watershed

- Dredging and channelization of headwater wet meadows.

Conservation Strategies

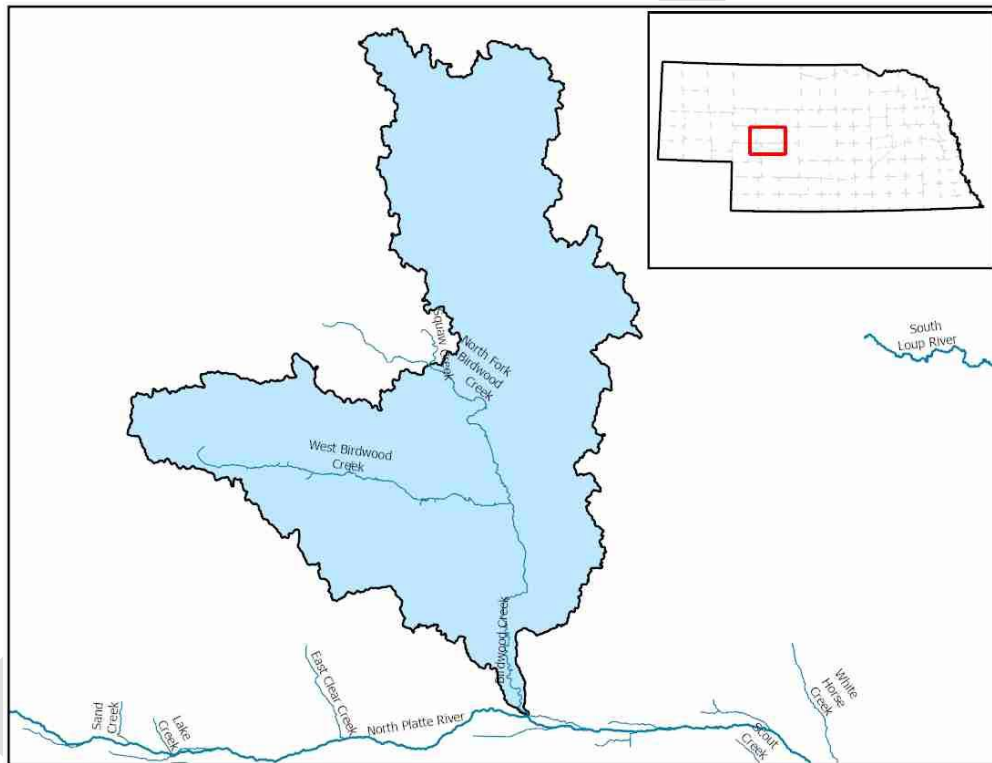
- Work collaboratively with local landowners to maintain the watershed in a high-quality state.
- Revegetate bare stream banks in the areas where they occur.

Species of Greatest Conservation Need

Tier 1: Blacknose Shiner, Finescale Dace, Flathead Chub, Northern Pearl Dace, Northern Redbelly Dace, Plains Topminnow, Topeka Shiner

Tier 2: Clammy Hedge-hyssop, Loesel's Twayblade, Marsh-St. John's-wort, Northern Adder's-tongue, Pennsylvania Bitter Cress, Slender Cotton-grass, Spiked Muhly, Water Sedge, Western Blacknose Dace, Yellow Marsh-marigold

Birdwood Creek



Priority Watershed Description

The Birdwood Creek is a tributary of the North Platte River between Lake McConaughy and North Platte. It consists of a single HUC10 unit which encompasses Birdwood Creek, West Birdwood Creek, and the North Fork Birdwood Creek ending at its confluence with Squaw Creek. This spring-fed system contains excellent in-stream habitat with submergent vegetation present. Barriers in the form of road crossings are low in number and present few obstacles for the species that occupy the system. While the presence of SGCN richness is low, this system was selected as it is one of few in the state that has been maintained close to its natural state. Wetland restoration work is currently occurring in the system and conservation actions should be minimal if current land use in the area is maintained.

Stresses Affecting the Watershed

- Aquatic non-native and invasive species present in the system.

- Potential threat of invasive silver carp and bighead carp entering the system from the Platte River.

Conservation Strategies

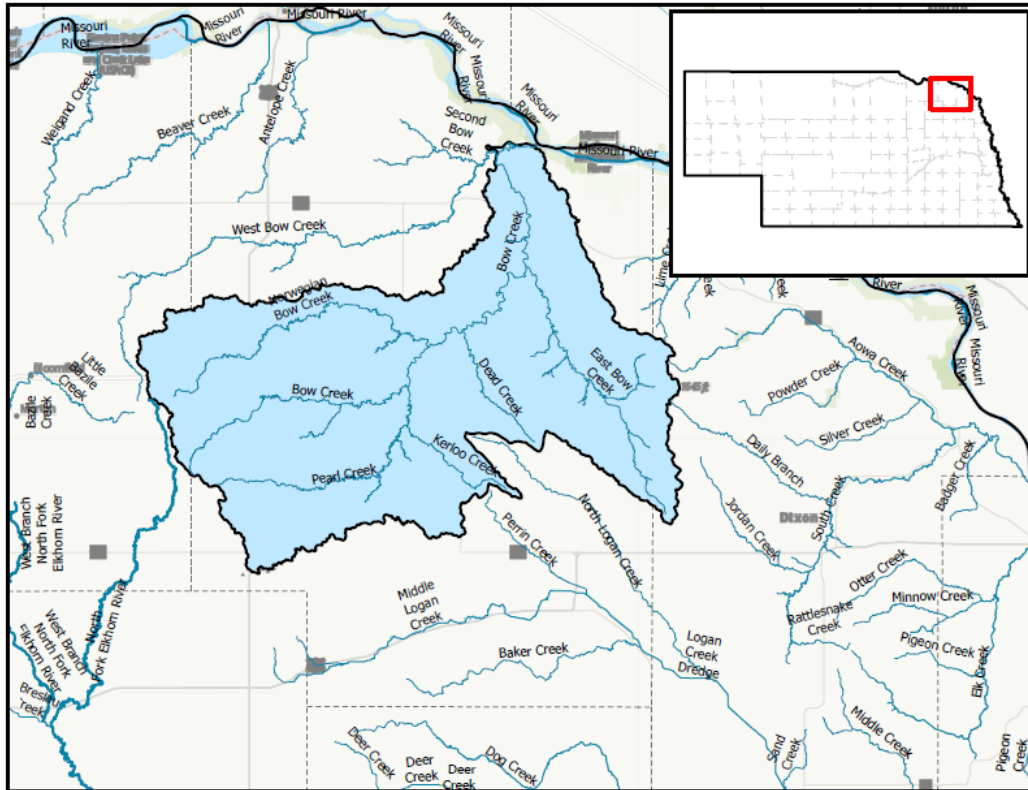
- Implement efforts to remove non-native and invasive species from the system.
- Continue monitoring the spread of silver and bighead carp through larger river systems.
- Work collaboratively with local landowners to maintain the watershed in a high-quality state.
- Revegetate bare stream banks in the areas where they occur.
- Survey to evaluate how ongoing conservation efforts impact the distribution and presence of aquatic SGCN.

Species of Greatest Conservation Need

Tier 1: Plains Topminnow

Tier 2: Longnose Sucker

Bow Creek



Priority Watershed Description

The Bow Creek Watershed is one of the larger, undammed tributaries on the Nebraska side of the unchannelized 59-mile stretch of the Missouri River. As such, it may provide vital spawning habitat for fish SGCN that depend on the free-flowing stretch of the Missouri below Gavins Point Dam. The single HUC10 unit contains Bow Creek, East Bow Creek, Norwegian Bow Creek, Pearl Creek, Kerloo Creek and Dead Creek. This system supports an important stronghold population of Flathead Chub and represents the eastern periphery of robust plains topminnow populations. The lower Bow has mostly formed a new floodplain bench, regaining some of the function of a connected floodplain, even within an agriculturally dominated landscape. The Bow also lacks any small dams and reservoirs, and so it is a highly connected system. Any barriers to upstream movement would likely exist as road culvert crossings.

The Bow Creek Watershed is also a priority focus of the Lewis and Clark Natural Resources District, which brings together resources from NDWEE, NRCS, and Game and Parks to focus on education and implementation of best management practices (from soil health to buffer strips) to improve watershed health. Annual education events are hosted in partnership between Game and Parks, the LCNRD, and local NRCS offices with local high schools, UNL Agronomy students, and local producers creating opportunities for Nebraska residents of all ages to understand stream health and interact with at-risk fish species annually.

Stresses Affecting the Watershed

- Aquatic non-native and invasive species present in the system.
- Spread of invasive silver and bighead carp from the Missouri River.
- Agricultural runoff and pollution.

Conservation Strategies

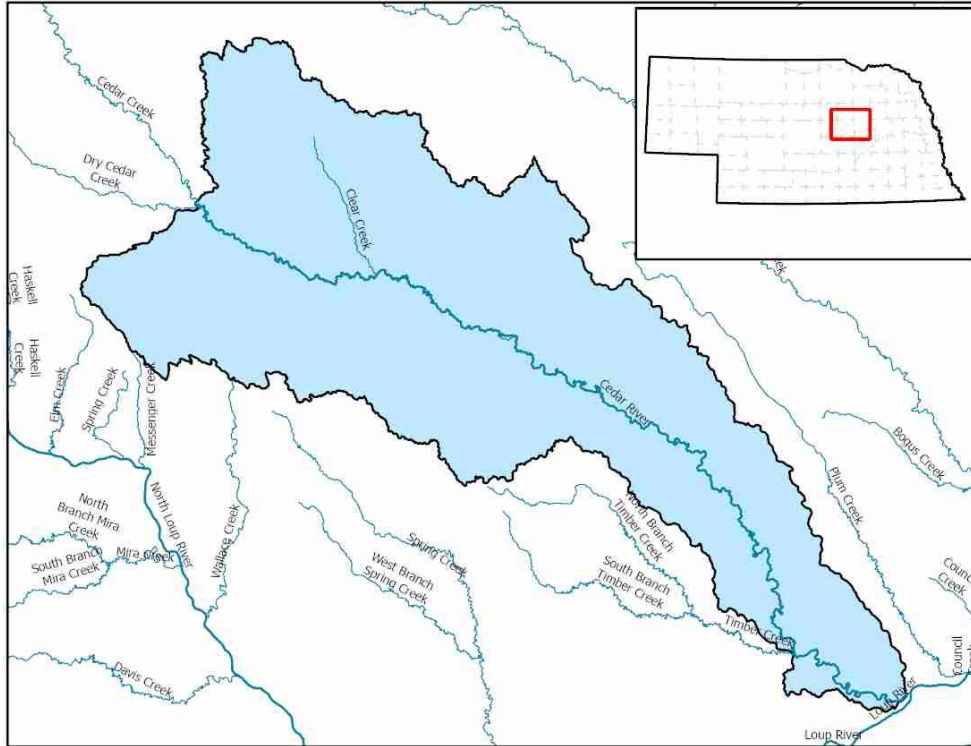
- Implement efforts to remove non-native and invasive species from the system.
- Continue monitoring the spread of silver and bighead carp through larger river systems.
- Work collaboratively with local landowners to maintain the watershed in a high-quality state.
- Revegetate bare stream banks in the areas where they occur.
- Collaborate with local towns community groups to provide education on the importance of the watershed management. Identify direct source areas that consistently exceed state regulation limits (Total Maximum Daily Loads TMDLs - NDWEE's Integrated Reports) and determine areas where there are overlap with at-risk species distribution.

Species of Greatest Conservation Need

Tier 1: Flathead Chub, Plains Topminnow

Tier 2: Blue Sucker, Bluntnose Minnow, Western Blacknose Dace

Cedar River



Priority Watershed Description

The Cedar River Priority Watershed includes three HUC10 units from its confluence with Dry Cedar Creek to the Loup River. The highly sinuous system is well connected to the floodplain and has few barriers impeding fish movement. Once such barrier, Spalding Dam, currently has a fish bypass system which has been used quite effectively. The incorporation of a second fish bypass system at Ericson Dam would greatly improve connectivity. Overall, the watershed is in good condition where, if best management practices were implemented, it could support a diversity of SGCN. Because of its recreational use, collaborative efforts with local towns could provide educational opportunities for the significance of this system to SGCN conservation.

Stresses Affecting the Watershed

- Stream fragmentation and alteration.

Conservation Strategies

- Maintain the natural state of the system and install culverts that allow for fish passage to maintain the connectivity of the system.
- Build fish bypass systems to allow for connectivity between large dams.
- Work collaboratively with local landowners to maintain the watershed in a high-quality state.

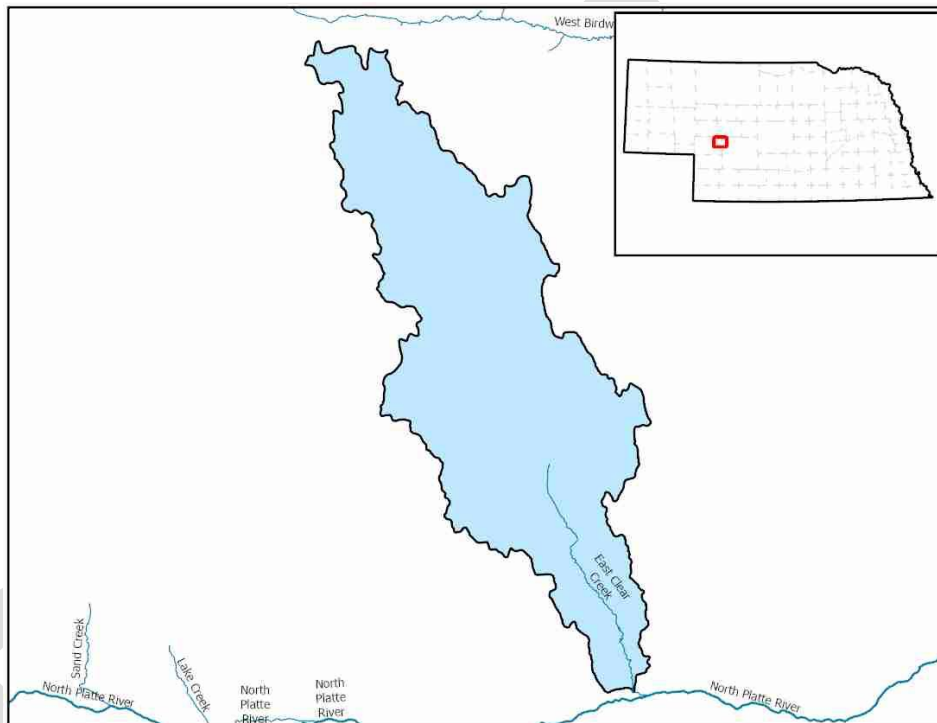
- Collaborate with local towns to provide education on the importance of the watershed.

Species of Greatest Conservation Need

Tier 1: Blanding's Turtle, Flathead Chub, Plains Topminnow, Two-lined Stonefly

Tier 2: Clammy Hedge-hyssop

East Clear Creek



Priority Watershed Description

The East Clear Creek Watershed consists of one HUC12 extending from its headwaters in the Sandhills to its confluence with the North Platte River northwest of Sutherland Reservoir. The system has high quality habitat and low barrier density. Despite being a small, sinuous stream, it is unique in that fish SGCN documented in the system are more typically found in the Niobrara and Loup River basins. As a result, these may represent disjunct populations in the state. Because of its short length, collaboration with the few local landowners could help to maintain the system and allow for these SGCN to persist.

Stresses Affecting the Watershed

- Aquatic non-native and invasive species present in the system.

- Agricultural runoff.

Conservation Strategies

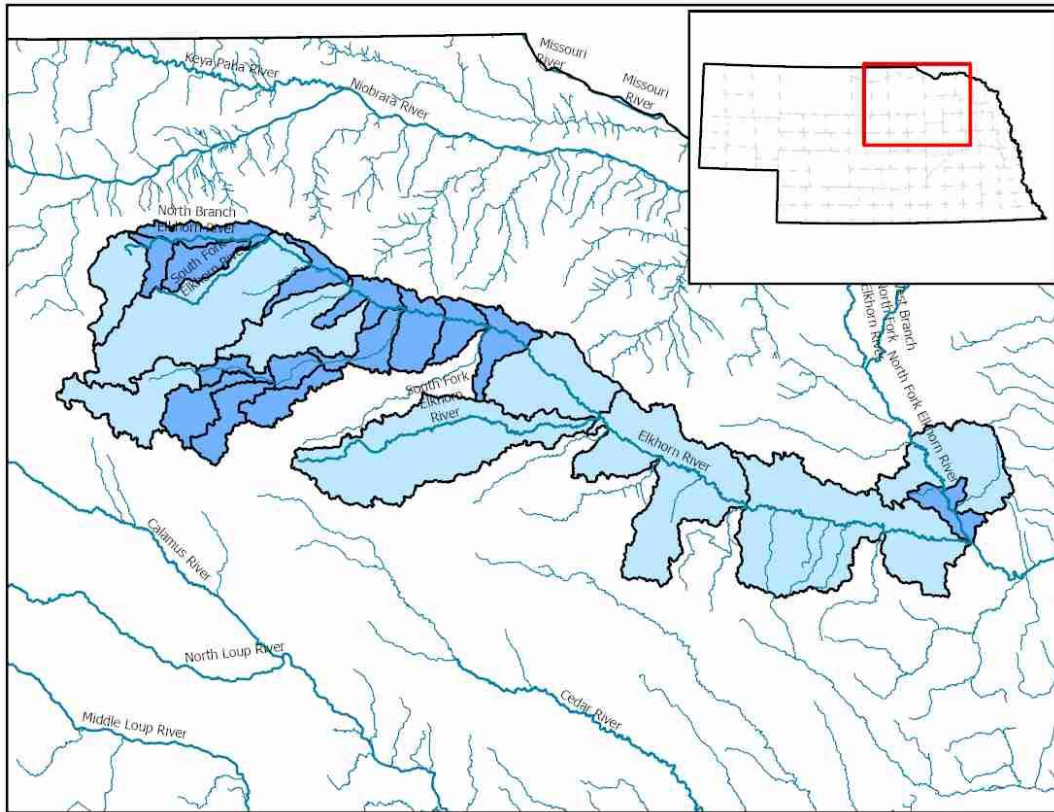
- Implement efforts to remove non-native and invasive species from the system.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Work collaboratively with local landowners to maintain the watershed.
- Continue to monitor aquatic SGCN populations in the system.

Species of Greatest Conservation Need

Tier 1: Finescale Dace, Northern Pearl Dace, Northern Redbelly Dace, Plains Minnow, Plains Topminnow, Western Silvery Minnow

Tier 2: Beaked Spikerush, Longnose Sucker, Silverweed

Elkhorn River



Priority Watershed Description

The Elkhorn River Watershed contains nine HUC10 units from its headwaters to its confluence with the North Fork Elkhorn River at Norfolk. Another stretch of the lower Elkhorn River Watershed is also identified as a Priority Watershed, but it is grouped with the Lower Platte River due to its significance to larger riverine SGCN.

This system appears to be significant for *Hybognathus* and *Macrhybopsis* species, bluntnose minnow, Iowa and Johnny darters, and plains topminnow which can be abundant in certain tributaries. The river and its tributaries also boast numerous and diverse mussel records for that part of the state. The presence of multiple Wildlife Management Areas (WMAs) along the river allow for access to potential have mussel reintroduction efforts in the northeastern part of the state.

Spotlight Areas:

Fifteen HUC12 units are highlighted within this system for their significance to at-risk species conservation. Several reaches along the Elkhorn River have been significant to mussel SGCN, such as the plain pocketbook. Holt Creek has seen recent freshwater mussel stocking efforts. The upper end of the Elkhorn River between Newport and Bassett contains numerous groundwater-driven wetlands and headwater streams. The amount of surface water in these

areas are significant to several aquatic SGCN including fish and Blanding's turtles as well as migratory water birds. In the middle to upper Holt Creek, there are opportunities to restore hydrology to streamside meadows. Such efforts could improve aquatic habitats while also improving hay and forage production on working lands.

Stresses Affecting the Watershed

- Aquatic non-native and invasive species present in the system.
- Potential threat of invasive silver and bighead carp entering the system.
- Agricultural runoff and other forms of pollution.
- Lake impoundment.
- Water availability — protection from in-stream water withdrawals.

Conservation Strategies

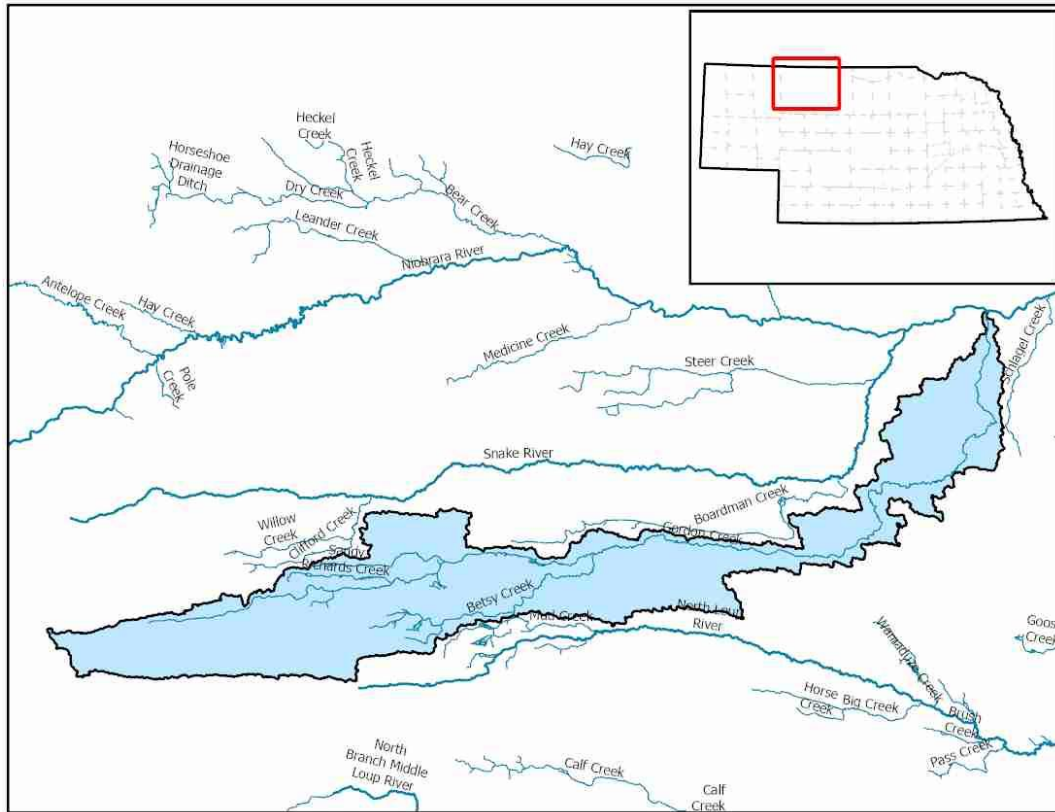
- Continue monitoring the upstream movement of silver and bighead carp, along with other aquatic non-native and invasive species, through larger river systems.
- Implement efforts to remove non-native and invasive species from the system.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Work collaboratively with local landowners to maintain the watershed.
- Continue to monitor aquatic SGCN populations in the system.
- Continue to monitor the distribution and abundance of naturally occurring freshwater mussels and explore opportunities for mussel reintroduction and population augmentation efforts.
- Identify direct source areas that consistently exceed state regulation limits (Total Maximum Daily Loads TMDLs - NDWEE's Integrated Reports) and determine areas where there are overlap with at-risk species distribution.
- Collaborate with local water users to maintain minimum stream base-flows or pursue in-stream flow rights.

Species of Greatest Conservation Need

Tier 1: Flathead Chub, Plain Pocketbook, Plains Minnow, Plains Topminnow, Shoal Chub, Small White Lady's Slipper, Western Prairie Fringed Orchid, Western Silvery Minnow

Tier 2: Bluntnose Minnow, Brown Bog Sedge, Common Shiner, Englemann's Flatsedge, Green-fruit Bur-reed, Inflated Sedge, Narrow-leaf Paleseed, Roundstem Agalinis, Smooth False Foxglove, Tadpole Madtom, Twisted Yellow-eyed-grass, White Water-lily, Yellow-fruit Sedge

Gordon Creek



Priority Watershed Description

The Gordon Creek Watershed is a Sandhills system consisting of two HUC10 units. This is a high-quality, heterogeneous system surrounded by grazing lands and prairie that is very sinuous in its lower reaches, while the headwaters and surrounding wet meadows have become channelized. The barrier density in the area is highly variable but mostly consists of road crossing culverts. Wetland restoration has been occurring within the system, but there are still areas that are degraded. This Sandhills system contains a high diversity of fish SGCN, but the presence of northern pike threatens their distribution and abundance.

Stresses Affecting the Watershed

- Stream fragmentation and alteration through ditching and culvert installation.
- Introduction of large predator species into the system.
- Hybridization of fish SGCN.
- Protection from in-stream water withdrawals.

Conservation Strategies

- Ditch mitigation.

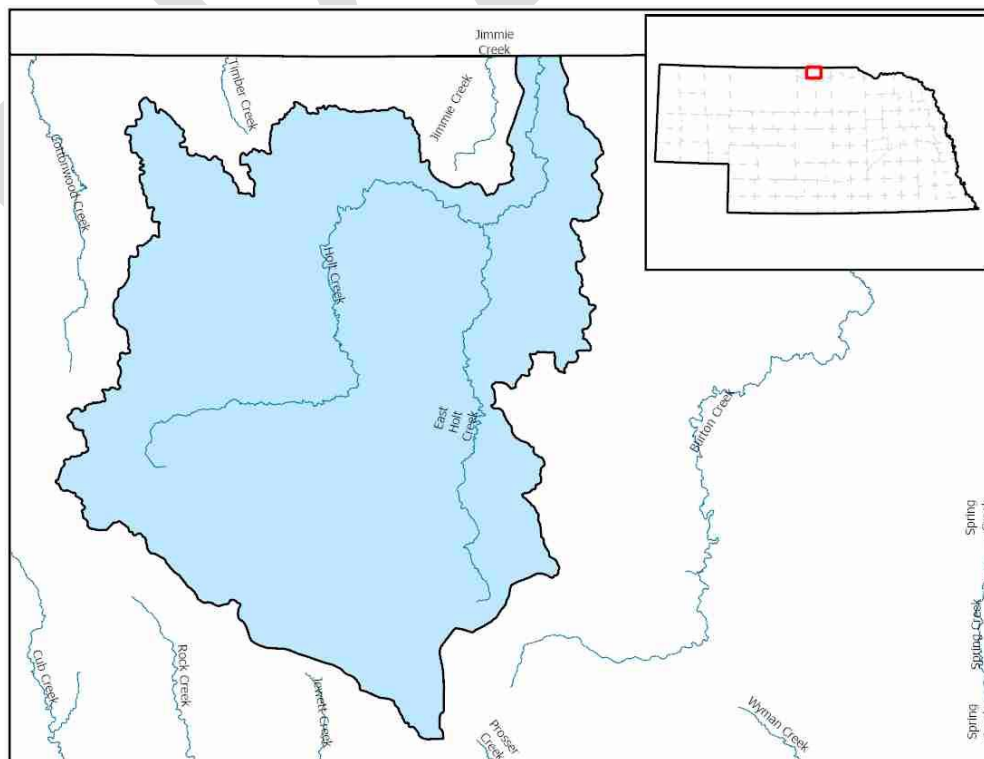
- Work collaboratively with local landowners to maintain the watershed in a high-quality state.
- Maintain the natural state of the system and install or correct culvert/stream crossings that improve fish passage and maintain connectivity of the system.
- Continue to monitor aquatic SGCN populations in the system.
- Continue monitoring the potential impact of large predator fish species in areas with high densities of SGCN.
- Develop genetic investigations to evaluate level of hybridization across SGCN distributions.
- Collaborate with local water users to maintain minimum stream base-flows or pursue in-stream flow rights.

Species of Greatest Conservation Need

Tier 1: Blacknose Shiner, Finescale Dace, Northern Pearl Dace, Northern Redbelly Dace, Plains Topminnow, Western Prairie Fringed Orchid

Tier 2: Bebb's Sedge, Englemann's Flatsedge, Green-fruit Bur-reed, Marsh-St. John's-wort, Mud Sedge, Northern Adder's-tongue, Northwest Territory Sedge, Pennsylvania Bitter Cress, Slender Cotton-grass, Streambank Ragwort, Water Sedge, Western Blacknose Dace, Yellow Marsh-marigold, Yellow Pond-lily

Holt Creek



Priority Watershed Description

The Holt Creek Watershed, consisting of one HUC 12, includes the entirety of Holt Creek and East Holt Creek, extending north to the South Dakota border where it empties into the Keya Paha River. The heterogeneous system is high quality with a sinuous, consistent flow. The area has few barriers and even fewer known threats. The system is in good condition as is and is one of the few known locations for Blacknose Shiner in the state. Given the condition of the system, status quo can be maintained to allow for the persistence of this and other SGCN.

Stresses Affecting the Watershed

- Potential threat of aquatic invasive species.
- Bank destabilization from cattle access.
- Hybridization of fish SGCN.

Conservation Strategies

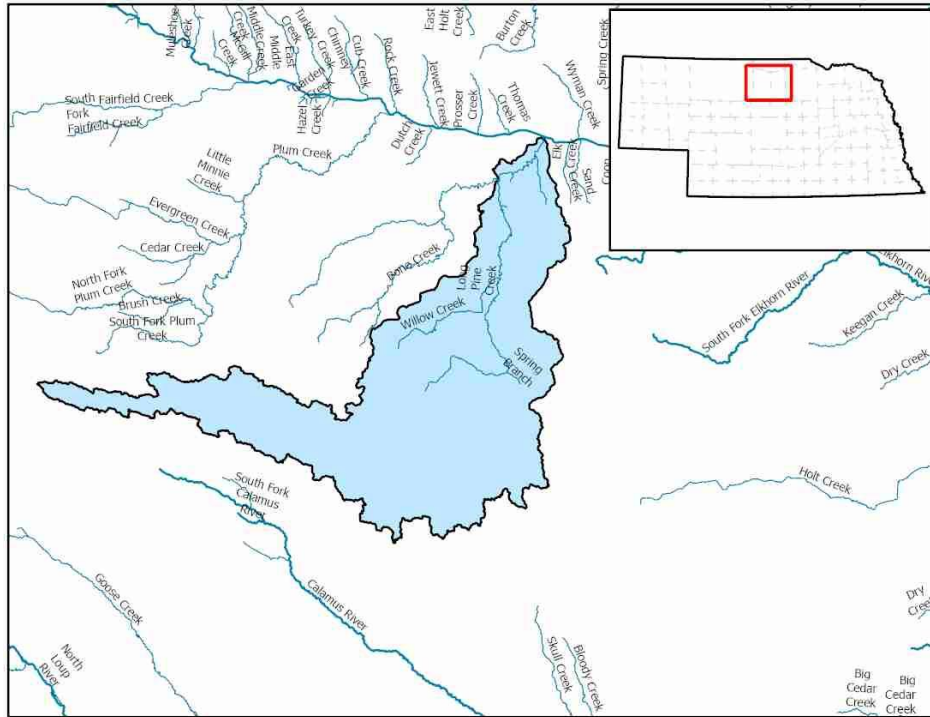
- Continue monitoring for aquatic invasive species presence.
- Work collaboratively with local landowners to maintain the watershed in a high-quality state.
- Continue to monitor aquatic SGCN populations in the system.
- Develop genetic investigations to evaluate level of hybridization across SGCN distributions.

Species of Greatest Conservation Need

Tier 1: Blacknose Shiner, Finescale Dace, Northern Pearl Dace, Northern Redbelly Dace, Plains Topminnow

Tier 2: Common Shiner, Plains Minnow, Western Blacknose Dace

Long Pine Creek



Priority Watershed Description

The Long Pine Creek Watershed incorporates Long Pine Creek, Short Pine Creek, and Willow Creek as they meet and flow into the Niobrara River. The high-quality system has high-water clarity and is heavily vegetated both in-stream and on its banks. The waterways are well buffered from agricultural lands by wooded riparian areas and pastureland. Long Pine Watershed Restoration Projects took place between 2020 and 2023, and the system is significant for Flathead Chub populations. This species uses Long Pine Creek for spawning runs coming from the Niobrara River.

Stresses Affecting the Watershed

- Aquatic non-native and invasive species present in the system.
- Agricultural runoff.

Conservation Strategies

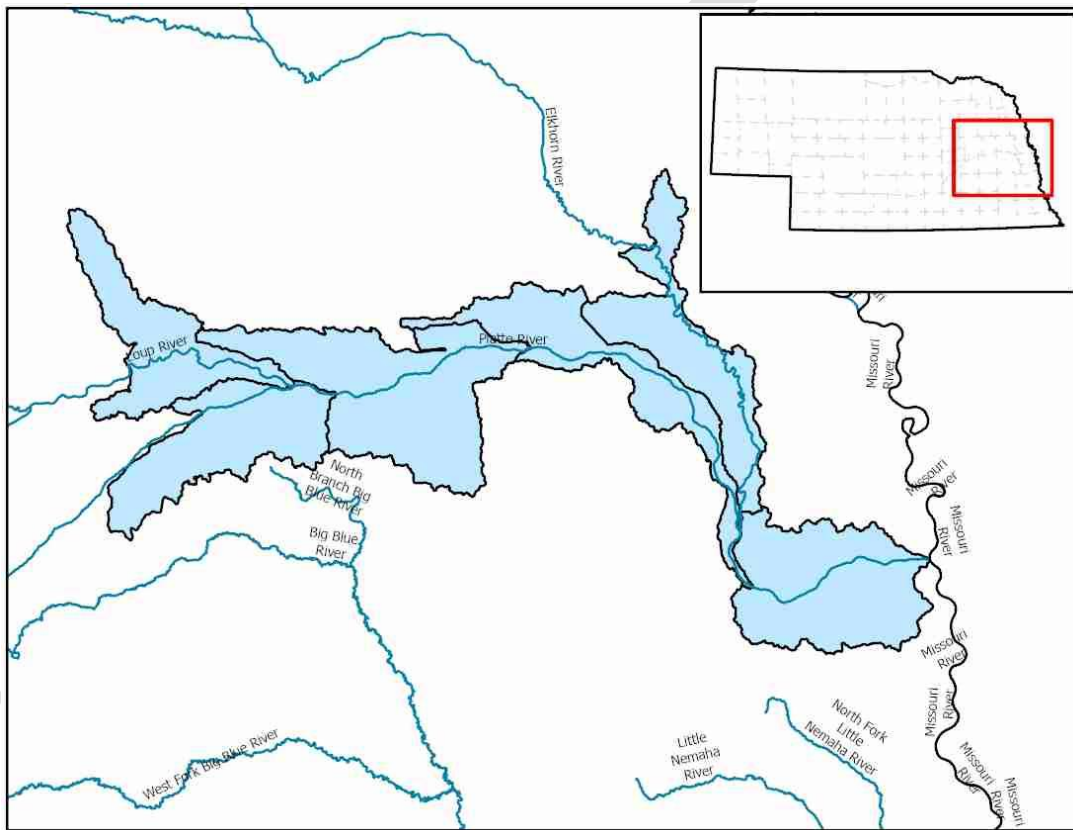
- Continue monitoring for aquatic non-native and invasive species presence.
- Work collaboratively with local landowners to maintain the watershed in a high-quality state.
- Continue to monitor aquatic SGCN populations in the system.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.

Species of Greatest Conservation Need

Tier 1: Flathead Chub, Northern Pearl Dace, Plains Topminnow

Tier 2: Englemann's Flatsedge, Green-fruit Bur-reed, Western Blacknose Dace

Lower Platte and Lower Elkhorn Rivers



Priority Watershed Description

This Priority Watershed includes six HUC10s, five on the Platte River and one on the Elkhorn River. The Platte River HUC extends from the confluence with the Elkhorn River to the Missouri River. The Elkhorn River HUC extends north to Nickerson. The system is characterized by its highly braided channels that provide spawning habitat for the federally endangered pallid sturgeon. Growing urbanization and poor buffering from agricultural land increase runoff and subsequent pollution, while high water demands lead to dewatering of the system.

Stresses Affecting the Watershed

- Aquatic non-native and invasive species present in the system.
- Presence of silver and bighead carp throughout the system.

- Agricultural runoff.
- Increased dewatering due to drought.
- Increased urbanization in the area.

Conservation Strategies

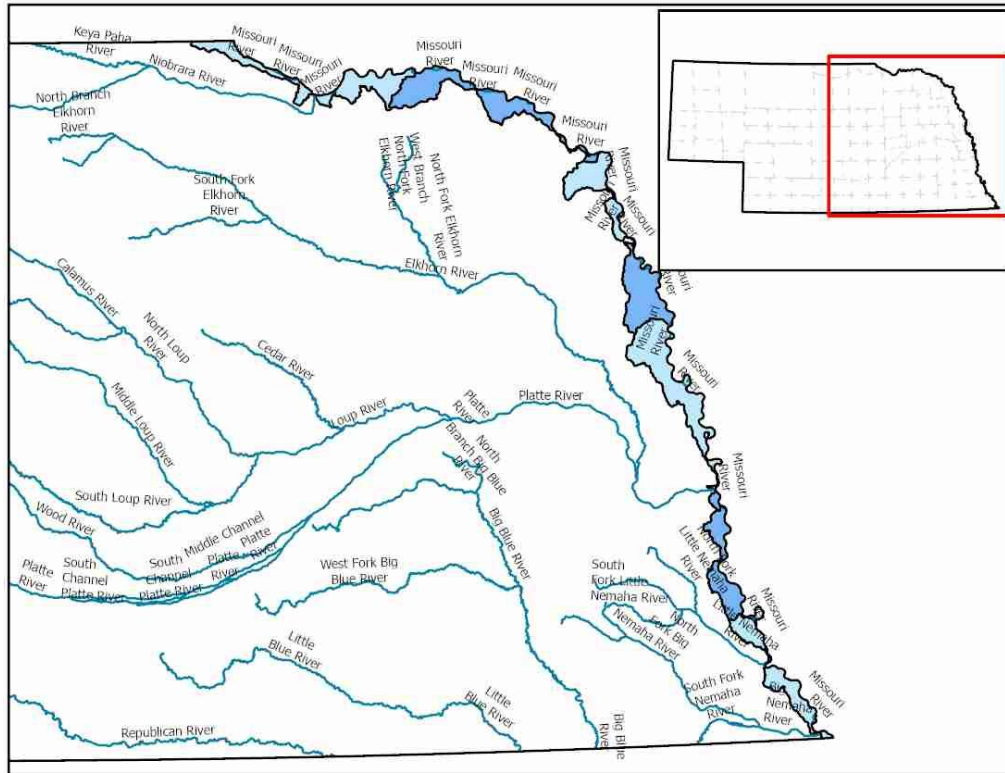
- Implement efforts to remove aquatic invasive species from the system.
- Identify tributaries that present important spawning habitat for pallid sturgeon and other fish SGCN.
- Continue to monitor aquatic SGCN populations in the system.

Species of Greatest Conservation Need

Tier 1: Flathead Chub, Lake Sturgeon, Pallid Sturgeon, Plains Minnow, Plains Topminnow, Shoal Chub, Small White Lady's Slipper, Sturgeon Chub, Western Prairie Fringed Orchid, Western Silvery Minnow

Tier 2: Blue Sucker, Canada Lousewort, Eastern Star Sedge, Floating Primrose-willow, Hooked Buttercup, Hop Sedge, Louisiana Waterthrush, Marsh Vetchling, Narrow-leaf Paleseed, Paddlefish, Spring Bitter Cress, Streambank Ragwort

Missouri River



Priority Watershed Description

Consisting of 17 HUC10s, the Missouri River Watershed is the largest of the Priority Watersheds but also boasts the highest diversity of aquatic SGCN in the state. The Missouri River, despite its size and historical significance, suffers from degraded habitat quality due to a variety of factors. Channelization for navigation has straightened and constricted the river, eliminating vital backwaters, side channels, and wetlands that once provided crucial spawning and nursery grounds for fish and other aquatic species. Dams along the river's course disrupt natural flow regimes, altering water temperature, sediment transport, and nutrient cycling, further impacting aquatic life. Agricultural runoff introduces pollutants like fertilizers and pesticides, contributing to algal blooms and oxygen depletion, while invasive species outcompete native organisms for resources. These combined stressors have significantly diminished the river's biodiversity and overall ecological health, impacting both wildlife and the ecosystem services it provides.

Historically, the Missouri River had dramatic seasonal fluctuations, with high flows in spring and early summer and lower flows in late summer and winter. However, the construction of numerous dams and reservoirs along the river has significantly altered this natural flow regime, reducing the river's natural variability and leading to a more consistent but less dynamic flow. This altered flow regime has impacts on the river's ecosystem, affecting fish populations, riparian habitats, and the overall health of the river.

The Missouri River supplies water for a multitude of uses. Its flow supports agriculture through extensive irrigation, enabling the production of crops in often arid regions. Municipalities rely on the river for drinking water, while industries utilize it for various processes. Furthermore, the system provides crucial habitat for aquatic life and supports recreational activities like boating and fishing. However, this heavy reliance on the river's water has led to competition and challenges, particularly during periods of drought. Army Corps of Engineers (ACOE) is authorized to maintain the channel for navigation.

The Missouri River along Nebraska's border is a dynamic and complex ecosystem with a patchwork of diverse habitats shaped by the river's flow and human modifications. Remnant channels, backwaters, and side chutes provide vital spawning and nursery grounds for numerous fish SGCN, while sandbars and islands offer nesting sites for bird SGCN. Riparian forests, though often fragmented, line the banks, offering shelter and food for a variety of wildlife. However, this complexity is often challenged by channelization, dams, and agricultural runoff, which have altered the river's natural flow and impacted water quality.

Spotlight Areas

Fifteen HUC12s are highlighted within this system for their significance to at-risk species conservation. Extensive effort has been put forth to identify river miles that are significant to the federally endangered pallid sturgeon. Areas where pallid sturgeon appear to congregate or where primary spawning areas have been identified include the following HUC12 watersheds: Beaver Creek, Horse Creek, Keg Creek, Lime Creek, and Tekamah Creek.

Stresses Affecting the Watershed

- Presence of aquatic invasive species, including bighead carp, silver carp, and zebra mussels.
- Agricultural runoff leading to sedimentation and pollution.
- Fragmentation and alteration due to dams and channelization.
- Removal of riparian vegetation.
- Increased urbanization in the area.
- Reduced flow due to drought and excess water use.

Conservation Strategies

- Implement efforts to remove aquatic invasive species from the system.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Plant and maintain riparian buffer zones to filter pollutants and stabilize shorelines.
- Implement stricter stormwater management practices and wastewater treatment upgrades to reduce point-source pollution.
- Promoting water conservation through efficient irrigation techniques and responsible residential use.

- Identify opportunities to collaborate among stakeholders, including landowners, municipalities, and state and federal agencies, to develop and implement comprehensive conservation strategies that balance human needs with the health of the Missouri River ecosystem.
- Identify tributaries that present important spawning habitat for pallid sturgeon and other fish SGCN.
- Continue to monitor aquatic SGCN populations in the system.

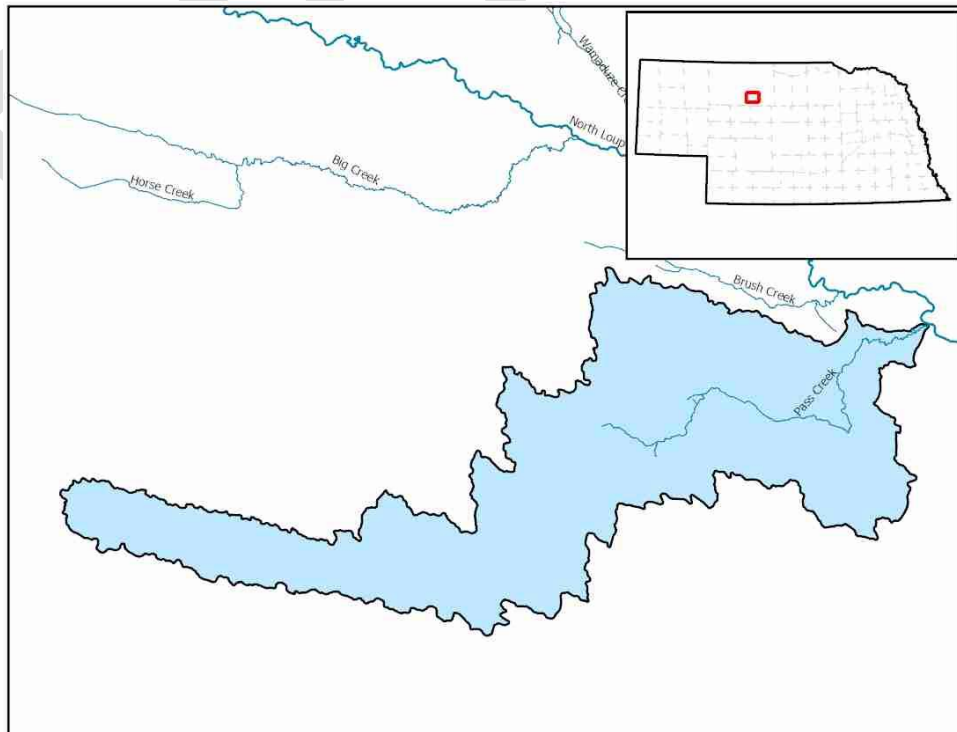
Species of Greatest Conservation Need

Tier 1: Flat Floater, Flathead Chub, Lake Sturgeon, Pallid Sturgeon, Plains Minnow, Plains Topminnow, Scaleshell Mussel, Shoal Chub, Sturgeon Chub, Western Prairie Fringed Orchid, Western Silvery Minnow, Yellow Sandshell

Tier 2: American Eel, Blue Sucker, Bluntnose Minnow, Bulblet Bladder Fern, Burbot, Canada Lousewort, Common Shiner, Eastern Star Sedge, Frank's Sedge, Frost Grape, Giant St. John's-wort, Graybark Grape, Hooked Buttercup, Nannyberry, Paddlefish, Raven Foot Sedge, Red-eared Slider, Sharpwing Monkey-flower, Spring Aven, Tadpole Matom, Threeridge, Western Blacknose Dace, Zigzag Goldenrod

Pass Creek

Priority Watershed Description



The Pass Creek Watershed consists of a single HUC12 unit in southern Cherry County. Despite its short length, this Sandhills tributary of the North Loup River contains a diverse array of glacial relict SGCN. The system has high sinuosity and few barriers while being surrounded by rangeland and hayed wet meadows. The federally endangered Topeka shiner has been found in nearby systems.

Stresses Affecting the Watershed

- Potential threat of aquatic invasive species
- Stream fragmentation and alteration

Conservation Strategies

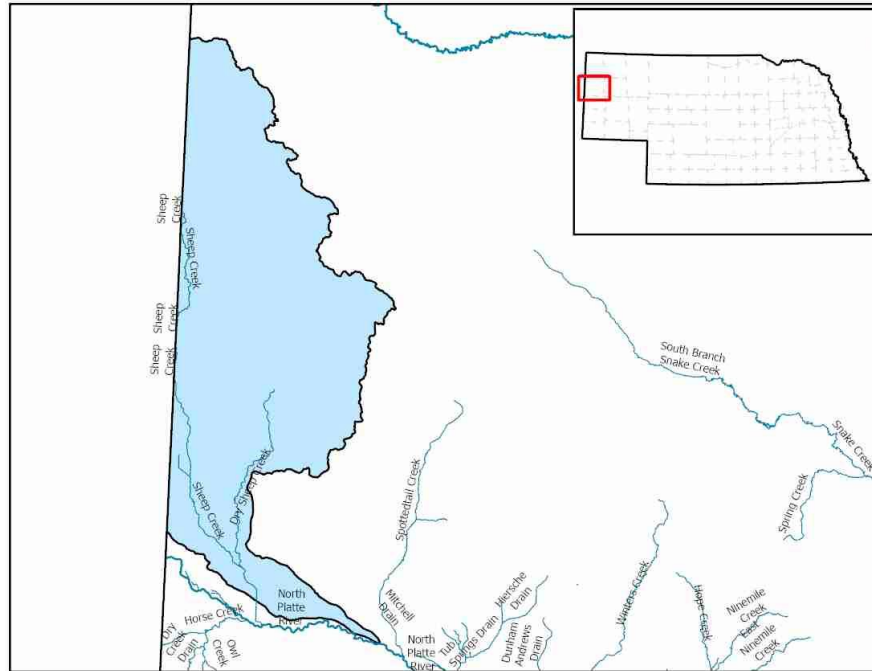
- Continue monitoring for aquatic invasive species presence
- Maintain the natural state of the system and install culverts that allow for fish passage to maintain the connectivity of the system
- Continue to monitor aquatic SGCN populations in the system

Species of Greatest Conservation Need

Tier 1: Blacknose Shiner, Finescale Dace, Northern Pearl Dace, Northern Redbelly Dace, Plains Minnow, Plains Topminnow, Topeka Shiner, Western Prairie Fringed Orchid

Tier 2: American Eelgrass, Western Blacknose Dace

Sheep Creek



Priority Watershed Description

The Sheep Creek Watershed consists of one HUC10 extending from the Nebraska-Wyoming border to the North Platte River south of Mitchell. It contains Sheep Creek and Dry Sheep Creek, which flow into the North Platte River west of Morrill. The system flows larger and longer than the nearby Dry Spottedtail Creek. It also contains aquatic vegetation that supports fish SGCN by providing habitat and protection from predatory trout. Because the surrounding land area is mostly range and pastureland, implementing best management practices to conserve water and prevent agricultural runoff will be imperative.

Stresses Affecting the Watershed

- Aquatic non-native and invasive species present in the system.
- Stream channelization.
- Agricultural runoff.

Conservation Strategies

- Maintain the natural state of the system and install culverts that allow for fish passage to maintain the connectivity of the system
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Work collaboratively with local landowners to maintain the watershed.
- Continue to monitor aquatic SGCN populations in the system.

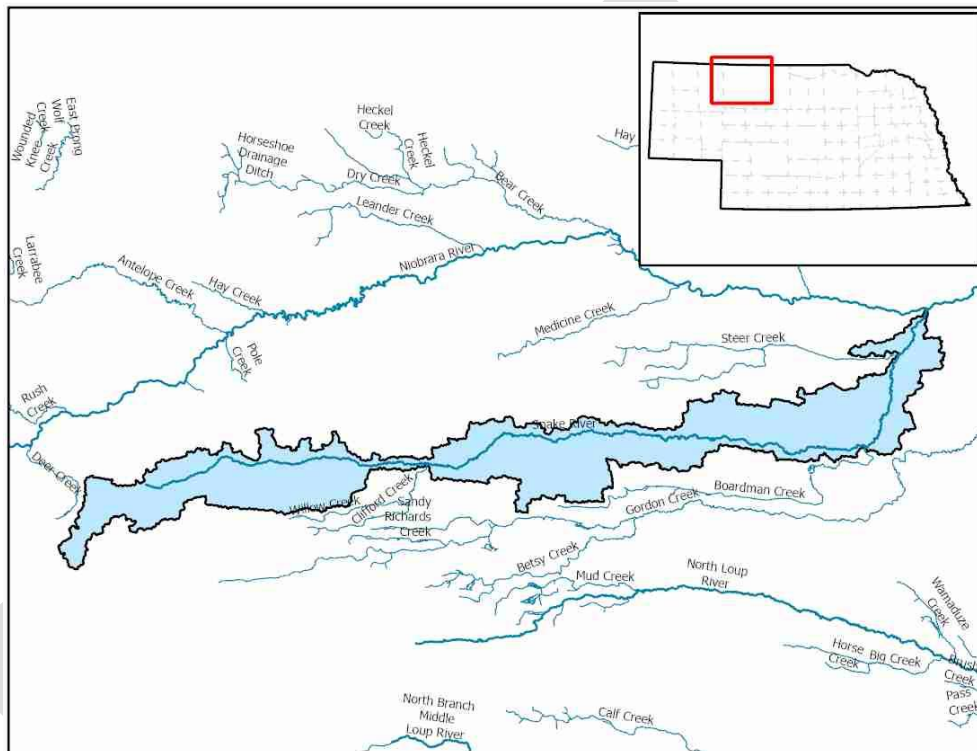
- Collaborate with Wyoming to maintain headwaters of Sheep Creek.

Species of Greatest Conservation Need

Tier 1: Plains Topminnow

Tier 2: Common Shiner, Longnose Sucker, Silverweed

Snake River



Priority Watershed Description

The Snake River Watershed consists of two HUC10s from the river's headwaters to its confluence at the Niobrara River. This system is recognized both as a Biologically Unique Landscape and as a Priority Watershed. The system has high sinuosity but is hindered by barrier severity and density. Overall, the system contains a diverse assemblage of glacial relict SGCN.

Stresses Affecting the Watershed

- Potential threat of aquatic invasive species.
- Stream fragmentation and alteration.
- Presence of sportfish in the system.

Conservation Strategies

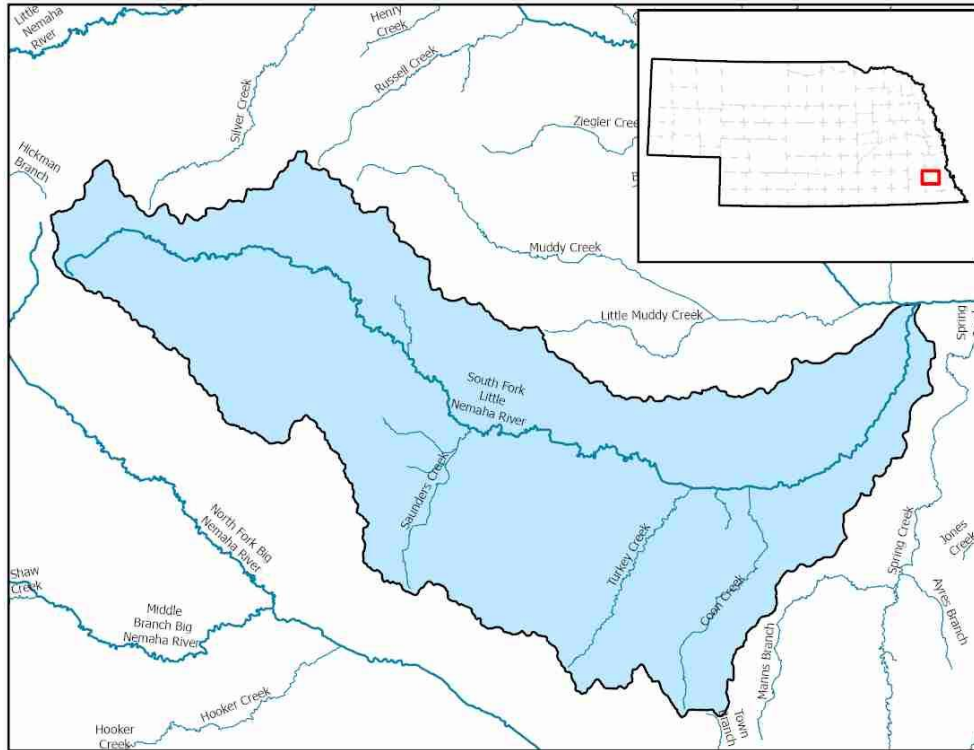
- Continue monitoring for aquatic non-native and invasive species presence.
- Maintain the natural state of the system and evaluate the costs and benefits of installing culverts that allow for fish passage to maintain the connectivity of the system.
- Continue to monitor aquatic SGCN populations in the system.

Species of Greatest Conservation Need

Tier 1: Finescale Dace, Northern Pearl Dace, Northern Redbelly Dace, Plains Topminnow, Western Silvery Minnow

Tier 2: Marsh-St. John's-wort, Northern Adder's-tongue, Water Sedge

South Fork Little Nemaha River



Priority Watershed Description

The South Fork Little Nemaha River Watershed consists of one HUC10 from the river's headwaters near Panama to its confluence at the Little Nemaha River. The system also contains Saunders Creek, Turkey Creek, and Coon Creek. The system is highly entrenched but does not have any known barriers along the main channel. Of the systems in southeastern Nebraska, this is arguably the most intact system remaining.

Stresses Affecting the Watershed

- Presence of aquatic non-native and invasive species and potential threat of black carp.
- Stream fragmentation and alteration through channelization.
- Agricultural runoff.

Conservation Strategies

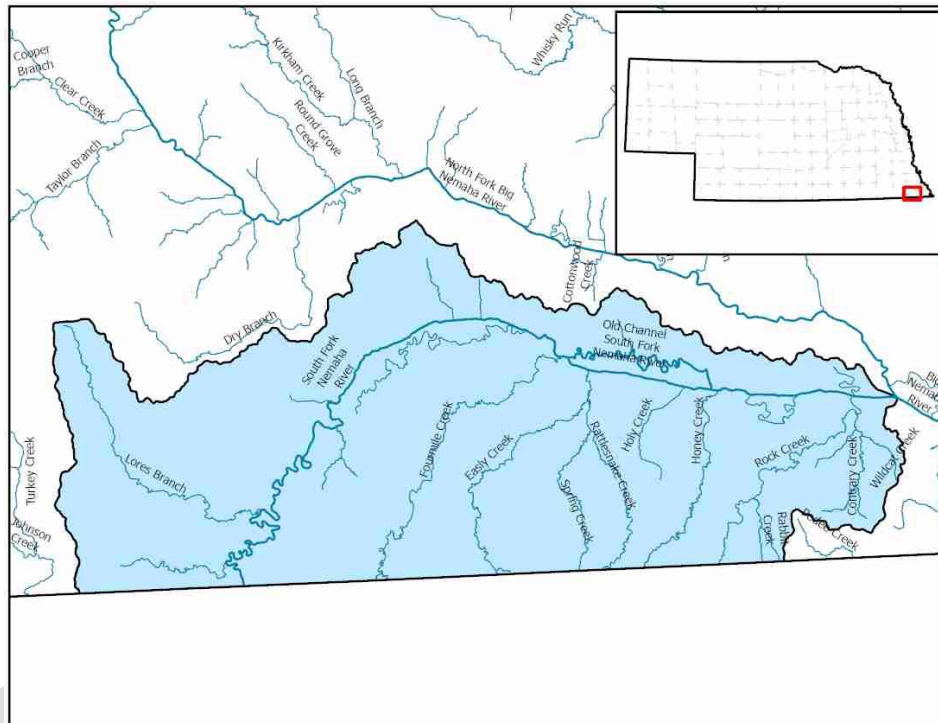
- Continue monitoring for aquatic non-native and invasive species presence.
- Implement efforts to remove non-native and invasive species from the system.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Continue to monitor aquatic SGCN populations in the system.

Species of Greatest Conservation Need

Tier 1: Flathead Chub, Plains Minnow, Silver Chub, Western Silvery Minnow

Tier 2: Tadpole Madtom

South Fork Nemaha River



Priority Watershed Description

The South Fork Nemaha River Watershed consists of one HUC10 from where the river crosses into the state from Kansas in Pawnee County to its confluence with the Big Nemaha River. The system also contains numerous creeks that present opportunities for conservation. Because the system is highly channelized, it is unlikely to be recovered. However, the system historically boasted a high diversity of freshwater mussel SGCN, and the tributaries may present opportunities to reintroduce and augment populations in the watershed. Since 2017, conservation efforts have been ongoing to reintroduce and create stable populations of plain pocketbook and fatmucket mussels at Kinter's Ford WMA.

Stresses Affecting the Watershed

- Likely presence of aquatic non-native and invasive species, including the potential threat of black carp.
- Stream fragmentation and alteration through channelization.
- Agricultural runoff.

Conservation Strategies

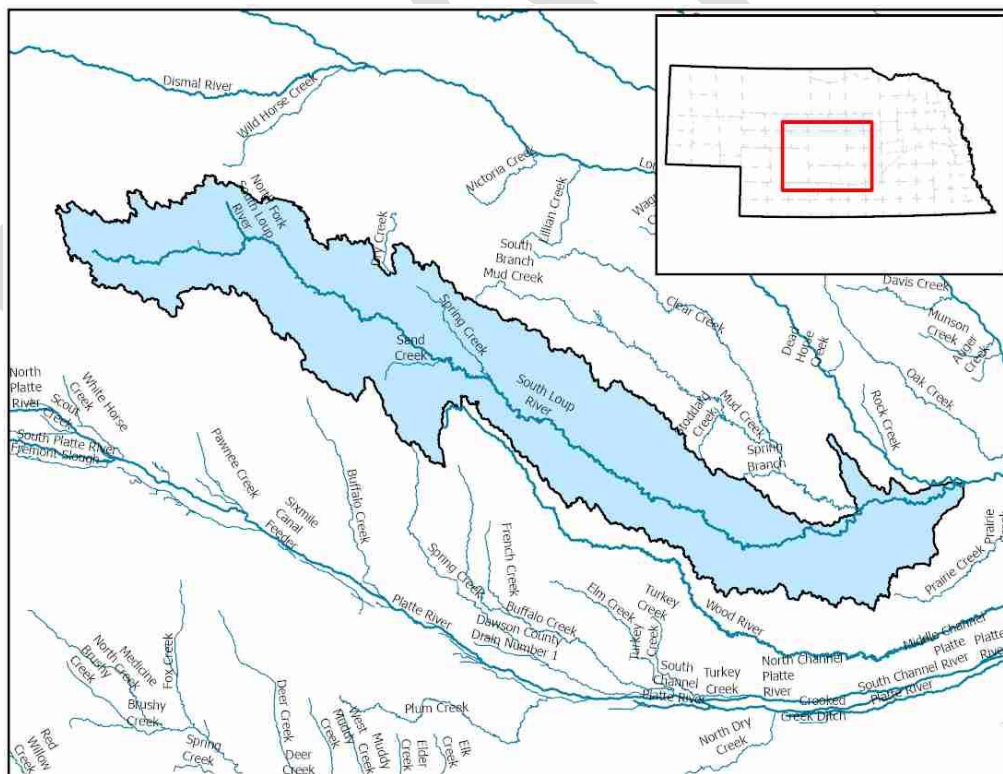
- Continue monitoring for aquatic invasive species presence.
- Implement efforts to remove non-native and invasive species from the system.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Continue to monitor the distribution and abundance of naturally occurring and reintroduction/population augmentation stocking of freshwater mussels.
- Continue to monitor aquatic SGCN populations in the system.
- Collaborate with Kansas to maintain headwaters of these waterways.

Species of Greatest Conservation Need

Tier 1: Fatmucket, Western Silvery Minnow, Yellow Sandshell

Tier 2: Spring Aven, Spring Bitter Cress, Threeridge

South Loup River



Priority Watershed Description

The South Loup River Watershed consists of five HUC10 from the river's headwaters west of Stapleton to its confluence with the Middle Loup River. The system also contains Sand Creek and Spring Creek in Custer County. While segments of the river flow through irrigated cropland, the majority is well-buffered by wooded riparian habitat and pastureland. The system boasts a high diversity of SGCN, but recent surveys have documented declines in a number of species.

Stresses Affecting the Watershed

- Presence of aquatic invasive species.
- Stream fragmentation and alteration through channelization.
- Agricultural runoff.

Conservation Strategies

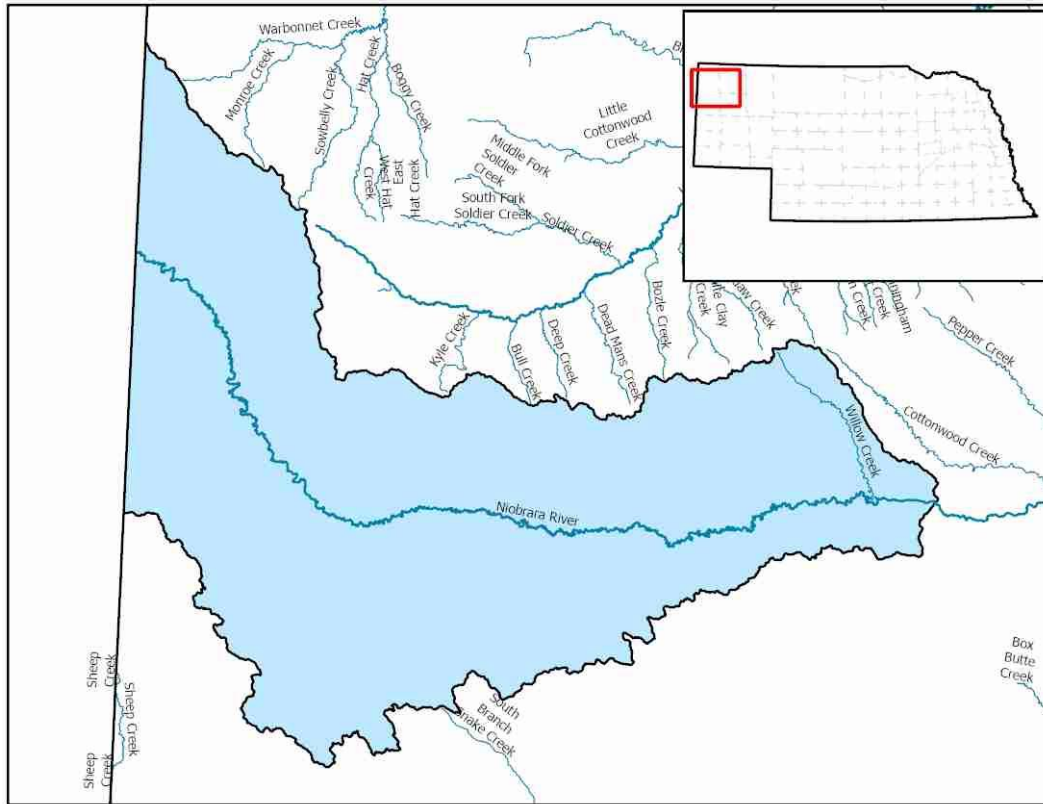
- Continue monitoring for aquatic invasive species presence.
- Implement efforts to remove non-native and invasive species from the system.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Continue to monitor aquatic SGCN populations in the system.

Species of Greatest Conservation Need

Tier 1: Flathead Chub, Plains Minnow, Silver Chub, Western Silvery Minnow

Tier 2: Tadpole Madtom

Upper Niobrara River



Priority Watershed Description

The Upper Niobrara River Watershed consists of four HUC10s from the Wyoming border to Box Butte Reservoir where a large impoundment (Box Butte) dam creates a barrier for fish movement. The area historically boasted a diverse assemblage of SGCN, but threats to the system (e.g., low dissolved oxygen, sportfish, aquatic invasive vegetation) may eradicate these species. Efforts to manage and maintain the system may allow SGCN to persist and recover in the area.

Stresses Affecting the Watershed

- Presence of aquatic invasive species and sportfish (e.g., northern pike).
- Increase in aquatic invasive vegetation.
- Increased water temperatures resulting in lower dissolved oxygen.
- Groundwater pumping has reduced flows; increasing the risk of dry river beds during drought years.

Conservation Strategies

- Continue monitoring for aquatic invasive species presence.

- Implement efforts to remove non-native and invasive species from the system.
- Work with landowners on education for better land use practices.
- Continue supporting best management practices, such as no till, cover crops, and buffer strips, to reduce water-quality issues to enable soil to hold more water and to limit runoff.
- Continue to monitor aquatic SGCN populations in the system.

Species of Greatest Conservation Need

Tier 1: Finescale Dace, Meadow Lousewort, Northern Pearl Dace, Northern Redbelly Dace, Plains Topminnow

Tier 2: Marsh Arrow-grass, Mat Muhly, Short-ray Fleabane, Silverweed, Smooth False Foxglove

Chapter 10

Adaptive Management, Monitoring, Inventory and Research

This chapter presents a framework for adapting conservation actions in response to new information and changing conditions. The Nebraska Natural Legacy Project's adaptive management framework strives to improve our understanding of Nebraska's ecological systems. Management objectives should be achieved through a process that:

- Involves stakeholders.
- Is transparent and inclusive.
- Acknowledges uncertainty about the system and the potential impacts of conservation actions.
- Uses management actions and follow-up monitoring to improve subsequent decisions.
- Improves the consistency of implementing conservation actions.

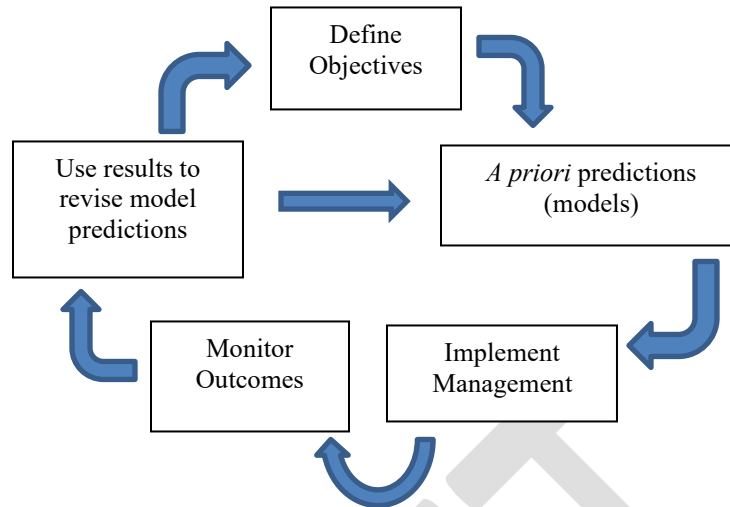
This approach includes exploring alternative ways to meet management objectives, predicting the outcomes based on the current knowledge, implementing selected alternative actions, monitoring their impacts, and using the results to update knowledge and adjust management actions. This approach helps ensure the most effective use of limited financial and operational resources.

An integral component of adaptive management is monitoring to assess species and habitat responses to management actions. Several components are presented that should be included in a monitoring plan, the development of which is one of the priorities in implementing the Nebraska Natural Legacy Project. In addition, a list of priority inventory and research needs have been identified to fill critical data gaps, provide baseline information for monitoring and the knowledge needed to develop more effective conservation actions.

Adaptive Management

Adaptive management is the process of continually improving management policies and practices by learning from the outcome of management actions (Figure 1). Broadly, adaptive management requires defining specific objectives, making a priori predictions (i.e., constructing models) about the effects of one or more management actions on those objectives, implementing management actions, monitoring outcomes, using results to revise model predictions and management actions, and then repeating the process in an iterative loop. Adaptive management seeks to speed up the learning process about cause-and-effect relations between management actions and outcomes thus, allowing managers to make more effective decisions in a shorter time.

Figure 1.



The fundamental motivation for using adaptive management is the uncertainty of the impacts of management actions on resources. Reducing this uncertainty through systematic learning enables more effective and timely progress toward meeting management objectives. However, not all decisions can or should be adaptive. In some cases there is no opportunity to apply learning. In other cases, there is little uncertainty about which action to choose. Several conditions must apply:

- The issue is important enough to warrant action.
- There is institutional capacity and commitment to undertake and sustain adaptive management.
- Real choices exist among alternative management strategies.
- Learning can occur quickly enough to apply it to subsequent management decisions.
- Resource management decisions can be revisited and modified over time.

In its simplest form, adaptive management can involve applying a conservation action at a site, observing the results and adjusting the action in the future if warranted. However, it has its widest applicability when components of experimental design are incorporated into the monitoring process including replication, random assignment of treatments (including controls) and sites, and statistical analysis of results. Monitoring and evaluation provide the critical links between implementing conservation actions and revising management objectives and actions to be more effective. A feedback information loop ensures that conservation practice remains evidence-based and adaptable.

Adaptive management can be a powerful tool for adapting to changing environmental conditions, where uncertainty is high, change may be rapid (e.g., flooding events), and management evaluation and responses must be dynamic with increasing knowledge. Implementing adaptation strategies within this framework allows for frequent reassessment and creative problem-solving based on emerging evidence.

Case Study: Mountain Plover Nest Marking Program

The mountain plover (*Charadrius montanus*) nest marking program is an example of an adaptive management project that identifies the issues that negatively impact a specific species, identifies and conducts priority research, and improves conservation actions accordingly. The mountain plover is a threatened species in Nebraska. The first conservation action for the mountain plovers was to survey the panhandle of Nebraska to estimate the abundance and location of nesting pairs. After this initial survey, many more pairs were detected than anticipated, but nests were primarily in agriculture fields on private lands. In neighboring states, this species typically nests in short-stature grasslands and prairie dog towns. An identified threat in the first addition of the Natural Legacy Project for mountain plovers was “agriculture practices” and a research question was to evaluate “the impact of nesting in agriculture fields vs. native grasslands on mountain plover productivity.” Action was taken to reduce the threat of nests being destroyed by tillage, through a nest marking program developed in cooperation with the Bird Conservancy of the Rockies. The nest marking program works with willing landowners to detect and mark nests in agriculture fields and provides landowners incentives to till around the marked nests. From 2005 to 2007, the nest marking program was evaluated and was successful, with less than 3% (7/246) of marked nests failing because of tillage (20% total nest failure rate). In 2007, 65% (34/52) of unmarked artificial nests (i.e., scrapes with similar-sized eggs painted to look like mountain plover eggs) failed (no eggs survived) because of tillage. The program was also a success because landowners became knowledgeable of mountain plovers and were interested in continuing the program. The next phase is to understand if chick survival in “nest marked” crop field is high enough to sustain or increase the resident population. Initial results of this study suggest that chick survival is high in crop fields participating in the nest marking program relative to native habitats, but another survey year is needed to determine if the nest marking program should be continued.

The next steps for integrating adaptive management principles into implementation of the Natural Legacy Project include:

- Development of plans that identify the goals and objectives at local and/or regional scales.
- Identify priority questions appropriate for the application of adaptive management.
- Collaborate with resource managers for implementation of adaptive management.

Monitoring

Below is a framework for developing a monitoring plan, which is important to implementation of the Natural Legacy Project. Because of limitations of human, financial and information resources, there must be a strategy for selecting both what to monitor and how to monitor it. Monitoring of management actions is typically conducted at two levels: 1) response of individual species and 2) response of habitats or natural communities. In addition to monitoring biotic responses, one can monitor whether proposed conservation actions were carried out (implementation monitoring), the public/stakeholder understanding, acceptance and support of conservation actions, and/or the abatement of key threats to species or communities. To be

successful, a monitoring strategy needs to be affordable, provide credible information that assesses effectiveness and is usable by decision makers.

There is a need to develop long-term monitoring systems that are strategically designed to evaluate species and ecosystem responses to changing environmental conditions. It is vital to design and implement monitoring programs that can provide the best science-based information possible. Results can be used to better inform decision makers and habitat managers on the best adaptation strategies.

Implementation Monitoring

An important component of the monitoring strategy will be to track the implementation of conservation actions that are proposed in the Nebraska Natural Legacy Project. These can be used to evaluate how well the goals set for conservation of natural communities and species are being met. Information collected would include the location, types of conservation actions, agencies and organizations involved, species and communities affected, acres or miles of stream, cost of project, funding sources, etc. The use and effectiveness of tools such as incentives, easements, voluntary acquisitions, management agreements, and restorations should also be monitored and analyzed, not only in terms of accomplishments but also cost-effectiveness.

Species Monitoring

Population monitoring is currently being conducted on a regular basis, mostly annually, for a handful of at-risk species including, American burying beetle (Roberts et al. 2025), monarch (Paris & Anderson 2024), regal fritillary (Paris & Anderson, 2024), piping plover (Forsburg et al. 2024, Platte River Recovery Implementation Program, 2025), interior least tern (Forsburg et al. 2024, Platte River Recovery Implementation Program, 2025), greater prairie-chicken (Lusk, 2011), long-billed curlew (Jorgensen & Brenner, 2023), pallid sturgeon (Welker & Drobish 2020, Hall et al. 2025), and Salt Creek tiger beetle (Spomer & Fritz, 2011). This type of monitoring allows researchers to determine if populations are increasing, stable, or decreasing, and can alert staff to the need for action in the case of declining populations.

Monitoring is most effective when conducted prior to and following management actions to assess their impacts and to modify the actions to maximize the desired effect on species of interest. Given the expense of detailed population monitoring, careful evaluation is needed to determine which additional at-risk species should be monitored, as well as if the currently monitored species warrant continued evaluation.

Standardized monitoring protocols exist for some well-studied species and should be used to ensure the compatibility with data gathered in other states. If no established protocols exist, they should be developed based on existing knowledge of the species. Monitoring protocols need to be specifically tailored to the species and management actions being evaluated. Monitoring should be designed to quantify population change and to understand the potential causes of the change.

Monitoring factors might include direct measurements of populations or indirect measures, such as habitat. Direct measures can include population size, density, growth or condition, productivity, or survival. Habitat can serve as a surrogate for direct population measures if the relationship between habitat and population is well defined. In many cases, a combination of direct and indirect measures will be appropriate. In addition, habitat data are critical to the understanding of causes of population change.

The overall conservation status of species will also be monitored. The Tier I and Tier II at-risk species lists will be periodically reviewed and revised by taxon experts. This revision will occur on an ongoing basis as new information on abundance, distribution, and population trends becomes available.

Habitat Monitoring

Habitat monitoring can occur at two main levels: 1) monitoring trends in abundance, distribution, and condition of individual community types, and 2) monitoring the response of community examples to management actions, including restoration.

Monitoring trends in abundance and distribution of different habitat types can be used to detect land use changes and help direct conservation action toward those showing the steepest declines. A map of historic vegetation (Kaul and Rolfsmeier 1993) can be used to evaluate changes in abundance since pre-Euro-American settlement, while more recent trends can be examined using current surveys. This type of monitoring over a large-scale is best accomplished using remote sensing techniques.

A challenge associated with monitoring at-risk species and ecosystems is that many Tier I and Tier II species occur at low densities, use specialized habitats, and/or require specialized survey techniques to detect. Thus, monitoring efforts focused on at-risk species may be unable to produce sufficient sample sizes to make inferences about the condition of broader habitats or the impacts of management actions. Instead, monitoring other relatively numerous species may provide better insight into habitat conservation needs. Nebraska is a grassland state, and grassland birds are declining at alarming rates. Therefore, a suite of grassland bird species is recommended for monitoring grassland habitats in the state. These species include, but are not necessarily limited to, the Western Meadowlark, Upland Sandpiper, Bobolink, and Grasshopper Sparrow. All four of these species are recognized as Regional Species of Greatest Conservation Need by the Midwest Landscape Initiative since Nebraska and the Great Plains represent the core breeding ranges of these species. These species occur virtually statewide and have slightly different preferences for vegetative composition and structure, so collectively, they should provide a meaningful representation of the habitat quality of Nebraska's grasslands.

There is a need to develop a set of best management practices for natural communities that maintain and enhance their biodiversity value. Monitoring responses of individual community types to various management practices will be a key component in developing those guidelines. Both formal experimentation testing different management practices, as well as monitoring existing practices on managed lands, will be needed. Floristic quality assessment is one

approach that may be used for evaluating responses to treatments. One could also monitor responses of indicator species or exotic species within the community.

Databases

The Nebraska Natural Heritage Program maintains the most comprehensive, statewide database on at-risk species and natural communities. Information on at-risk species from other Nebraska Game and Park Commission databases (Fisheries, Nongame Bird Program, Nongame Mammal Program) has been added to this database. Currently, there are more than 22,000 species records and 1,900 community records in the Natural Heritage database. This database is updated annually with new survey information from agency staff, university researchers, and biologists from conservation organizations. The Heritage database is linked to the Biologically Unique Landscapes layer (see Chapter 3) and will automatically update information on the landscapes as new survey information becomes available.

All data added to the Heritage database are quality controlled and converted to a standard format. The quality control process ensures that the data are accurate and reliable, while the standard format allows data from many sources to be easily queried, summarized, and distributed. In addition, because the same standard format is used by programs in the Natural Heritage network (all 50 states, all Canadian provinces and several Latin American countries), the data can be easily combined into large datasets that allow for analyses across state and national boundaries. These multi-jurisdictional datasets allow for effective broad-scale conservation planning. Data standards as well as multi-jurisdictional datasets are developed and maintained by NatureServe in conjunction with its member Heritage Programs and Conservation Data Centers.

Additional databases can be used to help track progress toward meeting the goals of the Natural Legacy Project.

Inventory and Research

Development of the Nebraska Natural Legacy Project was hampered by lack of information in a variety of areas including species and natural community data, appropriate conservation strategies, and best management practices. In addition to inventory and research that may be conducted as a part of monitoring, there is a need to fill critical information gaps on the distribution, abundance, conservation status, threats, biology and ecology of at-risk species and natural communities. Below is a list of priority inventory and research projects that are needed to fill critical data gaps, provide baseline information for monitoring, and provide the knowledge needed to develop more effective conservation actions.

Biological Inventory

Species

- For a number of the Tier I species, there were not enough documented occurrences of populations to fully meet the goals set for those species. Inventory of additional populations of these species should be a priority. There is also a strong need to assess the condition/viability of each population during inventory work. Appendix 8 identifies inventory and research needs for individual Tier I species.
- Conduct inventory work to better document the distribution and abundance of Tier II at-risk species. Inventory work should be prioritized based on gaps in knowledge and the imperilment status of the species. In general, our inventory needs are greatest for invertebrates (both terrestrial and aquatic) and non-vascular plants.
- Develop predictive models of species distribution for at-risk species to guide survey work and increase inventory efficiency.
- Inventory the distribution and spread of key invasive species including garlic mustard, purple loosestrife, Eurasian phragmites, Russian-olive, saltcedar, and zebra mussel.
- Conduct long-term monitoring studies to evaluate changes in distribution and abundance of selected Tier I species that have been identified as less adaptable to changing environmental conditions.

Natural Communities

- There were insufficient documented occurrences of some of the natural community types to fully meet the goals set for those communities. Inventories to identify high-quality examples of each type should be a high priority.
- Develop a classification for aquatic systems (lakes, rivers, streams). Conduct inventories to identify high-quality examples of each type.

Landscapes

- Inventory priority landscapes for additional high-quality examples of Tier I species and natural communities. Identifying other occurrences within existing sites will improve the efficiency of the conservation efforts. For example, the Central Loess Hills BUL has been identified as a high priority for inventory work.

Biological Research

Species

- Conduct research to better understand the biology/ecology of at-risk species. Appendix 8 lists research needs for individual Tier I species.
- Evaluate the habitat requirements of at-risk species including the size, condition and landscape context of habitat(s) needed to sustain viable populations.
- Evaluate the feasibility and efficacy of captive rearing. Develop and continue to improve captive rearing techniques for highly imperiled species that require re-introduction efforts to recover the species (e.g., Salt Creek tiger beetle).
- Conduct studies to evaluate the impact of invasive species on native flora and fauna.
- Evaluate the potential threat of candidate invasive species.
- Develop control mechanisms for invasive species that have a high impact on at-risk species and natural communities.

Natural Communities

- Increase understanding of ecological processes influencing communities; investigate grazing, fire, and hydrology, and the natural mosaic of disturbance and patch types in a landscape.
- Identify thresholds for ecosystem-function impairment that affect the viability of at-risk species and biological diversity.
- Conduct studies to evaluate the effects of management practices (e.g., burning, grazing, haying, hydrologic manipulation) on the composition, structure and function of natural communities.
- Develop best management practices to promote native species diversity and maintain ecological processes in different community types.
- Develop and refine habitat restoration techniques for community types with the greatest need of restoration and the least known about restoration (e.g., saline wetlands, freshwater streams).
- Conduct studies to evaluate the success of habitat restoration projects.

Conservation and Environmental Education Research

- Determine the most critical and requested education materials and develop a priority listing for areas of needs.
- Determine the need for additional educators who are trained in nature education.
- Conduct an inventory of outdoor education and nature centers in Nebraska and identify areas of the state that would benefit from new centers.

Nature-based Recreation Research

- Continue to conduct statewide and regional economic impact studies of hunting, fishing, wildlife viewing, and other nature-based recreation to determine the economic benefits of these activities. Publish and promote the results from the studies for the public and tourism agencies to use for recreation planning and development. Expand efforts to broaden education about nature-based recreation opportunities.
- Conduct a marketing assessment of current and potential nature-based tourism clients to identify user needs and wants.
- Continue to utilize the Nebraska Statewide Outdoor Recreation Plan (SCORP) generalized survey and other assessments to understand the wants, needs, and satisfaction levels of constituents that participate in nature-based recreation and the opportunities and facilities available to support this recreation.
- Evaluate the potential and need for enhancing existing opportunities and access for nature-based recreation.
- Conduct studies to determine the wants/needs/satisfaction level of constituents that participate in non-consumptive, wildlife-dependent recreation and determine the availability of sites/facilities to support that recreation.
- Inventory sites on public and private lands currently providing opportunities and access for wildlife viewing, nature and wildlife interpretation, and evaluate the potential and need for enhancing existing opportunities and access.

- Identify sites that would provide new opportunities and access for nature-based recreation with minimal impacts to natural communities.

Economic Research

- Conduct studies to evaluate the economic importance of nature tourism in Nebraska.
- Conduct research on trends in economic development and population demographics in the state and assess their potential impact on biodiversity conservation.
- Conduct research to assess the economic viability of habitat restoration. For example, evaluate the economic benefits of grazing restored wetlands compared to cropping flood-prone land.

Human Dimensions Research

- Conduct surveys to determine public attitudes toward biological diversity, conservation and management practices.
- Assess the success of methods of outreach to landowners and land managers in engaging them in wildlife-friendly practices and conservation programs.

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Appendix 1: Membership of the teams involved with the revision of the Nebraska Natural Legacy Project.

See Chapter 2 for descriptions of the role of each team. Nebraska Natural Legacy Project representation as of June 2025:

Natural Legacy Partnership Team

Core Team Lead – Olivia DaRugna

Melissa	Mosier	<i>Audubon Great Plains</i>
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Ritch	Nelson	<i>Natural Resource Conservation Service</i>
Amber	Schiltz	<i>Nebraska Alliance for Conservation and Environment Education</i>
Dean	Edson	<i>Nebraska Association of Resources Districts</i>
Jacy	Schafer	<i>Nebraska Cattlemen</i>
Matt	Gruntorad	<i>Nebraska Chapter of The Wildlife Society</i>
Jonathan	Spurgeon	<i>Nebraska Cooperative Fish and Wildlife Research Unit</i>
Rachael	Whitehair	<i>Nebraska Corn Board</i>
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Schneider, R., K. Stoner, G. Steinauer, M. Panella, and M. Humpert (Eds.). 2011. The Nebraska Natural Legacy Project: State Wildlife Action Plan. 2nd ed. The Nebraska Game and Parks Commission, Lincoln, NE.

Schneider, R., M. Fritz, J. Jorgensen, S. Schainost, R. Simpson, G. Steinauer, and C. Rothe-Groleau. 2018. Revision of the Tier 1 and 2 Lists of Species of Greatest Conservation Need: A Supplement to the Nebraska Natural Legacy Project State Wildlife Action Plan. The Nebraska Game and Parks Commission, Lincoln, NE.

Appendix 2: National guidance on fulfilling the eight required elements.

National Advisory Acceptance Team (NAAT) Review Reference Guide for the Members

Congress identified eight required elements for a State Wildlife Action Plan, with the expectation that “species in greatest need of conservation” will be identified, while addressing the full array of wildlife and wildlife-related issues.

The NAAT believes it must make an affirmative finding that all of the eight required elements are satisfactorily fulfilled in order for an “approval” recommendation to be made to the Director of the U.S. Fish and Wildlife Service (Director). Strategy reviews will first occur at the regional level, by NAAT member-teams, prior to full discussion and voting by the entire NAAT.

Below follows a template the NAAT uses as it reviews the Strategies. There are eight major topic headings, which correspond to the eight elements prescribed by Congress. Under each element heading is a series of statements to help NAAT members think about whether or not the requirements of a particular element have been satisfactorily addressed. These statements, in effect, are examples of what the NAAT expects may be helpful in evaluating the merits of a Strategy. Strategy authors may want to offer additional reasons or factors as to why they believe they satisfactorily meet the requirements of a particular element, above or beyond the examples provided.

The NAAT expects that Strategies will describe or identify sources of information, as well as critical information gaps, and plans for acquiring critical information for species in greatest need of conservation. The NAAT will consult the “Guiding Principles,” developed by the International Association of Fish and Wildlife Agencies, when reviewing the Strategies. While this guide includes language regarding expectations that sections of the Strategies will provide sufficient information, the NAAT has not described or quantified the level of information expected, as each State or Territory will have different levels and sources of information available. The NAAT generally expects that Strategies will provide clear explanations of how information was used to reach conclusions. Strategies should explicitly draw logical connections between the problems that affect priority species and habitats, the conservation actions proposed to address those problems, and the indicators and monitoring approaches that will be used to measure the success of the conservation strategy.

It is anticipated that the Strategy will include an executive summary, synopsis or appendix that highlights where in the document reviewers can find information about each of the elements.

1st Element. Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife.

- A. The Strategy indicates sources of information (e.g., literature, databases, agencies, individuals) on wildlife abundance and distribution consulted during the planning process.
- B. The Strategy includes information about both abundance and distribution for species in all major groups to the extent that data are available. There are plans for acquiring information about species for which adequate abundance and/or distribution information is unavailable.
- C. The Strategy identifies low and declining populations to the extent data are available.
- D. All major groups of wildlife have been considered or an explanation is provided as to why they were not (e.g., including reference to implemented marine fisheries management plans). The State may indicate whether these groups are to be included in a future Strategy revision.
- E. The Strategy describes the process used to select the species in greatest need of conservation. The quantity of information in the Strategy is determined by the State with input from its partners, based on what is available to the State.

2nd Element. Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in the 1st element.

- A. The Strategy provides a reasonable explanation for the level of detail provided; if insufficient, the Strategy identifies the types of future actions that will be taken to obtain the information.
- B. Key habitats and their relative conditions are described in enough detail such that the State can determine where (i.e., in which regions, watersheds, or landscapes within the State) and what conservation actions need to take place.

3rd Element. Descriptions of problems which may adversely affect species identified in the 1st element or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats.

- A. The Strategy indicates sources of information (e.g., literature, databases, agencies or individuals) used to determine the problems or threats.
- B. The threats/problems are described in sufficient detail to develop focused conservation actions (for example, "increased highway mortalities" or "acid mine drainage" rather than generic descriptions such as "development" or "poor water quality").

- C. The Strategy considers threats/problems, regardless of their origins (local, state, regional, national and international), where relevant to the State's species and habitats.
- D. If available information is insufficient to describe threats/problems, research and survey efforts are identified to obtain needed information.
- E. The priority research and survey needs, and resulting products, are described sufficiently to allow for the development of research and projects after the strategy is approved.

4th Element. Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions.

- A. The Strategy identifies how conservation actions address identified threats to species of greatest conservation need and their habitats.
- B. The Strategy describes conservation actions sufficiently to guide implementation of those actions through the development and execution of specific projects and programs.
- C. The Strategy links conservation actions to objectives and indicators that will facilitate monitoring and performance measurement of those conservation actions (outlined in Element #5).
- D. The Strategy describes conservation actions (where relevant to the State's species and habitats) that could be addressed by Federal agencies or regional, national or international partners and shared with other States.
- E. If available information is insufficient to describe needed conservation actions, the strategy identifies research or survey needs for obtaining information to develop specific conservation actions.
- F. The Strategy identifies the relative priority of conservation actions.

5th Element. Descriptions of the proposed plans for monitoring species identified in the 1st element and their habitats, for monitoring the effectiveness of the conservation actions proposed in the 4th element, and for adapting these conservation actions to respond appropriately to new information or changing conditions.

- A. The Strategy describes plans for monitoring species identified in Element #1, and their habitats.
- B. The Strategy describes how the outcomes of the conservation actions will be monitored.
- C. If monitoring is not identified for a species or species group, the Strategy explains why it is not appropriate, necessary or possible.

- D. Monitoring is to be accomplished at one of several levels including individual species, guilds, or natural communities.
- E. The monitoring utilizes or builds on existing monitoring and survey systems or explains how information will be obtained to determine the effectiveness of conservation actions.
- F. The monitoring considers the appropriate geographic scale to evaluate the status of species or species groups and the effectiveness of conservation actions.
- G. The Strategy is adaptive in that it allows for evaluation of conservation actions and implementing new actions accordingly.

6th Element. Descriptions of procedures to review the Strategy/Plan at intervals not to exceed ten years.

- A. The State describes the process that will be used to review the Strategy every ten years or less.

7th Element. Descriptions of the plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the Plan-Strategy with Federal, State and local agencies and Indian tribes that manage significant land and water areas within the State or administer programs that significantly affect the conservation of identified species and habitats.

- A. The State describes the extent of its coordination with and efforts to involve Federal, State and local agencies and Indian Tribes in the development of its Strategy.
- B. The State describes its continued coordination with these agencies and tribes in the implementation, review, and revision of its Strategy.

8th Element. Descriptions of the necessary public participation in the development, revision and implementation of the Plan.

- A. The State describes the extent of its efforts to involve the public in the development of its Strategy.
- B. The State describes its continued public involvement in the implementation and revision of its Strategy.

Appendix 3: Definitions of Natural Heritage conservation status ranks.

Global Ranks (GRANK)

GRANK refers to numeric ranks (G1 through G5) of the conservation status or relative endangerment globally of species or ecological communities. Primary factors used in determining rank for species are population size, number of occurrences, viability of occurrences, population trend, and threats. Secondary factors are geographic distribution, environmental specificity, protection and management, and intrinsic vulnerability.

G1	Critically imperiled - at very high risk of extinction due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.
G2	Imperiled - at high risk of extinction or collapse due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
G3	Vulnerable - at moderate risk of extinction or collapse due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
G4	Apparently secure - At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
G5	Secure - At very low risk of extinction or elimination due to a very extensive range, abundance populations or occurrences, and little to no concern from declines or threats.
G#G#	Range Rank - a numeric range rank (e.g., G2G3, G1G3) is used to indicate uncertainty about the exact status of a taxon or ecosystem type. Ranges cannot skip more than two ranks (e.g. GU should be used rather than G1G4).
GU	Unrankable - currently unrankable due to lack of information or due to substantially conflicting information about status or trends. Note: whenever possible (when the range of uncertainty is three consecutive ranks or less), a range rank (e.g., G2G3) should be used to delineate the limits (range) of uncertainty.
GH	Possibly Extinct (species) or Possibly Eliminated (ecosystems) - known from only historical occurrences but still some hope of rediscovery. Examples of evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully

	but not thoroughly enough to presume that it is extinct or eliminated throughout its range.
GX	Presumed Extinct (species)- not located despite intensive searches and virtually no likelihood of rediscovery. Presumed Eliminated (ecosystems)- eliminated throughout its range, due to loss of key dominant and characteristic taxa and/or elimination of the sites and ecological processes on which the type depends.

Subrank:	
T	Intraspecific Taxon- the status of infraspecific taxa (subspecies or varieties) are indicated by a “T-rank” following the species’ global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species, for example, a G1T2 subrank should not occur. A vertebrate animal population (e.g., listed under the U.S. Endangered Species Act or assigned candidate status) may be tracked as an infraspecific taxon and given a T rank; in such cases a Q is used after the T-rank to demote the taxon’s informational taxonomic status.
Qualifiers:	
?	Inexact Numeric Rank- denotes inexact numeric rank; this should not be used with any of the Variant Global Conservation Status Ranks or GX or GH.
Q	Questionable taxonomy that may reduce conservation priority- distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. The “Q” modifier is only used at a global level and not at a national or subnational level.

Subnational Ranks (S Rank) and associated qualifiers:

S Rank refers to numeric ranks (S1 through S5) of conservation status or relative endangerment within the state of species or ecological communities. Primary factors used in determining rank for species are population size, number of occurrences, viability of occurrences, population trend, and threats. Secondary factors are geographic distribution, environmental specificity, protection and management, and intrinsic vulnerability.

S1	Critically imperiled- at very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
S2	Imperiled- at high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
S3	Vulnerable- at moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
S4	Apparently Secure- at a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
S5	Secure- at a very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundance populations or occurrences, with little to no concern from declines or threats.
S#S#	Range Rank- a numeric range rank (e.g., S2S3 or S1S3) is used to indicate any range of uncertainty about the status of the species or ecosystem. Ranges cannot skip more than two ranks (e.g., SU is used rather than S1S4).
SH	Possibly Extirpated- Known from only historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully but not thoroughly enough to presume that it is no longer present in the jurisdiction.
SX	Presumed Extirpated- Species or ecosystem is believed to be extirpated from the jurisdiction. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SNR	Unranked- state conservation status not yet assessed.

SNA	Not Applicable- a conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities
SU	Unrankable- currently unrankable due to lack of information or due to substantially conflicting information about status or trends
S#?	Inexact Numeric Rank- denotes inexact numeric rank; this should not be used with any of the Variant National or Subnational Conservation Status Ranks, or SX or SH.
B	Breeding- conservation status refers to the breeding population of the species in the state.
N	Non-breeding- conservation status refers to the non-breeding population of the species in the state.

Appendix 4: Natural Heritage State Conservation Status Ranking (S-Rank) Instructions and Ranking Factors

The below instructions were distributed to the species experts and discussions during the expert workgroup meetings were mainly focused on these and the ranking factor questions:

Instructions

- Ranking factors should be evaluated with regard to the species' populations within Nebraska.
- Use your best judgment to evaluate the species for the factors below.
- If the uncertainty for a factor is greater than provided in individual scores, you can use a range of scores. For example, if you think the Nebraska population size is between 1,000 and 10,000 individuals, insert "DE" for the score.
- If there is not sufficient information to develop an estimate for a factor, use the "U" score (Unknown).
- Please provide comments about your confidence in the scoring of individual factors, if you think it would be helpful.
- Insert letter codes and comments in the Conservation Status Ranking Scoresheet.
- We will not be using the Number of Occurrences ranking factor unless a value was entered in a previous edition and can be confidently altered by the experts.
- For the calculator to produce a rank the experts must be able to assign values for at least two rarity category factors, or one rarity factor and one threats or trends factor. In the case where these cannot be confidently assigned, we will discuss probable imperilment and possible addition of the species to the Species of Greatest Information Need (SGIN) list.

Ranking Factors

Abundance

1. Range Extent:

The area contained within the shortest continuous imaginary boundary that can be drawn to encompass all the known, inferred, or projected sites of present occurrence of the species within Nebraska, excluding cases of vagrancy.

- A = <100 km² (less than about 40 square miles)
B = 100–250 km² (about 40–100 square miles)
C = 250–1,000 km² (100–400 square miles)
D = 1,000–5,000 km² (400–2,000 square miles)
E = 5,000–20,000 km² (2,000–8,000 square miles)
F = 20,000–200,000 km² (8,000–80,000 square miles)
U = Unknown

Null = Factor not assessed

Note: 2,000 square miles is roughly the size of Sioux County. 8,000 square miles is roughly the size of Cherry and Sheridan Counties combined. The entire state is roughly 77,000 square miles.

2. Population Size

Z = Zero, species presumed to be extirpated from NE

A = 1–50 individuals

B = 50–250 individuals

C = 250–1,000 individuals

D = 1,000–2,500 individuals

E = 2,500–10,000 individuals

F = 10,000–100,000 individuals

G = 100,000–1,000,000 individuals

H = >1,000,000 individuals

U = Unknown

Null = Factor not assessed

3. Number of Occurrences

Occurrence: The geographic location within which a species is known to occur and reproduce, separated from other occurrences by less suitable or unoccupied habitat.

Examples include populations, sub-populations, stands, colonies, etc.

Z = 0 Zero, species presumed to be extirpated from NE

A = 1–5

B = 6–20

C = 21–80

D = 81–300

E = >300

U = Unknown

Null = Factor not assessed

4. Number of Occurrences with Good Viability

A = No occurrences with excellent or good (assessed as A or B) viability

B = Very few (1–3) occurrences with excellent or good viability

C = Few (4–12) occurrences with excellent or good viability

D = Some (13–40) occurrences with excellent or good viability

E = Many (41–125) occurrences with excellent or good viability

F = Very many (>125) occurrences with excellent or good viability

U = Unknown number of occurrences with excellent or good viability

Null = Factor not assessed

Trends

The observed, estimated, inferred, or suspected degree of change in population size, range extent, number of occurrences, and/or number of occurrences with good viability - whichever most significantly affects the trend value in the state.

5. Long-term Trend (~ last 200 years)

A = Decline of >90%

B = Decline of 80–90%

C = Decline of 70–80%

D = Decline of 50–70%

E = Decline of 30–50%

F = Decline of 10–30%

G = Relatively Stable ($\leq 10\%$ change)

H = Increase of 10–25%

I = Increase of >25%

U = Long-term trend unknown

Null = Factor not assessed

6. Short-Term Trend (last 10 years or 3 generations, whichever is longer up to 100 years)

A = Decline of >90%

B = Decline of 80–90%

C = Decline of 70–80%

D = Decline of 50–70%

E = Decline of 30–50%

F = Decline of 10–30%

G = Relatively Stable ($\leq 10\%$ change)

H = Increase of 10–25%

I = Increase of >25%

U = Short-term trend unknown

Null = Factor not assessed

Threats

The threat score is a combination of scope of the threat and the threat severity, within Nebraska.

- For each Specific Threat (non-bold type on scoresheet), that you think negatively impacts the species, estimate the scope and severity using the guidelines on page 4. When evaluating the severity of a threat, only consider that portion of the population that is being affected by the threat (i.e. within the scope of the threat).
- Determine the threat impact using the Threat Impact Calculation Table on page 4.
- Record the scope, severity, and impact values on the scoresheet for each Specific Threat that is of concern. If a Specific Threat has no appreciable impact on the species, leave the row blank.

- If more than one Specific Threat is of concern in a given Threat Category (**bold** type on scoresheet), an overall Threat Category score should be determined. See the Multiple Threats Scoring instructions on page 4.
- If all the threats of concern are likely be in the low impact category, the spreadsheet does not need to be filled out and a note should be made that the overall threat impact is low.

See page 5 for example threats scoresheet

Scope of Threat Scoring

Pervasive: Affects all or most (71–100%) of the total population or occurrences

Large: Affects much (31–70%) of the total population or occurrences

Restricted: Affects some (11–30%) of the total population or occurrences

Small: Affects a small (1–10%) proportion of the total population or occurrences

Note: Scope is typically assessed within a 10-year time frame

Severity of Threat Scoring

Extreme: Within the scope, the Threat is likely to destroy or eliminate the occurrences of species, or reduce the species population by 71–100%

Serious: Within the scope, the Threat is likely to seriously degrade/reduce the affected occurrences or habitat, or reduce the species population by 31–70%

Moderate: Within the scope, the Threat is likely to moderately degrade/reduce the affected occurrences or habitat, or reduce the species population by 11–30%

Slight: Within the scope, the Threat is likely to only slightly degrade/reduce the affected occurrences or habitat, or reduce the species population by 1–10%

Note: Severity is assessed within a 10-year or three-generation time frame, whichever is longer (up to 100 years)

Threat Impact Calculation Table

		Scope			
		Pervasive	Large	Restricted	Small
Severity	Extreme	Very High	High	Medium	Low
	Serious	High	High	Medium	Low
	Moderate	Medium	Medium	Low	Low
	Slight	Low	Low	Low	Low

Multiple Threats Scoring

- If there are scores recorded for multiple Specific Threats within a given Threat Category, evaluate their degree of overlap.
- If the Specific Threats overlap, identify which of them has the highest impact and assign the scope, severity, and impact values of this Specific Threat to the Threat Category in which it is included.
- If the Specific Threats are substantially non-overlapping, then a Threat Category score that is higher than any of the Specific Threat scores may be justified. Use your best professional judgment to assign scope, severity, impact values to that Threat Category.
- Record the estimated impact scores of the Threat Category in the appropriate Threat Category rows.

Example Threats Scoresheet

<u>Threat</u>	<u>Threat Description</u>	<u>Scope</u>	<u>Severity</u>	<u>Impact</u>
1	Residential & Commercial Development			High
1.1	Housing & Urban Areas	Large	Serious	High
1.2	Commercial & Industrial Areas			
1.3	Tourism & Recreation Areas			
2	Agriculture & Aquaculture			High*
2.1	Annual & Perennial Non-Timber Crops	Large	Moderate	Medium
2.2	Wood & Pulp Plantations			
2.3	Livestock Farming & Ranching	Restricted	Serious	Medium
2.4	Marine & Freshwater Aquaculture			
3	Energy Production & Mining			
3.1	Oil & Gas Drilling			

3.2	Mining & Quarrying			
3.3	Renewable Energy			
4	Transportation & Service Corridors			

Cont.

*It is a judgement call whether specific threats within a threat category combine to have an overall impact that is higher than any of the specific threat impacts.

DRAFT

Appendix 5: Tier I At-risk species.

Tier I species are those that are globally or nationally most at-risk of extinction and which occur in Nebraska. This list is used to help prioritize conservation planning and actions and does not have legal or regulatory ramifications. Conservation of these species is needed to prevent future state/federal listings and help listed species recover.

The Tier I at-risk species lists will be periodically reviewed and revised by taxon experts. This revision will occur on an on-going basis as new information on abundance, distribution, and population trends becomes available, with an overall review at least every five years. The Tier I list was reviewed and revised with input from taxon experts in workshops held in 2025.

Species were selected for the Tier I when they met one or more of the following criteria:

State and Federally Listed Species: Species listed as threatened or endangered under the federal Endangered Species Act or the Nebraska Non-game and Endangered Species Conservation Act. Recovery and de-listing of these species are goals of the plan.

Heritage Ranked Species: Species either 1) ranked by NatureServe and the Natural Heritage Network as globally critically imperiled (G1), imperiled (G2), or vulnerable (G3) or 2) species ranked as either state critically imperiled (S1), imperiled (S2), or vulnerable (S3) in all or nearly all states in their range.

Declining species: Species whose abundance and/or distribution has been declining across much of their entire range. For land birds, the Partners in Flight national watch list was used as a guide.

Endemic Species (or nearly so): Species whose entire range of distribution occurs within or primarily within Nebraska. Conservation actions in Nebraska would be critical to the conservation of the species.

Disjunct Species: Species whose populations in Nebraska are widely disjunct (200 miles +) from the species' main range of distribution. Species must be ranked as critically imperiled (S1) or imperiled (S2) within Nebraska. Such populations may contain genetic variations that could be important to the long-term survival of the species.

Following the list of Tier I species is information on each one. Fields that are not self-explanatory are described below.

G-Rank, S-Rank: Explanation of ranks is found in Appendix 4.

Goal: The minimum number of populations to be conserved in Nebraska (see Chapter 3).

Distribution: The species distribution in Nebraska relative to its entire range. This was a factor used in setting the goal for each species (see Chapter 3).

- Endemic:** species occurs only within NE or generally have more than 90% of their range within the state.
- Limited:** species occurs primarily within one region (e.g., Great Plains)
- Widespread:** species is common in a number of regions and widespread in NE.
- Peripheral:** species is found mainly in other regions; generally, less than 10% of the range is within NE.

Estimated population in NE: Experts in the various taxa were queried as to their estimates of the current population sizes for Tier species. A few of the estimates are from statistically-based survey work and are published, while the majority are based on the opinion of experts with years of experience conducting field surveys for these species. The range of the estimate for a given species is an indication of the confidence in the estimate. For estimates based on publications, the publications are cited here and listed in the references section. Caution should be used when considering these estimates because most of them are not based on comprehensive and statistically based survey work. They are provided here to give an “order of magnitude” sense of the abundances among species, as understood by species experts. Additional survey work is needed for most Tier I species to better understand their distribution and abundance in Nebraska.

Trends since 2005 in NE: Based on data when available (primarily for birds) and on the consensus opinion of those attending the taxon experts workshops in 2025.

Landscapes: These are the Biologically Unique Landscapes for which there were known occurrences of populations (or migratory stopover sites) for the species.

Additional Priority Watersheds: For aquatic species Priority Watersheds that have occurrences outside of the BUL system are listed here

Tier 1 Species Profiles

Amphibians

Common Name Small-mouthed Salamander

Scientific Name *Ambystoma texanum*

G-Rank G5

S-Rank S1

Goal 1

Distribution Peripheral

Criteria for selection as Tier 1 At risk of extirpation

Estimated population in NE 1000-2500

Estimate based on Expert opinion

Trends since 2005 in NE Declining

Range in NE Southeasternmost corner of the state, Douglas to Richardson Counties

Habitat Woodlands and prairies with high moisture and crayfish burrows

Threats Conversion and loss of habitat, alterations to hydrology, pesticides that impact invertebrate availability, crayfish population decline

Research/Inventory Determine population in NE; monitor for reductions in range

Landscapes Missouri River and Bluffs, Southeast Prairies, Lower Platte River, Sandstone Prairies

Birds

Common Name Black-billed Cuckoo

Scientific Name *Coccyzus erythrophthalmus*

G-Rank G5

S-Rank S3

Goal 4

Distribution Widespread

Criteria for selection as Tier 1 Declining across much of its range

Estimated population in NE <3,000

Estimate based on Expert opinion

Trends since 2005 in NE – 4.68 (95% C.I.; -10.68, 1.01) annual decline based on Breeding Bird Survey trend analysis

Range in NE Primarily restricted to eastern, northeastern and north-central Nebraska and along the Platte River west to Keith Co.

Habitat Woodlands and thickets, often in proximity to water

Threats Cause of declines poorly understood. Degradation of habitat may be a factor as well as reduction of large caterpillars, a primary food resource, due to pesticide use.

Research/Inventory Determine areas of regular occurrence (breeding). Identify cause(s) of declines.

Landscapes Missouri River and Bluffs, Running Water, Middle Niobrara, Lower Loup Rivers, Upper Loup Rivers and Tributaries, Lower Platte River, Elkhorn Confluence, Loess Canyons, Central Platte River, Platte Confluence, Keya Paha

Common Name Black-billed Magpie

Scientific Name *Pica hudsonia*

G-Rank G5

S-Rank S2

Goal 1

Distribution Peripheral

Criteria for selection as Tier 1 Dramatic decline in numbers and a significant reduction of its range in Nebraska

Estimated population in NE <5,000 **Estimate based on** Expert opinion

Trends since 2005 in NE –0.27 (95% C.I.; -6.18, 7.86) annual decline based on Breeding Bird Survey trend analysis

Range in NE As recently as 2000 occurred over the western three-quarters of the state. Now occurs primarily in the western panhandle with isolated local occurrences within its former range. Declines appear to be continuing, and persistence of isolated local occurrences is in question.

Habitat A generalist that occurs in open riparian woodlands, thickets, open country, suburban areas. General absent in the Sandhills.

Threats Primary source of declines appears to be West Nile Virus.

Research/Inventory Monitor status in the state, investigate cause of decline.

Landscapes Pine Ridge, Oglala Grasslands, Upper Niobrara River, Middle Niobrara, Wildcat Hills, Sandsage Prairie, Loess Canyons, North Platte River, Panhandle Prairies, Elkhorn Confluence, Willow Creek

Common Name Black Tern **Scientific Name** *Chlidonias niger*

G-Rank G4G5 **S-Rank** S1 **Goal 1** **Distribution** Peripheral

Criteria for selection as Tier 1 Notable long-term decline in numbers in Nebraska and Great Plains

Estimated population in NE < 5,000 **Estimate based on** Expert opinion

Trends since 2005 in NE – 7.58 (95% C.I.; -15.33, -0.23) annual decline based on Breeding Bird Survey trend analysis.

Range in NE Breeding areas are restricted to lakes and marshes of the Sandhills. Formerly bred in appropriate habitat throughout the state. Common during spring and fall migration throughout the state.

Habitat Marshes and shallow lakes with emergent vegetation.

Threats Loss and degradation of wetlands is primary threat and is likely why the species is extirpated as a breeder in areas it formerly occupied.

Research/Inventory Monitor status in the state, investigate cause of decline.

Landscapes Breeding occurs in Cherry County Wetlands, Elkhorn River Headwaters, Upper Loup River and Tributaries, Dismal River Headwaters, and Sandhills Alkaline Lakes. Migrants occur statewide.

Common Name Brewer's Sparrow **Scientific Name** *Spizella breweri*

G-Rank G5 **S-Rank** S1 **Goal 1** **Distribution** Peripheral

Criteria for selection as Tier 1 Declining; PIF watch list

Trends since 2005 in NE Declining (-9.9 (with 95% CI -31.61 to 8.54) annual decline based on Breeding Bird Survey trend analysis)

Estimated population in NE 1,000 - 2,000 **Estimate based on** BBA field surveys

Range in NE Shortgrass Prairie ecoregion in the Panhandle

Habitat Sandsage prairie; short-grass; mixed-grass w/sandsage component; shrub associated species - low shrubs

Threats Sage removal (to improve rangeland), land conversion – pivots, habitat fragmentation

Research/Inventory Identify habitat requirements; continue surveys to assess distribution and abundance; survey for sagebrush

Landscapes Oglala Grasslands, Panhandle Prairies, Upper Niobrara River, Pine Ridge, Wildcat Hills, Kimball Grasslands

Common Name Buff-breasted Sandpiper **Scientific Name** *Tryngites subruficollis*

G-Rank G4 **S-Rank** S2N **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 Declining, Shorebird Conservation Plan

Estimated population in NE 22,000 - 78,000 **Estimate based on** Published estimate, Jorgensen et al. 2008

Trends since 2005 in NE Unknown

Range in NE East-central portion of state

Habitat Cropland associated with palustrine wetlands - open flats; very short stature grasslands; playa wetlands; require mixture of agriculture and wetlands; spring and fall migrant, does not nest in Nebraska

Threats Agricultural practices, contaminants, wind energy development

Research/Inventory Determine food sources, migratory stopover duration, roost sites, what agricultural practices favor them, effects of agricultural practices- contaminants, population trend, effects of wind energy development

Landscapes Rainwater Basin, Running Water

Common Name Burrowing Owl **Scientific Name** *Athene cunicularia*

G-Rank G4 **S-Rank** S2 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 Ranked as imperiled or vulnerable in nearly all states in its range

Estimated population in NE 4,000 – 10, 000 **Estimate based on** Field surveys

Trends since 2005 in NE -3.43 95% CI: -10.24 to 3.29

Range in NE Western two-thirds of state

Habitat Prairie dog towns, short-grass prairie, mixed-grass prairie, heavily grazed grasslands

Threats Prairie dog control, habitat conversion-pivots; loss of short, open grasslands; plague, wind energy development, insecticide impact on food source

Research/Inventory Expand surveys to assess distribution and abundance; determine productivity, cause of population variability (predators), status and trends of prairie dogs, effects of wind energy development; conduct genetics study

Landscapes Central Loess Hills, Keya Paha, Loess Canyons, Rainwater Basin, Running Water, Cherry County Wetlands, Dismal River Headwaters, Elkhorn River Headwaters, Middle Niobrara, Sandhills Alkaline Lakes, Upper Loup Rivers, Kimball Grasslands, North Platte River, Oglala Grasslands, Panhandle Prairies, Pine Ridge, Sandsage Prairies, Upper Niobrara River, Wildcat Hills

<u>Common Name</u>	Chestnut-collared Longspur	<u>Scientific Name</u>	<i>Calcarius ornatus</i>
<u>G-Rank</u>	G5	<u>S-Rank</u>	S3
<u>Goal</u>	7	<u>Distribution</u>	Limited
<u>Criteria for selection as Tier 1</u>	Declining, PIF watch list		
<u>Estimated population in NE</u>	500-3,000	<u>Estimate based on</u>	BBA field surveys
<u>Trend since 2005</u>	Unknown		
<u>Range in NE</u>	Western and northern portions of the Nebraska Panhandle		
<u>Habitat</u>	Native short- and mixed-grass prairie. Prefers taller prairie than McCown's Longspur.		
<u>Threats</u>	Loss of habitat, conversion of habitat to agriculture, degradation because of tree planting or invasive species, lack of grazing.		
<u>Research/Inventory</u>	Breeds locally; identify additional breeding locations.		
<u>Landscapes</u>	Panhandle Prairies, Oglala Grasslands, Kimball Grasslands, Keya Paha		

<u>Common Name</u>	Ferruginous Hawk	<u>Scientific Name</u>	<i>Buteo regalis</i>
<u>G-Rank</u>	G4	<u>S-Rank</u>	S2
<u>Goal</u>	7	<u>Distribution</u>	Widespread
<u>Criteria for selection as Tier 1</u>	Ranked as imperiled or vulnerable in nearly all states in its range		
<u>Estimated population in NE</u>	200 - 400	<u>Estimate based on</u>	Expert opinion
<u>Trends since 2005 in NE</u>	Stable		
<u>Range in NE</u>	Western third of state - primarily Panhandle		
<u>Habitat</u>	Rock outcrop, shortgrass prairie, Sandhills dune prairie, prairie dog towns, trees for nesting		
<u>Threats</u>	Human activity (agriculture/farming), prairie dog control, habitat fragmentation, wind energy development		
<u>Research/Inventory</u>	Survey southwest NE, Sandhills, and southern Sioux County; identify range in Sandhills associated with prairie dogs; study long-range movement; Identify wind energy development impacts		
<u>Landscapes</u>	Kimball Grasslands, Oglala Grasslands, Panhandle Prairies, Pine Ridge, Sandsage Prairie, Upper Niobrara River, Wildcat Hills, Cherry County Wetlands		

Common Name Henslow's Sparrow **Scientific Name** *Ammodramus henslowii*

G-Rank G4 **S-Rank** S1 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 Declining; PIF watch list

Estimated population in NE <300 **Estimate based on** Expert opinion

Trends since 2005 in NE Unknown

Range in NE SE portion of state

Habitat Tall-grass prairie; wet-mesic tall-grass prairie; will use CRP; prefers large open grasslands

Threats Annual burning or haying (lack of litter), habitat conversion, woody species invasion, haying during nesting period, loss of CRP, wind energy development

Research/Inventory Conduct surveys to assess distribution and abundance: identify prairie size requirements; research potential use of patch- burn grazing system to manage for suitable habitat

Landscapes Central Platte River, Rainwater Basin, Sandstone Prairies, Southeast Prairies

Common Name Interior Least Tern **Scientific Name** *Sternula antillarum athalassos*

G-Rank G4T3Q **S-Rank** S2 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 State and federally listed, G2

Estimated population in NE 800 - 1500 **Estimate based on** Field surveys, Lott 2006

Trends since 2005 in NE Stable

Range in NE Platte River east of Lake McConaughy, lower reaches of major rivers north of Platte River

Habitat Bare sand bars and sandy shorelines of large rivers, lakes and sand pits, housing developments

Threats Loss of dynamic river flows to form and maintain bare macro-form sandbar and shoreline habitat, flooding of nests, loss of nests to vehicles and human disturbance, hydro-peaking, invasive plant species affecting nesting habitat

Research/Inventory Conduct nesting surveys throughout breeding range in state; evaluate taxonomy, region-wide movements

Landscapes Central Platte River, Elkhorn Confluence, Lower Loup Rivers, Lower Platte River, Middle Niobrara, Missouri River and Bluffs, Upper Loup Rivers and Tributaries, Running Water

Common Name Loggerhead Shrike **Scientific Name** *Lanius ludovicianus*

G-Rank G4 **S-Rank** S3 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 Declining, PIF watch list

Estimated population in NE 3,00 to 6,000 **Estimate based on** Expert opinion

Trends since 2005 in NE -5.69 (95% CI: -8.95 to -2.42) annual decline based on Breeding Bird Survey trend analysis

Range in NE Statewide, although more common in areas with extensive grasslands

Habitat Grasslands with at least some scattered small trees or shrubs

Threats Loss of grassland habitats, depletion of food resources (due to pesticides), organochloride pesticide negatively impacts reproduction

Research/Inventory Determine causes of population declines; determine conservation measures (habitat improvement) that can positively impact species

Landscapes Sandstone Prairies, Southeast Prairies, Willow Creek, Central Loess Hills, Keya Paha, Loess Canyons, Lower Loup Rivers, Running Water, Cherry County Wetlands, Dismal River Headwaters, Elkhorn River Headwaters, Sandhills Alkaline Lakes, Upper Loup Rivers, Kimball Grasslands, Oglala Grasslands, Panhandle Prairies, Sandsage Prairies

Common Name Long-billed Curlew **Scientific Name** *Numenius americanus*

G-Rank G4 **S-Rank** S3 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 Ranked as imperiled or vulnerable in nearly all states in its range

Estimated population in NE 20,000- 27,000 **Estimate based on** Published estimate, Gregory 2011

Trends since 2005 in NE Declining

Range in NE North-central through panhandle

Habitat Sandhills dune prairie, Sandhills valley prairie with mixed-grass, prairie dog towns, mixed-grass and short-grass prairie in the Panhandle

Threats Habitat conversion – pivots, fragmentation, wind energy development

Research/Inventory Conduct more surveys to assess distribution and abundance; determine factors affecting nest success and chick survival; determine habitat needs, management impacts, and effects of wind energy development

Landscapes Cherry County Wetlands, Dismal River Headwaters, Middle Niobrara, Oglala Grasslands, Panhandle Prairies, Platte Confluence, Sandhills Alkaline Lakes, Upper Loup Rivers and Tributaries, Upper Niobrara River, Wildcat Hills

Common Name Mountain Plover **Scientific Name** *Charadrius montanus*

G-Rank G3 **S-Rank** S2 **Goal** 7 **Distribution** Limited

Criteria for Tier 1 State listed, G3

Estimated population in NE 100-300

Estimate based on Field surveys, Bly et al., 2008

Trends since 2005 in NE Unknown

Range in NE Kimball, Banner and Cheyenne, possibly Sioux counties

Habitat Shortgrass, agricultural fields; prairie dog towns; very low stature vegetation; flat, rocky areas

Threats Agriculture practices, predation on range sites, grazing management that maintains higher vegetation structure; habitat conversion and fragmentation; fire suppression

Research/Inventory Conduct surveys in native grassland; determine productivity on field vs. native prairie, spatial requirements for prairie near fallow habitats for brood-rearing and migration, effects of agriculture practices on foraging, effects of fire and of agricultural practices (e.g., chemical spraying), chick survival

Landscapes Kimball Grasslands

Common Name Pinyon Jay **Scientific Name** *Gymnorhinus cyanocephalus*

G-Rank G3 **S-Rank** S3 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 Declining

Estimated population in NE <200

Estimate based on Expert opinion, Field Surveys

Trends since 2005 in NE Unknown

Range in NE Pine Ridge and Wildcat Hills

Habitat Open ponderosa pine woodlands

Threats Loss and degradation of open ponderosa pine forests

Research/Inventory Refine knowledge of breeding status; identify important breeding sites; determine relationship between forest management and species response

Landscapes Pine Ridge, Wildcat Hills, Oglala Grasslands

<u>Common Name</u>	Piping Plover	<u>Scientific Name</u>	<i>Charadrius melodus</i>
<u>G-Rank</u>	G3	<u>S-Rank</u>	S2
<u>Goal</u>	7	<u>Distribution</u>	Limited
<u>Criteria for selection as Tier 1</u> State and federally listed, G3			
<u>Estimated population in NE</u>	500 - 1,000	<u>Estimate based on</u>	Five-year census, IPPC report
<u>Trends since 2005 in NE</u>	Unknown		
<u>Range in NE</u>	Platte River east of Lake McConaughy, lower reaches of major rivers north of Platte River		
<u>Habitat</u>	Bare sand bars and sandy shorelines of large rivers, lakes and sand pits		
<u>Threats</u>	Loss of dynamic river flows to form and maintain bare macro-form sandbar and shoreline habitat, flooding of nests (hydro-peaking), loss of nests to vehicles and human disturbance, invasive plant species affecting nesting habitat, loss of over- wintering habitat along the Gulf		
<u>Research/Inventory</u>	Conduct nesting surveys throughout breeding range in state; evaluate meta- population issues		
<u>Landscapes</u>	Central Platte River, Lower Loup Rivers, Lower Platte River, Missouri River and Bluffs, Middle Niobrara, Upper Loup Rivers and Tributaries, Running Water		

<u>Common Name</u>	Thick-billed Longspur	<u>Scientific Name</u>	<i>Rhynchophanes mccownii</i>
<u>G-Rank</u>	G4	<u>S-Rank</u>	S3
<u>Goal</u>	7	<u>Distribution</u>	Limited
<u>Criteria for selection as Tier 1</u> Declining, PIF watch list			
<u>Estimated population in NE</u>	2,000-4,000	<u>Estimate based on</u>	Expert opinion and Brenner and Jorgensen 2022.
<u>Trends since 2005 in NE</u>	Unknown		
<u>Range in NE</u>	Panhandle - primarily Sioux, Scotts Bluff, Banner and Kimball counties		
<u>Habitat</u>	Short-grass prairie with mixed-grass, short stature vegetation, and prairie dog colonies		
<u>Threats</u>	Habitat fragmentation and conversion, management that maintains higher vegetation structure, prairie dog control		
<u>Research/Inventory</u>	Identify habitat requirements; continue surveys to assess distribution and abundance; evaluate use of agricultural fields		
<u>Landscapes</u>	Kimball Grasslands, Oglala Grasslands, Panhandle Prairies		

Common Name Whooping Crane **Scientific Name** *Grus americana*

G-Rank G1 **S-Rank** S1N **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 State and federally listed, G1

Estimated population in NE ~ 500-600 **Estimate based on** 2011 field survey, Stehn 2011

Trends since 2005 in NE Slowly Increasing

Range in NE Platte River from Scottsbluff to Chapman; wetlands and major rivers in central flyway

Habitat Wetlands, wet meadows, sandbars and shallow water in rivers; spring and fall migrant, does not nest in Nebraska

Threats Loss of natural river flows to maintain wet meadows, bare sandbar and shallow water habitat, loss of wetland habitat, wind energy development, tree encroachment in wet meadows

Research/Inventory Continue migration surveys; increase surveys of Sandhills wetlands, southwest playas, Middle Loup River headwaters, and Custer County playas

Landscapes Central Loess Hills, Central Platte River, Cherry County Wetlands, Elkhorn River Headwaters, Lower Loup Rivers, Middle Niobrara, North Platte River, Oglala Grasslands, Panhandle Prairies, Platte Confluence, Rainwater Basin, Upper Loup Rivers and Tributaries, Running Water

Common Name Wood Thrush **Scientific Name** *Hylocichla mustelina*

G-Rank G4 **S-Rank** S3 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 Declining; PIF watch list

Estimated population in NE 1,000 - 4,000 **Estimate based on** Expert opinion

Trends since 2005 in NE -.88 (95% CI of -5 to 3.2) annually based on Breeding Bird Survey trend analysis

Range in NE Along major river valleys in eastern Nebraska

Habitat Mature eastern deciduous forests; needs shrubby understory component

Threats Reduction/ degradation of habitat, forest fragmentation - area sensitive species, fragmentation that increases cowbird parasitism, deer over-browsing of forest/woodland understory, invasive species (garlic mustard)

Research/Inventory Determine impacts of deer, invasive species, forest fragmentation, and cowbird parasitism

Landscapes Missouri River and Bluffs, Lower Platte River, Running Water, Southeast Prairies

Species of Greatest Information Need:

Harris' Sparrow (*Zonotrichia querula*)

- Identify cause and rate of decline
- Describe habitat use in Nebraska at different life stages
- Determining limiting factors or bottlenecks during wintering and migration periods
- Determine survival during non-breeding periods.
- Define long-term trends

Sprague's Pipit (*Anthus spragueii*)

- Define role and important of stopover sites and habitat during migration in Nebraska.

Baird's Sparrow (*Ammodramus bairdii*)

- Determine breeding status
- Define stopover abundance and duration
- Clarify stopover sites and habitat used during migration in NE

Short-Eared Owl (*Asio flammeus*)

- Determine approximate state population size
 - Define range extent in the state
 - Quantify approximate or range of breeding pairs in the state and how prey resource cycles influence breeding activity in the state
 - Determine nomadic movements range wide and how Nebraska plays into that life strategy.
-

Crustaceans

<u>Common Name</u> Ornate Fairy Shrimp			<u>Scientific Name</u> <i>Eubbranchipus ornatus</i>		
<u>G-Rank</u> G3	<u>S-Rank</u> SNR	<u>Goal</u> 7	<u>Distribution</u> Limited		
<u>Criteria for selection as Tier 1</u> G3					
<u>Estimated population in NE</u> Unknown			<u>Estimate based on</u> N/A		
<u>Trends since 2005 in NE</u> Unknown					
<u>Range in NE</u> Headwaters of the Elkhorn Rivers in eastern Sandhills, potentially central portion of Sandhills					
<u>Habitat</u> Clear, cool water with neutral to low pH, in well vegetated ephemeral pools					
<u>Threats</u> Changes in water quality, increase in turbidity and increase in pH due to run-off pollution, increase in temperature due to climate change					
<u>Research/Inventory</u> Conduct survey work to determine current distribution and population status. Conduct research to determine specific water quality and habitat parameters.					
<u>Landscapes</u> Elkhorn River Headwaters					

<u>Common Name</u> Potassium-loving Fairy Shrimp			<u>Scientific Name</u> <i>Branchinecta potassa</i>		
<u>G-Rank</u> G2	<u>S-Rank</u> S2	<u>Goal</u> 10	<u>Distribution</u> Endemic		
<u>Criteria for selection as Tier 1</u> G2, endemic					
<u>Estimated population in NE</u> Unknown			<u>Estimate based on</u> N/A		
<u>Trends since 2005 in NE</u> Unknown					
<u>Range in NE</u> Alkaline lakes region of western Sandhills					
<u>Habitat</u> Shallow to ephemeral, alkaline lakes with specific range of potassium levels					
<u>Threats</u> Changes in water quality, changes in potassium and pH due to run-off, changes in water availability due to groundwater declines and precipitation patterns associated with climate change					
<u>Research/Inventory</u> Conduct survey work to determine current distribution and population status. Conduct research to determine specific water quality and habitat parameters and life cycle.					
<u>Landscapes</u> Sandhills Alkaline Lakes, Cherry County Wetlands					

Fish

Common Name Blacknose Shiner **Scientific Name** *Notropis heterolepis*

G-Rank G5 **S-Rank** S1 **Goal** 1 **Distribution** Disjunct

Criteria for selection as Tier 1 State listed, disjunct

Estimated population in NE < 1,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Stable

Range in NE North-central portion of state

Habitat Headwater streams, spring fed, clear water, pools, quiet waters

Threats Stream dewatering, siltation, channelization, dams, culverts, water control structures, exotic species, introduced predator fish

Research/Inventory Determine age structure; study recruitment, population dynamics, seasonal movement and habitat use; conduct population monitoring

Landscapes Cherry County Wetlands, Keya Paha, Upper Loup Rivers and Tributaries, Upper Niobrara River

Common Name Finescale Dace **Scientific Name** *Chrosomus neogaeus*

G-Rank G5 **S-Rank** S2 **Goal** 1 **Distribution** Disjunct

Criteria for selection as Tier 1 State listed, disjunct

Estimated population in NE 5,000 - 10,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Stable

Range in NE Sandhills of central portion of state

Habitat Headwater streams, spring fed, clear water, sandhill streams, beaver ponds, undercut banks, meandering streams, small pools

Threats Channelization, stream dewatering, dams, culverts, water control structures, introduced predator fish, exotics species, and hybridization

Research/Inventory Understand basic biology; determine age structure, recruitment, population dynamics, seasonal movements, and habitat use; conduct genetic studies to determine level of hybridization with Northern Redbelly Dace.

Landscapes Cherry County Wetlands, Dismal River Headwaters, Keya Paha, Panhandle Prairies, Platte Confluence, Snake River, Upper Loup Rivers and Tributaries, Upper Niobrara River, Lower Loup Rivers, Elkhorn River Headwaters

Common Name Flathead Chub **Scientific Name** *Platygobio gracilis*

G-Rank G5 **S-Rank** S2 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 Declining

Estimated population in NE Unknown (>10,000) **Estimate based on** Expert opinion

Trends since 2005 in NE Declining

Current Range in NE Lower Niobrara River, Loup River, Lower Elkhorn River, Missouri River tributaries

Habitat Large, turbid rivers with relatively fast currents over gravel or sand substrates. A long, relatively natural reach of river (~180 km) is necessary to support viable populations.

Threats Pollution, dams, culverts, water control structures, stream dewatering, flow depletion, alteration of stream hydrology, channelization, habitat loss

Research/Inventory Current status of populations, lengths of stream needed for successful reproduction or recruitment; hydrologic conditions needed for successful recruitment; timing of flows needed for successful recruitment; stratified statewide surveys to develop estimate of population sizes and trends.

Landscapes Central Loess Hills, Lower Loup River, Running Water, Missouri River and Bluffs, Cherry County Wetlands, Upper Loup Rivers and Tributaries, Keya Paha, Elkhorn Confluence, Lower Platte River, Central Platte River, Middle Niobrara, North Platte River, Upper Niobrara River

Additional Priority Watersheds Cedar River, Long Pine Creek, South Fork Little Nemaha

Common Name Lake Sturgeon **Scientific Name** *Acipenser fulvescens*

G-Rank G3G4 **S-Rank** S1 **Goal** 10 **Distribution** Peripheral

Criteria for selection as Tier 1 State listed, G3

Estimated population in NE < 100 **Estimate based on** Field surveys

Trends since 2005 in NE Slightly increasing because of hatchery supplementation in the lower Missouri River and middle Mississippi River

Range in NE Lower Platte and Missouri Rivers – Cedar through Richardson Counties

Habitat Shallow water, gravel/rocky substrate – for spawning, large rivers, lakes in other states

Threats Pollution, channelization, dams, habitat loss, stream dewatering, flow depletion, alteration of stream hydrology, sediment transport, siltation, illegal commercial harvest

Research/Inventory Increase surveys to assess distribution and abundance; determine specific spawning habitat and population dynamics; conduct genetic studies

Landscapes Missouri River and Bluffs, Lower Platte River, Lower Loup Rivers

Additional Priority Watersheds Lower Platte and Lower Elkhorn Rivers

Common Name Northern Pearl Dace**Scientific Name** *Margariscus nachtriebi***G-Rank** G5**S-Rank** S2**Goal** 10**Distribution** Disjunct**Criteria for selection as Tier 1** Small range like Finescale Dace and Northern Redbelly Dace, disjunct glacial relict**Estimate population in NE** 1000-2,500**Estimate based on** Expert opinion**Trends since 2005 in NE** Stable**Range in NE** Sandhills of central portion of state**Habitat** Headwater streams, spring fed, clear water, sandhill streams, beaver ponds, undercut banks, meandering streams, small pools**Threats** Channelization, culverts, dams, water control structures, stream dewatering, introduced predator fish, exotic species**Research/Inventory** Understand basic biology; determine age structure, recruitment, population dynamics, seasonal movements, and habitat use; conduct genetic studies**Landscapes** Cherry County Wetlands, Dismal River Headwaters, Keya Paha, Panhandle Prairies, Platte Confluence, Snake River, Upper Loup Rivers and Tributaries, Upper Niobrara River, Running Water, Lower Loup Rivers, Elkhorn River Headwaters, Middle Niobrara**Additional Priority Watersheds** Long Pine Creek**Common Name** Northern Redbelly Dace**Scientific Name** *Chrosomus eos***G-Rank** G5**S-Rank** S2**Goal** 10**Distribution** Disjunct**Criteria for selection as Tier 1** State listed, disjunct**Estimated population in NE** 5,000 – 10,000 **Estimate based on** Field surveys**Trends since 2005 in NE** Stable**Range in NE** Sandhills of central portion of state**Habitat** Headwater streams, spring fed, clear water, sandhill streams, beaver ponds, undercut banks, meandering streams, small pools**Threats** Channelization, stream dewatering, dams, culverts, water control structures, introduced predator fish, exotics species, hybridization**Research/Inventory** Understand basic biology; determine age structure, recruitment, population dynamics, seasonal movements, and habitat use; conduct genetic studies for level of hybridization with Finescale Dace**Landscapes** Cherry County Wetlands, Dismal River Headwaters, Keya Paha, Middle Niobrara, Panhandle Prairies, Platte Confluence, Snake River, Upper Loup Rivers and Tributaries, Upper Niobrara River, Central Loess Hills

Common Name Pallid Sturgeon**Scientific Name** *Scaphirhynchus albus***G-Rank** G2**S-Rank** S1**Goal** 10**Distribution** Limited**Criteria for selection as Tier 1** State and federally listed, G1**Estimated population in NE** Adult sized fish (> 800mm): 688 (463-971) wild-origin & 1829 (1305-2488) hatchery-origin**Estimate based on** Published estimate, Missouri River Recovery Program – 2024 ESA Adaptive Management Compliance Report**Trends since 2005 in NE** Wild-origin fish are slightly decreasing, hatchery-origin fish are slightly increasing due to the continued Stocking Program.**Range in NE Wild origin:** Lower Platte and Missouri rivers – Cedar (below Gavins Point Dam) through Richardson counties**Hatchery-origin:** Lower Platte and Missouri rivers - Boyd through Richardson counties**Habitat** Large turbid rivers, steep drop-offs at the edge of sandbars, sandy areas, downstream end of islands**Threats** Pollution, channelization, dams, habitat loss, flow depletion, alteration of stream hydrology, sediment transport, siltation, illegal commercial harvest**Research/Inventory** Determine specific spawning habitat requirements and limiting factor in recruitment, population dynamics, and seasonal movement**Landscapes** Missouri River, Running Water, Lower Platte River**Common Name** Plains Minnow**Scientific Name** *Hybognathus placitus***G-Rank** G4**S-Rank** S2**Goal** 7**Distribution** Limited**Criteria for selection as Tier 1** Declining**Estimated population in NE** Unknown (<10,000)**Estimate based on** Expert opinion**Trends since 2005 in NE** Declining**Current Range in NE** Loup, Elkhorn, Middle Platte, Lower Platte Rivers**Habitat** Inhabit permanent streams and backwaters with sandy substrate and moderate current. They will use deep silty pools, but they can be found also in shallow waters. The Plains Minnow is one of the species that was diagnostic of “channels of fluctuating, shallow streams with shifting sand beds”.**Threats** Pollution, dams, culverts, water control structures, stream dewatering, flow depletion, alteration of stream hydrology, channelization, habitat loss**Research/Inventory** Current status of populations; lengths of stream, hydrologic conditions, and timing of flows needed for successful reproduction/recruitment; stratified statewide surveys to develop estimate of population sizes and trends.**Landscapes** Central Loess Hills, Central Platte River, Cherry County Wetlands, Elkhorn Headwaters, Lower Loup River, Keya Paha, Platte Confluence, North Platte River, Missouri River and Bluffs, Elkhorn Confluence, Lower Platte River, Rainwater Basin, Running Water, Upper Loup Rivers, Oglala Grasslands, Sandsage Prairie**Additional Priority Watersheds** South Fork Little Nemaha River

<u>Common Name</u> Plains Topminnow		<u>Scientific Name</u> <i>Fundulus sciadicus</i>	
<u>G-Rank</u> G4	<u>S-Rank</u> S3	<u>Goal</u> 10	<u>Distribution</u> Endemic
<u>Criteria for selection as Tier 1</u> Endemic, declining			
<u>Estimated population in NE</u> 100,000- 250,000		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Northwest two-thirds of state			
<u>Habitat</u> Vegetative backwaters and headwaters, shallow parts of rivers and streams			
<u>Threats</u> Predation, direct competition with Western Mosquitofish (<i>Gambusia affinis</i>) and other exotic species, stream dewatering, flow depletion, habitat loss, culverts, dams, water control structures,			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; identify secure occurrence locations; determine level of competition with Western Mosquitofish; conduct genetics study			
<u>Landscapes</u> Central Platte River, Cherry County Wetlands, Dismal River Headwaters, Elkhorn River Headwaters, Keya Paha, Kimball Grasslands, Lower Loup Rivers, Middle Niobrara, Missouri River and Bluffs, North Platte River, Panhandle Prairies, Platte Confluence, Running Water, Sandsage Prairie, Snake River, Upper Loup Rivers and Tributaries, Upper Niobrara River, Wildcat Hills, Lower Platte River, Willow Creek, Central Loess Hills, Sandhills Alkaline Lakes			
<u>Additional Priority Watersheds</u> Cedar River, Long Pine Creek			

<u>Common Name</u> Shoal Chub		<u>Scientific Name</u> <i>Macrhybopsis hyostoma</i>	
<u>G-Rank</u> G5	<u>S-Rank</u> S2	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u>		Declining	
<u>Estimated population in NE</u> 10,000- 100,000		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Eastern third of state			
<u>Habitat</u> Shallow riffles in medium to large turbid rivers			
<u>Threats</u> Pollution, dams, culverts, water control structures, stream dewatering, flow depletion, alteration of stream hydrology, channelization, habitat loss, pesticides (neonicotinoids) that reduce food availability			
<u>Research/Inventory</u> Current status of populations; lengths of stream, hydrologic conditions, and timing of flows needed for successful reproduction/recruitment; stratified statewide surveys to develop estimate of population sizes and trends			
<u>Landscapes</u> Elkhorn River Headwaters, Missouri River and Bluffs, Saline Wetlands, Upper Loup Rivers, Elkhorn Confluence, Lower Platte River, Central Platte River, Central Loess Hills, Lower Loup Rivers			

Common Name Sicklefın Chub**Scientific Name** *Macrhybopsis meeki***G-Rank** G3**S-Rank** S1**Goal 7****Distribution** Limited**Criteria for selection as Tier 1** G3**Estimated population in NE** 500 - 1,000**Estimate based on** Expert opinion**Trends since 2005 in NE** Unknown**Range in NE** Missouri River - Cedar through Richardson Counties**Habitat** Large turbid rivers**Threats** Pollution, reduction of turbidity, channelization, dams, habitat loss, alteration of stream hydrology, sediment transport, siltation**Research/Inventory** Determine specific habitat requirements, population dynamics, seasonal movement, and basic biology**Landscapes** Missouri River and Bluffs

Common Name Silver Chub**Scientific Name** *Macrhybopsis storeriana***G-Rank** G5**S-Rank** S2**Goal 7** **Distribution** Limited**Criteria for selection as Tier 1** Declining**Estimated Population in NE** 10,000-100,000 **Estimate based on** Expert opinion**Trends since 2005 in NE** Declining**Range in NE** Eastern third of the state**Habitat** Large turbid rivers**Threats** Pollution, channelization, habitat loss, stream dewatering, flow depletion, alteration of stream hydrology, dams, culverts, water control structures, pesticides (neonicotinoids) that reduce food availability**Research/Inventory** Current status of populations; lengths of stream, hydrologic conditions, and timing of flows needed for successful reproduction/recruitment; stratified statewide surveys to develop estimate of population sizes and trends**Landscapes** Elkhorn River Headwaters, Missouri River and Bluffs, Running Water, Southeast Prairies, Elkhorn Confluence, Lower Platte River, Central Loess Hills, Central Platte River, Lower Loup Rivers**Additional Priority Watersheds** South Fork Little Nemaha River

Common Name Sturgeon Chub**Scientific Name** *Macrhybopsis gelida***G-Rank** G3**S-Rank** S1**Goal** 10**Distribution** Limited**Criteria for selection as Tier 1** State listed, G3**Estimated population in NE** 500 – 2,500**Estimate based on** Expert opinion**Trends since 2005 in NE** Unknown**Range in NE** Lower Platte and Missouri Rivers – Cedar through Richardson Counties**Habitat** Large turbid rivers with gravel**Threats** Stream dewatering, pollution, reduction of turbidity, channelization, dams, habitat loss, flow depletion, alteration of stream hydrology, sediment transport, siltation**Research/Inventory** Determine specific habitat requirements, population dynamics, seasonal movement, and basic biology**Landscapes** Missouri River and Bluffs, Lower Platte River**Additional Priority Watersheds** Lower Platte and Elkhorn Rivers

Common Name Topeka Shiner**Scientific Name** *Miniellus topeka***G-Rank** G3**S-Rank** S1**Goal** 10**Distribution** Limited**Criteria for selection as Tier 1** State and federally listed, G3**Estimated population in NE** < 200 **Estimate based on** Expert opinion**Trends since 2005 in NE** Declining**Range in NE** Very localized- Cherry, Madison, and Stanton Counties**Habitat** Cold/cool clear water streams with gravel and a low gradient**Threats** Pollution, sedimentation, introduced predator fish, exotic species, channelization, stream dewatering, flow depletion, alteration of stream hydrology, dams, culverts, water control structures, habitat loss**Research/Inventory** Determine age structure, recruitment, population dynamics, seasonal movements, and identify potential for reintroduction sites that meet species needs.**Landscapes** Cherry County Wetlands, Upper Loup Rivers and Tributaries

Common Name Western Silvery Minnow **Scientific Name** *Hybognathus argyritis*

G-Rank G4 **S-Rank** S2 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 Declining, proposed for state listing

Estimated population in NE Unknown (<10,000) **Estimate based on** Expert opinion

Trends since 2005 in NE Declining

Current Range in NE Loup, Elkhorn, Middle Platte, Lower Platte Rivers

Habitat Inhabit backwaters, pools, and slow-moving waters in medium to large rivers. Rivers they inhabit have fine sandy or silty substrates.

Threats Pollution, dams, culverts, water control structures, stream dewatering, flow depletion, alteration of stream hydrology, channelization, habitat loss

Research/Inventory Current status of populations; lengths of stream, hydrologic conditions, and timing of flows needed for successful reproduction/recruitment; stratified statewide surveys to develop estimate of population sizes and trends.

Landscapes Central Platte River, Lower Loup River, Missouri River and Bluffs, Southeast Prairies, Upper Loup Rivers and Tributaries, Upper Niobrara River, Elkhorn Confluence, Lower Platte River, Keya Paha, Platte Confluence, Running Water, Cherry County Wetlands, Elkhorn River Headwaters, Middle Niobrara, Snake River, North Platte River

Additional Priority Watersheds South Fork Little Nemaha River

Species of Greatest Information Need

Black Buffalo (*Ictiobus niger*)

- Range extent
- Genetic differentiation between Smallmouth and Black Buffalo

Smallmouth Buffalo (*Ictiobus bubalus*)

- Population size
- Short term trends

Bigmouth Buffalo (*Ictiobus cyprinellus*)

- Population size
 - Short term trend
 - Sampling methodology
 - Movement
-

Insects

Common Name American Burying Beetle **Scientific Name** *Nicrophorus americanus*

G-Rank G3 **S-Rank** S3? **Goal 10 Distribution** Limited

Criteria for selection as Tier 1 State and federally listed, G3

Estimated population in NE 10,000-1,000,000 **Estimate based on** 2011 field surveys

Trends since 2005 in NE Fluctuating with drought

Range in NE North-central and southwest-central portion of the state

Habitat Wet meadows in Sandhills, open woodlands, loess prairie

Threats Woody encroachment, drought, land development, light pollution, pesticide use

Research/Inventory Determine specific habitat use, effects of land management practices, population sizes; conduct long-term monitoring of individual populations

Landscapes Cherry County Wetlands, Elkhorn River Headwaters, Keya Paha, Loess Canyons, Middle Niobrara, Upper Loup Rivers and Tributaries, Running Water, Rainwater Basin, Upper Niobrara

Common Name Bucholz Black Dash **Scientific Name** *Euphyes conspicua bucholzi*

G-Rank G4G5T1 **S-Rank** S1 **Goal 10 Distribution** Endemic

Criteria for selection as Tier 1 Endemic

Estimated population in NE < 100 **Estimate based on** Expert opinion

Trends since 2005 in NE Stable

Range in NE North-eastern portion of state

Habitat Wet meadow and spring-fed marsh; larvae feed on wide-leaf sedge, adults in boggy areas

Threats Habitat conversion and fragmentation, exotics, drying up of "wet" areas, housing development, overgrazing

Research/Inventory Conduct surveys to assess distribution, abundance and population dynamics; determine best management practices

Landscapes Elkhorn Confluence, Elkhorn River Headwaters, Running Water, Willow Creek

Common Name Byssus Skipper **Scientific Name** *Problema byssus kumskaka*

G-Rank G4TNR **S-Rank** S1 **Goal** 1 **Distribution** Peripheral

Criteria for selection as Tier 1 G4 rank

Estimated population in NE <200 **Estimate based on** Expert opinion

Trends since 2005 in NE Unknown

Range in NE Very limited in southeast corner of state

Habitat High quality native tallgrass prairie with eastern gamagrass

Threats Loss of gamagrass host plant due to land conversion and overgrazing. Fire and management regimes that remove all standing vegetation and do not leave refugia habitat.

Research/Inventory Conduct survey work to determine extant populations, current distribution and population status.

Landscapes Southeast Prairies, Sandstone Prairies

Common Name Colorado Rita Dotted Blue **Scientific Name** *Euphilotes rita coloradensis*

G-Rank G3G4TT3 **S-Rank** S1 **Goal** 1 **Distribution** Peripheral

Criteria for selection as Tier 1 G3

Estimated population in NE < 100 **Estimate based on** Expert opinion

Trends since 2005 in NE Stable

Range in NE Southwest portion of the panhandle

Habitat Sparse grasslands with rocky, gravelly soils of ridges, outcrops and bluffs. Specific to two species of wild buckwheat (*Eriogonum*).

Threats Overgrazing, herbicide use, limited by host plant occurrence

Research/Inventory Conduct surveys to determine distribution, abundance, and population dynamics

Landscapes Kimball Grasslands

Common Name Elusive Clubtail **Scientific Name** *Stylurus notatus*

G-Rank G3 **S-Rank** SNR **Goal** 1 **Distribution** Peripheral

Criteria for selection as Tier 1 G3, declining in nearly all states in range

Estimated population in NE Unknown **Estimate based on** N/A

Trends since 2005 in NE Declining

Range in NE Niobrara River, Loup Rivers, Missouri River

Habitat Large, slow rivers and lakes

Threats Degradation of most large rivers in its range, pesticide runoff

Research/Inventory More concerted efforts to survey for this species and determine range extent in NE

Landscapes Middle Niobrara, Running Water, Upper Loup Rivers and Tributaries, Missouri River and Bluffs

Common Name Fox Mayfly **Scientific Name** *Cercobrachys fox*

G-Rank G3G4 **S-Rank** SNR **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 G3G4

Estimated population in NE Unknown **Estimate based on**

Trends since 2005 in NE Unknown

Range in NE Eastern two-thirds of state

Habitat Medium size rivers, specific habitat requirements not known

Threats Degradation of water quality due to lower water flows and pollution from pesticide runoff.

Research/Inventory Conduct survey work to determine extant populations, current distribution and population status. Conduct research to determine specific habitat requirements and assess threats.

Landscapes Upper Niobrara River, Southeast Prairies

<u>Common Name</u> Ghost Tiger Beetle		<u>Scientific Name</u> <i>Ellipsopteraa lepida</i>	
<u>G-Rank</u> G3	<u>S-Rank</u> S2	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> G3			
<u>Estimated population in NE</u> 3,000 – 5,000		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Statewide in localized populations			
<u>Habitat</u> Sparsely-vegetated areas with open, sandy soils, usually near water			
<u>Threats</u> Habitat succession, trampling, lights, off-road vehicle traffic			
<u>Research/Inventory</u> Conduct species and habitat-type specific surveys to determine distribution, abundance, and conservation status			
<u>Landscapes</u> Cherry County Wetlands, Dismal River Headwaters, Elkhorn River Headwaters, Missouri River and Bluffs, Platte Confluence, Sandsage Prairie, Upper Loup Rivers and Tributaries			

<u>Common Name</u> Hourglass Dronefly		<u>Scientific Name</u> <i>Eristalis brousii</i>	
<u>G-Rank</u> G4	<u>S-Rank</u> S1	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> Declining in all or nearly all states in range			
<u>Estimated population in NE</u> Unknown		<u>Estimate based on</u> N/A	
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> Central and western portion of state			
<u>Habitat</u> Specific habitat requirements unknown			
<u>Threats</u> Possibly the introduction of <i>E. arbustorum</i> (from Europe)			
<u>Research/Inventory</u> Conduct survey work to determine extant populations, current distribution and population status. Conduct research to determine specific habitat requirements and assess threats.			
<u>Landscapes</u> Upper Loup Rivers and Tributaries, Cherry County Wetlands, Pine Ridge			

<u>Common Name</u> Iowa Skipper		<u>Scientific Name</u> <i>Atrytone arogos iowa</i>	
<u>G-Rank</u> G2G3T2T3	<u>S-Rank</u> S1	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> G2G3			
<u>Estimated population in NE</u> < 500 <u>Estimate based on</u> Expert opinion			
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Eastern half of state			
<u>Habitat</u> Tall-grass prairie, mixed-grass prairie along the Niobrara - bluestems likely host plant, requires native prairie with standing grass stems			
<u>Threats</u> Management practices that remove all standing grass stems, vegetative litter and nectar sources, burning of entire grassland site can be detrimental, habitat fragmentation			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; determine best management practices			
<u>Landscapes</u> Keya Paha, Middle Niobrara, Platte Confluence, Sandstone Prairie, Southeast Prairies, Upper Loup Rivers and Tributaries, Running Water, Missouri River and Bluffs, Rainwater Basin, Central Platte River			
<u>Common Name</u> Kohler's Fritillary		<u>Scientific Name</u> <i>Boloria myrina sabulocollis</i>	
<u>G-Rank</u> G5?T3	<u>S-Rank</u> S1S2	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> G5?T3			
<u>Estimated population in NE</u> <5000 <u>Estimate based on</u> Expert opinion			
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> Sandhills and northwest corner of state			
<u>Habitat</u> Sandhills and stream valley wet meadows with violets			
<u>Threats</u> Degradation of wet meadows due to draining and drying climatic conditions. Herbicide use and overgrazing that eliminates violets, which are the larval host plant.			
<u>Research/Inventory</u> Conduct survey work to determine extant populations, current distribution and population status.			
<u>Landscapes</u> Cherry County Wetlands, Pine Ridge, Upper Niobrara River, Upper Loup Rivers and Tributaries, Sandhills Alkaline Lakes			

<u>Common Name</u>	Lakota Mayfly	<u>Scientific Name</u>	<i>Apobaetis lakota</i>
<u>G-Rank</u>	G2G3	<u>S-Rank</u>	SNR
<u>Goal</u>	7	<u>Distribution</u>	Limited
<u>Criteria for selection as Tier 1</u>	G2G3		
<u>Estimated population in NE</u>	Unknown	<u>Estimate based on</u>	N/A
<u>Trends since 2005 in NE</u>	Unknown		
<u>Range in NE</u>	Southeast portion of state		
<u>Habitat</u>	Medium size rivers, specific habitat requirements not known		
<u>Threats</u>	Degradation of water quality due to lower water flows and pollution from pesticide runoff.		
<u>Research/Inventory</u>	Conduct survey work to determine extant populations, current distribution and population status. Conduct research to determine specific habitat requirements and assess threats.		
<u>Landscapes</u>	Rainwater Basin		
<u>Common Name</u>	Large Marble	<u>Scientific Name</u>	<i>Euchloea ausonides</i>
<u>G-Rank</u>	G4?	<u>S-Rank</u>	S1
<u>Goal</u>	1	<u>Distribution</u>	Peripheral
<u>Criteria for selection as Tier 1</u>	Petition for listing, declining		
<u>Estimated population in NE</u>	Unknown	<u>Estimate based on</u>	
<u>Trends since 2005 in NE</u>	Unknown		
<u>Range in NE</u>	Northwest Nebraska		
<u>Habitat</u>	Open meadows, hillsides, and valleys; host plants include rockcress and other members of the mustard family		
<u>Threats</u>	Loss of host plant from overgrazing, pesticides, invasive species		
<u>Research/Inventory</u>	Monitor population size in NE, identify primary host plants in the state		
<u>Landscapes</u>	Oglala Grasslands, Panhandle Prairies, Pine Ridge, Upper Niobrara River, Wildcat Hills		

<u>Common Name</u> Lichen Grasshopper			<u>Scientific Name</u> <i>Trimerotropis saxatilis</i>	
<u>G-Rank</u> G3	<u>S-Rank</u> S1	<u>Goal</u> 1	<u>Distribution</u> Peripheral	
<u>Criteria for selection as Tier 1</u> G3				
<u>Estimated population in NE</u> 500			<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Unknown				
<u>Range in NE</u> Panhandle				
<u>Habitat</u> Bare, open rock surfaces, usually lichen-encrusted				
<u>Threats</u> Disturbance of rock surfaces, woody encroachment				
<u>Research/Inventory</u> Conduct survey work to determine extant populations, current distribution and population status. Conduct research to determine specific habitat requirements and assess threats.				
<u>Landscapes</u> Wildcat Hills, North Platte River, Panhandle Prairies, Kimball Grasslands				

<u>Common Name</u> Longnose Mayfly			<u>Scientific Name</u> <i>Brachycercus nasutus</i>	
<u>G-Rank</u> G3G4	<u>S-Rank</u> S1	<u>Goal</u> 1	<u>Distribution</u> Peripheral	
<u>Criteria for selection as Tier 1</u> G3G4				
<u>Estimated population in NE</u> <500		<u>Estimate based on</u> Single known occurrence		
<u>Trends since 2005 in NE</u> Unknown				
<u>Range in NE</u> One known location in South Platte River near Ogallala				
<u>Habitat</u> Oxbows and backwaters				
<u>Threats</u> Loss of oxbows and backwaters on South Platte River due to encroachment of phragmites and flow modifications				
<u>Research/Inventory</u> Surveys to determine the size and extent of known occurrence and location of any additional occurrences in the state.				
<u>Landscapes</u> None				

<u>Common Name</u> Monarch		<u>Scientific Name</u> <i>Danaus plexippus</i>	
<u>G-Rank</u> G4	<u>S-Rank</u> S2	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> Declining			
<u>Estimated population in NE</u> 100,000		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Dramatic decline			
<u>Range in NE</u> Statewide, highest population numbers in eastern third of state			
<u>Habitat</u> Utilizes broad range of habitats but requires select species of milkweeds as larval host plants			
<u>Threats</u> Loss of milkweeds as larval host plant due to land conversion and herbicide use. Loss of overwintering habitat and catastrophic weather events in Mexico.			
<u>Research/Inventory</u> Conduct surveys work to determine population trends and monitor status of milkweeds.			
<u>Landscapes</u> All BULS, highest priority in eastern third of state			

<u>Common Name</u> Morrison's Bumble Bee		<u>Scientific Name</u> <i>Bombus morrisoni</i>	
<u>G-Rank</u> G3	<u>S-Rank</u> SNR	<u>Goal</u> 1	<u>Distribution</u> Peripheral
<u>Criteria for selection as Tier 1</u> G3, petition for listing			
<u>Estimated population in NE</u> Unknown		<u>Estimate based on</u> N/A	
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Southwest panhandle			
<u>Habitat</u> Arid uplands			
<u>Threats</u> Habitat loss, pesticides			
<u>Research/Inventory</u> Determine range extent in Nebraska, population size or extirpation status			
<u>Landscapes</u> Wildcat Hills			

<u>Common Name</u> Mottled Duskywing			<u>Scientific Name</u> <i>Erynnis martialis</i>
<u>G-Rank</u> G3	<u>S-Rank</u> S2	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> G3			
<u>Estimated population in NE</u> 500 – 1,500			<u>Estimate based on</u> Expert opinion
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Scattered across state (e.g., Pine Ridge, Niobrara River valley, National Forest at Halsey, Missouri River bluffs)			
<u>Habitat</u> Hilly areas with prairie openings, host plant is New Jersey Tea (<i>Ceanothus</i>)			
<u>Threats</u> Loss of habitat and host plants, cheatgrass invasion			
<u>Research/Inventory</u> Conduct surveys to determine distribution and abundance			
<u>Landscapes</u> Cherry County Wetlands, Pine Ridge, Middle Niobrara, Missouri River and Bluffs			
<u>Common Name</u> Nebraska Fritillary			<u>Scientific Name</u> <i>Boloria selene nebraskensis</i>
<u>G-Rank</u> G5?T3T4	<u>S-Rank</u> SNR	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> G5?T3T4			
<u>Estimated population in NE</u> <10000			<u>Estimate based on</u> Expert opinion
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> Eastern half of state outside of the Sandhills			
<u>Habitat</u> Wet meadows with violets			
<u>Threats</u> Degradation of wet meadows due to draining and drying climatic conditions. Herbicide use and overgrazing that eliminates violets, which are the larval host plant.			
<u>Research/Inventory</u> Conduct survey work to determine extant populations, current distribution and population status.			
<u>Landscapes</u> Central Platte River, Lower Loup Rivers, Lower Platte River, Elkhorn River Headwaters, Elkhorn Confluence, Saline Wetlands			

<u>Common Name</u> Nine-spotted Ladybird Beetle			<u>Scientific Name</u> <i>Coccinella novemnotata</i>
<u>G-Rank</u> G5	<u>S-Rank</u> S1	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> Severe decline throughout its historic range of the eastern half of North America			
<u>Estimated population in NE</u> < 5,000		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Severe decline			
<u>Range in NE</u> Historically statewide, currently only in the panhandle of Nebraska			
<u>Habitat</u> Preys on aphids found in variety of habitats			
<u>Threats</u> Predation by introduced parasitic wasp, insecticides			
<u>Research/Inventory</u> Conduct surveys to determine distribution and abundance			
<u>Landscapes</u> Panhandle Prairies, Sandhills Alkaline Lakes, Upper Niobrara River, Pine Ridge, Oglala Grasslands, Wildcat Hills			

<u>Common Name</u> Ottoe Skipper			<u>Scientific Name</u> <i>Hesperia ottoe</i>
<u>G-Rank</u> G3	<u>S-Rank</u> S2	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> G3			
<u>Estimated population in NE</u> < 1,000		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Eastern two-thirds of the state			
<u>Habitat</u> Tall-grass prairie, rolling/hilly prairie, mixed-grass prairie - feed on bluestems			
<u>Threats</u> Loss of native grasslands, management practices that remove all standing grass stems, vegetative litter, and nectar sources; exotics, habitat fragmentation, and burning of entire grassland site can be detrimental			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; determine best management practices			
<u>Landscapes</u> Lower Loup Rivers, Middle Niobrara, Sandstone Prairies, Running Water, Lower Platte River, Upper Loup Rivers and Tributaries, Platte Confluence, Loess Canyons, Sandsage Prairies			

<u>Common Name</u> Pawnee Stonefly		<u>Scientific Name</u> <i>Perlesta xube</i>	
<u>G-Rank</u> G2	<u>S-Rank</u> S2?	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> G2			
<u>Estimated population in NE</u> Unknown		<u>Estimate based on</u> N/A	
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> Northwest portion of state and south along the Missouri River			
<u>Habitat</u> Shaded to open canopied, sand-bottomed streams			
<u>Threats</u> Degradation of water quality due to lower water flows and pollution from pesticide runoff.			
<u>Research/Inventory</u> Conduct survey work to determine extant populations, current distribution and population status. Conduct research to determine specific habitat requirements and assess threats.			
<u>Landscapes</u> Upper Niobrara River, Missouri River and Bluffs			

<u>Common Name</u> Platte River Caddisfly		<u>Scientific Name</u> <i>Ironoquia plattensis</i>	
<u>G-Rank</u> G1G2	<u>S-Rank</u> S1S2	<u>Goal</u> 10	<u>Distribution</u> Endemic
<u>Criteria for selection as Tier 1</u> G1, endemic			
<u>Estimated population in NE</u> 7,500 – 10,000		<u>Estimate based on</u> Recent field surveys	
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Platte, Elkhorn, and Loup River systems			
<u>Habitat</u> Sloughs, backwaters, wet meadows			
<u>Threats</u> Loss of natural river hydrology to maintain sloughs, backwater, and wet meadow habitat, use of insecticides, habitat conversion			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; determine population dynamics and specific habitat requirements; conduct genetic analysis			
<u>Landscapes</u> Central Platte River, Elkhorn Confluence, Elkhorn River Headwaters, Platte Confluence, Lower Loup River, Upper Loup River and Tributaries, Lower Platte River			

<u>Common Name</u> Regal Fritillary			<u>Scientific Name</u> <i>Argynnis idalia</i>
<u>G-Rank</u> G3	<u>S-Rank</u> S3	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> G3			
<u>Estimated population in NE</u> 1,000-100,000		<u>Estimate based on</u> Expert opinion, surveys	
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Statewide, primarily in the eastern half of the state			
<u>Habitat</u> Tall-grass and mixed-grass prairie with violets, wet meadows			
<u>Threats</u> Habitat loss and fragmentation, exotics, drought, heavy grazing or herbicide use that eliminates violets, burning of entire prairie remnant			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; monitor population trends			
<u>Landscapes</u> Found in all BULs			

<u>Common Name</u> Salt Creek Tiger Beetle			<u>Scientific Name</u> <i>Ellipsoptera nevadica lincolniana</i>
<u>G-Rank</u> G5T1	<u>S-Rank</u> S1	<u>Goal</u> 10	<u>Distribution</u> Endemic
<u>Criteria for selection as Tier 1</u> State and federally listed, endemic			
<u>Estimated population in NE</u> ~ 300		<u>Estimate based on</u> Annual census	
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Lancaster County			
<u>Habitat</u> Eastern Nebraska saline wetlands and their associated streams			
<u>Threats</u> Habitat loss and degradation, urban development, impacts to natural hydrology - wetland drainage due to stream channelization and head-cutting, light pollution, heavy grazing			
<u>Research/Inventory</u> Identify specific reproductive habitat parameters; determine best habitat restoration methods; improve captive-rearing techniques			
<u>Landscapes</u> Saline Wetlands			

<u>Common Name</u>	Sandy Tiger Beetle	<u>Scientific Name</u>	<i>Cicindela limbata limbata</i>
<u>G-Rank</u>	G4T3T4	<u>S-Rank</u>	S4
<u>Goal</u>	7	<u>Distribution</u>	Limited
<u>Criteria for selection as Tier 1</u>	G4T3T4		
<u>Estimated population in NE</u>	Unknown	<u>Estimate based on</u>	N/A
<u>Trends since 2005 in NE</u>	Unknown		
<u>Range in NE</u>	Sandhills		
<u>Habitat</u>	Blowouts in Sandhills, open sand substrate		
<u>Threats</u>	Loss of blowouts and open substrate due to vegetative stabilization.		
<u>Research/Inventory</u>	Conduct survey work to determine extant populations, current distribution and population status.		
<u>Landscapes</u>	Cherry County Wetlands, Sandhills Alkaline Lakes, Upper Loup River and Tributaries, Panhandle Prairies, Platte Confluence, Dismal River Headwaters		

<u>Common Name</u>	Simius Roadside Skipper	<u>Scientific Name</u>	<i>Notamblyscirtes simius</i>
<u>G-Rank</u>	G3	<u>S-Rank</u>	S1
<u>Goal</u>	1	<u>Distribution</u>	Peripheral
<u>Criteria for selection as Tier 1</u>	G3, steep declines in NE		
<u>Estimated population in NE</u>	Unknown	<u>Estimate based on</u>	N/A
<u>Trends since 2005 in NE</u>	Declining, possibly extirpated		
<u>Range in NE</u>	Found only in northern Sioux County		
<u>Habitat</u>	Shortgrass and mixed-grass prairie, open areas in pine forests and hillsides		
<u>Threats</u>	Unknown		
<u>Research/Inventory</u>	Confirm presence in Sioux County		
<u>Landscapes</u>	Ogala Grasslands, Panhandle Prairies, Pine Ridge		

<u>Common Name</u>	Smoky-eyed Brown	<u>Scientific Name</u>	<i>Lethe eurydice fumosus</i>
<u>G-Rank</u>	G5T3T4	<u>S-Rank</u>	S3
<u>Goal</u>	4	<u>Distribution</u>	Widespread
<u>Criteria for selection as Tier 1</u>	G5T3T4		
<u>Estimated population in NE</u>	Unknown	<u>Estimate based on</u>	N/A
<u>Trends since 2005 in NE</u>	Unknown		
<u>Range in NE</u>	Western four-fifths of state. Limited to localized populations.		
<u>Habitat</u>	Sedge meadows in Sandhills and along streams and wetlands		
<u>Threats</u>	Land conversion. Degradation of wet meadows due to draining and drying climatic conditions. Herbicide use and overgrazing that eliminates sedges which are the larval host plant.		
<u>Research/Inventory</u>	Conduct surveys to determine extant populations, current distribution and population status.		
<u>Landscapes</u>	Central Platte River, Cherry County Wetlands, Elkhorn Confluence, Elkhorn River Headwaters, Lower Loup Rivers, Upper Niobrara River, Middle Niobrara River, Upper Loup River and Tributaries, Sandsage Prairies		

<u>Common Name</u>	Southern Plains Bumble Bee	<u>Scientific Name</u>	<i>Bombus fraternus</i>
<u>G-Rank</u>	G3G4	<u>S-Rank</u>	S2
<u>Goal</u>	4	<u>Distribution</u>	Widespread
<u>Criteria for selection as Tier 1</u>	G3G4		
<u>Estimated population in NE</u>	Unknown	<u>Estimate based on</u>	N/A
<u>Trends since 2005 in NE</u>	Declining		
<u>Range in NE</u>	Statewide		
<u>Habitat</u>	Prairie grasslands and urban areas		
<u>Threats</u>	Loss of habitat due to land conversion, fragmentation of habitat, low population size, pesticides, and disease transmission from managed bees		
<u>Research/Inventory</u>	Conduct survey work to determine extant populations, occupancy and population status.		
<u>Landscapes</u>	Cherry County Wetlands, Sandhills Alkaline Lakes, Central Loess Hills, Missouri River and Bluffs, Sandstone Prairies, Saline Wetlands, Rainwater Basin, Central Platte River, Lower Platte River, Lower Loup River, Middle Niobrara River, Oglala Grasslands, Pine Ridge, Panhandle Prairies, Kimball Grasslands, Upper Niobrara		

<u>Common Name</u> Suckley's Cuckoo Bumble Bee			<u>Scientific Name</u> <i>Bombus suckleyi</i>		
<u>G-Rank</u> G2G3	<u>S-Rank</u> SNR	<u>Goal</u> 1	<u>Distribution</u> Peripheral		
<u>Criteria for selection as Tier 1</u> G2G3					
<u>Estimated population in NE</u> Unknown			<u>Estimate based on</u> N/A		
<u>Trends since 2005 in NE</u> Declining					
<u>Range in NE</u> Northwest portion of state					
<u>Habitat</u> Grasslands, wetlands, woodland openings					
<u>Threats</u> Decline of principal known hosts, the Western Bumble Bee and Yellow-banded Bumble Bee, which is linked to habitat loss, pesticide exposure, disease transmission, and climate change					
<u>Research/Inventory</u> Conduct survey work to determine extant populations, current distribution and population status.					
<u>Landscapes</u> Pine Ridge, Panhandle Prairies					

<u>Common Name</u> Tawny Crescent			<u>Scientific Name</u> <i>Phyciodes batesii</i>		
<u>G-Rank</u> G3G4	<u>S-Rank</u> S1	<u>Goal</u> 4	<u>Distribution</u> Widespread		
<u>Criteria for selection as Tier 1</u> Declining, ranked as possibly extirpated, imperiled, or vulnerable in most states in its range					
<u>Estimated population in NE</u> 500 – 1,500			<u>Estimate based on</u> Expert opinion		
<u>Trends since 2005 in NE</u> Unknown					
<u>Range in NE</u> Pine Ridge- Sioux County					
<u>Habitat</u> Canyon type habitat - close to water, between stream and dry pine wooded areas with grassland openings					
<u>Threats</u> Limited by host plant availability (<i>Aster laevis</i>), heavy grazing					
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; determine life-cycle and specific habitat requirements					
<u>Landscapes</u> Pine Ridge					

<u>Common Name</u> Two-lined Stonefly		<u>Scientific Name</u> <i>Perlesta golconda</i>	
<u>G-Rank</u> GNR	<u>S-Rank</u> SNR	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> G2G3			
<u>Estimated population in NE</u> Unknown		<u>Estimate based on</u> N/A	
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> North central Nebraska			
<u>Habitat</u> Medium rivers with sand bottoms			
<u>Threats</u> Degradation of water quality due to lower water flows and pollution from pesticide runoff. Modification of stream hydrology.			
<u>Research/Inventory</u> Conduct survey work to determine extant populations, current distribution and population status. Conduct research to determine specific habitat requirements and assess threats.			
<u>Landscapes</u> Middle Niobrara River, Running Water, Lower Loup Rivers, Upper Loup Rivers and Tributaries, Missouri River and Bluffs			

<u>Common Name</u> Two-spotted Skipper		<u>Scientific Name</u> <i>Euphyes bimacula illinois</i>	
<u>G-Rank</u> G4T1T2	<u>S-Rank</u> S3	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Estimated population in NE</u> Unknown		<u>Estimate based on</u> N/A	
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> Scattered statewide, most common in Sandhills and western three-quarters of state. Limited to localized populations.			
<u>Habitat</u> Along streams and wetlands, marshes, and wet road ditches, generally associated with wetlands. Wet meadows in Sandhills.			
<u>Threats</u> Degradation of wetland habitat due land conversion, draining of wetlands and drying climatic conditions.			
<u>Research/Inventory</u> Conduct surveys to determine extant populations, current distribution and population status.			
<u>Landscapes</u> Upper Niobrara River, Cherry County Wetlands, Central Platte River, Lower Loup Rivers, Elkhorn River Headwaters, Elkhorn Confluence, Running Water, Missouri River and Bluffs, Middle Niobrara, Lower Platte River, Upper Loup Rivers and Tributaries, Platte Confluence, Sandhills Alkaline Lakes, Panhandle Prairies			

<u>Common Name</u>	Variable Cuckoo Bumble Bee	<u>Scientific Name</u>	<i>Bombus variabilis</i>
<u>G-Rank</u>	G1G2	<u>S-Rank</u>	SH
<u>Goal</u>	1	<u>Distribution</u>	Widespread
<u>Criteria for selection as Tier 1</u>	G1G2, at high risk of extirpation		
<u>Estimated population in NE</u>	Unknown	<u>Estimate based on</u>	N/A
<u>Trends since 2005 in NE</u>	Declining		
<u>Range in NE</u>	Eastern four fifths of the state		
<u>Habitat</u>	Old fields and hedgerows		
<u>Threats</u>	Decline of host species <i>B. pensylvanicus</i> , which is linked to habitat loss, pesticide exposure, and pathogen spillover		
<u>Research/Inventory</u>	Determine if the species has been extirpated; last observed in 2000 Lancaster Co.		
<u>Landscapes</u>	Saline Wetlands, Central Loess Hills, Platte Confluence, Lower Platte River		
<u>Common Name</u>	Western Bumble Bee	<u>Scientific Name</u>	<i>Bombus occidentalis occidentalis</i>
<u>G-Rank</u>	G3	<u>S-Rank</u>	SH
<u>Goal</u>	1	<u>Distribution</u>	Peripheral
<u>Criteria for selection as Tier 1</u>	G3		
<u>Estimated population in NE</u>	Unknown	<u>Estimate based on</u>	N/A
<u>Trends since 2005 in NE</u>	Dramatic decline		
<u>Range in NE</u>	Northwest portion of state		
<u>Habitat</u>	Grasslands, woodland openings, urban		
<u>Threats</u>	Introduced pathogens, reduced genetic diversity, habitat loss and degradation, and pesticide exposure		
<u>Research/Inventory</u>	Conduct survey work to determine extant populations, current distribution and population status. Last observed in 2001 in Sioux Co. despite intentional survey effort from 2019-2024.		
<u>Landscapes</u>	Panhandle Prairies, Oglala Grasslands, Pine Ridge		

Common Name Winnebago Mayfly**Scientific Name** *Cercobrachys winnebago***G-Rank** G3G4**S-Rank** S1**Goal** 7**Distribution** Limited**Criteria for selection as Tier 1** G3G4**Estimated population in NE** Unknown**Estimate based on** N/A**Trends since 2005 in NE** Unknown**Range in NE** Eastern two-thirds of state**Habitat** Medium size rivers, specific habitat requirements not known**Threats** Degradation of water quality due to lower water flows and pollution from pesticide runoff.**Research/Inventory** Conduct survey work to determine extant populations, current distribution and population status. Conduct research to determine specific habitat requirements and assess threats.**Landscapes** None

Species of Greatest Information Need

Juanita Sphinx (*Proserpinus juanita*)

- Range extent
- Population size
- Short-term trends

For the following species in addition to an expert who can identify them to species we also need to clarify their range extent, host plant, and population size in Nebraska:

- *Anthidium psoraleae*
 - *Dieunomia apacha*
 - *Dieunomia triangulifera*
 - *Megachile anograe*
 - *Megachile dakotensis*
 - *Megachile deflexa*
 - *Megachile dentitarsus*
 - *Megachile fortis*
 - *Megachile mucorosa*
 - *Megachile rugifrons*
 - *Nomia universitatis*
 - *Osmia cyaneonitens*
-

Mammals

Common Name Bailey's Eastern Woodrat

Scientific Name *Neotoma floridiana baileyi*

G-Rank G5T3

S-Rank S4

Goal 10

Distribution Endemic

Criteria for selection as Tier 1 Endemic

Estimated population in NE 1,000-3,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Increasing

Range in NE North-central Nebraska

Habitat Pines and bluffs; woodlands and rocks

Threats Habitat degradation; excessive fire

Research/Inventory Conduct surveys to assess distribution and abundance

Landscapes Keya Paha, Middle Niobrara, Snake River, Upper Niobrara

Common Name Cheyenne Northern Pocket Gopher

Scientific Name *Thomomys talpoides cheyennensis*

G-Rank G5T3T4

S-Rank S2S3

Goal 7

Distribution Limited

Criteria for selection as Tier 1 Regional endemic

Estimated population in NE Unknown **Estimate based on** N/A

Trends since 2005 in NE Decreasing

Range in NE Kimball, Cheyenne and Banner counties

Habitat Hard rocky soils, short-grass prairies

Threats Land conversion, *Geomys* range expansion

Research/Inventory Conduct surveys to assess distribution and abundance

Landscapes Kimball Grasslands

<u>Common Name</u> Eastern Red Bat			<u>Scientific Name</u> <i>Lasiurus borealis</i>
<u>G-Rank</u> G3G4	<u>S-Rank</u> S3	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> G3G4, declining species			
<u>Estimated population in NE</u> <10,000		<u>Estimate based on</u> Survey data, expert opinion	
<u>Trends since 2005 in NE</u> Stable to declining			
<u>Range in NE</u> Statewide breeding and migration			
<u>Habitat</u> Deciduous and pine woodlands, usually associated with water source			
<u>Threats</u> Highly susceptible to mortality from strikes with turbines at wind farms.			
<u>Research/Inventory</u> Research to determine specific areas and habitats used for maternal roosting and rearing of young. Surveys to identify timing of migration and potential migration corridors. Surveys to obtain better estimates of resident and migratory populations. Monitoring to determine level of mortality at wind farms.			
<u>Landscapes</u> All BULs statewide			

<u>Common Name</u> Fringed Myotis			<u>Scientific Name</u> <i>Myotis thysanodes pahasapensis</i>
<u>G-Rank</u> G4T3	<u>S-Rank</u> S1	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> G4T3			
<u>Estimated population in NE</u> 500-1,500		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> Pine forests in panhandle and Wildcat Hills			
<u>Habitat</u> Ponderosa pine forest and woodland, green ash-elm bottom woodland, cliffs and buttes			
<u>Threats</u> Habitat loss, potential susceptibility to White-nose Syndrome (WNS)			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; identify maternal roost habitat requirements and winter hibernacula; track movement patterns			
<u>Landscapes</u> Pine Ridge, Wildcat Hills, Oglala Grasslands, Kimball Grasslands			

Common Name Hoary Bat **Scientific Name** *Lasiurus cinereus*

G-Rank G3G4 **S-Rank** S3 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 G3G4, declining species

Estimated population in NE <5,000 **Estimate based on** Survey data, expert opinion

Trends since 2005 in NE Stable to declining

Range in NE Statewide breeding and migration

Habitat Deciduous and pine woodlands, usually associated with water source in arid landscapes

Threats Highly susceptible to mortality from strikes with turbines at wind farms

Research/Inventory Research to determine specific areas and habitats used for maternal roosting and rearing of young. Surveys to identify timing of migration and potential migration corridors. Surveys to obtain better estimates of resident and migratory populations. Monitoring to determine level of mortality at wind farms.

Landscapes All BULs statewide

Common Name Little Brown Myotis **Scientific Name** *Myotis lucifugus*

G-Rank G3G4 **S-Rank** S1 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 G-rank, declining species

Estimated population in NE 1,000-2,500 **Estimate based on** Survey data, expert opinion

Trends since 2005 in NE Declining

Range in NE Panhandle, along Niobrara River, and into eastern third of state. Eastern populations are rare

Habitat Deciduous woodlands, usually associated with water source

Threats High mortality from White-nose Syndrome (WNS). Susceptible to mortality from strikes with turbines at wind farms

Research/Inventory Research to determine specific areas and habitats used for maternal roosting and rearing of young. Surveys to identify timing of migration and potential migration corridors. Surveys to obtain better estimates of resident and migratory populations. Monitoring to determine level of mortality at wind farms. Continue White-nose Syndrome (WNS) monitoring and assess impacts to populations

Landscapes Middle Niobrara River, Running Water, Missouri River and Bluffs, Lower Platte River, Upper Niobrara River, North Platte River, Oglala Grasslands, Pine Ridge, Panhandle Prairies, Southeast Prairies

Common Name Northern Long-eared Myotis**Scientific Name** *Myotis septentrionalis***G-Rank** G2G3**S-Rank** S1S2**Goal** 4**Distribution** Widespread**Criteria for selection as Tier 1** G2G3, declining species**Estimated population in NE** <2,000 **Estimate based on** Survey data, expert opinion**Trends since 2005 in NE** Declining**Range in NE** Northern half and eastern third of state, populations along Republican River to Harlan County Reservoir**Habitat** Interior of deciduous and coniferous woodlands**Threats** High mortality from White-nose Syndrome (WNS).**Research/Inventory** Research to determine specific areas and habitats used for maternal roosting and rearing of young. Surveys to identify timing of migration and potential migration corridors. Surveys to obtain better estimates of resident and migratory populations. Continue WNS monitoring and assess impacts to populations. Monitoring to determine level of mortality at wind farms.**Landscapes** Pine Ridge, Upper Niobrara River, Middle Niobrara River, Running Water, Missouri River and Bluffs, Southeast Prairies, Sandstone Prairies, Lower Platte River, Upper Loup Rivers and Tributaries

Common Name Pierre Northern Pocket Gopher**Scientific Name** *Thomomys talpoides pierreicolus***G-Rank** G5TNR**S-Rank** S2S3**Goal** 7**Distribution** Limited**Criteria for selection as Tier 1** Regional endemic**Estimated population in NE** Unknown**Estimate based on** N/A**Trends since 2005 in NE** Unknown**Range in NE** Northern Dawes and Sioux counties**Habitat** Short-grass, hard soils**Threats** Control**Research/Inventory** Conduct surveys to assess distribution and abundance**Landscapes** Oglala Grasslands, Pine Ridge

<u>Common Name</u> Plains Spotted Skunk			<u>Scientific Name</u> <i>Spilogale interrupta</i>
<u>G-Rank</u> G4	<u>S-Rank</u> S1	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> Declining			
<u>Estimated population in NE</u> <1,000 <u>Estimate based on</u> Survey data, expert opinion			
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Statewide			
<u>Habitat</u> Grasslands and old field habitat close to old structures and wooded areas			
<u>Threats</u> Loss of habitat due to land conversion and land management			
<u>Research/Inventory</u> Conduct survey work to determine extant populations, current distribution and population status. Research to determine genetic relationship to adjacent populations.			
<u>Landscapes</u> Pine Ridge, Cherry County Wetlands, Elkhorn River Headwaters, Southeast Prairies, Sandstone Prairies, Keya Paha, Middle Niobrara, Central Platte River, Platte Confluence, Rainwater Basin, Running Water, Oglala Grasslands, Wildcat Hills			

<u>Common Name</u> Rocky Mountain Bighorn Sheep			<u>Scientific Name</u> <i>Ovis canadensis</i>
<u>G-Rank</u> G4T4	<u>S-Rank</u> S2	<u>Goal</u> 1	<u>Distribution</u> Disjunct
<u>Criteria for selection as Tier 1</u> Disjunct			
<u>Estimated population in NE</u> 215			<u>Estimate based on</u> NGPC monitoring
<u>Trends since 2005 in NE</u> Herd specific- varies from stable to significant population declines.			
<u>Range in NE</u> Buttes in Scotts Bluff, Banner, Morrill, Dawes, and Sioux counties			
<u>Habitat</u> Rocky buttes of Pine Ridge and Wildcat Hills			
<u>Threats</u> Disease, predation, parasites, highway mortalities			
<u>Research/Inventory</u> Monitor for parasites, disease, and cause-specific mortality; inventory for population estimates/classification and adult and lamb survival rates.			
<u>Landscapes</u> Pine Ridge, Wildcat Hills			

Common Name Silver-haired Bat**Scientific Name** *Lasionycteris noctivagans***G-Rank** G3G4**S-Rank** S3**Goal** 4**Distribution** Widespread**Criteria for selection as Tier 1** G3G4, declining species**Estimated population in NE** <5,000**Estimate based on** Survey data, expert opinion**Trends since 2005 in NE** Stable to declining**Range in NE** Statewide breeding and migration**Habitat** Deciduous and pine woodlands, usually associated with water source**Threats** Highly susceptible to mortality from strikes with turbines at wind farms.**Research/Inventory** Research to determine specific areas and habitats used for maternal roosting and rearing of young. Surveys to identify timing of migration and potential migration corridors. Surveys to obtain better estimates of resident and migratory populations. Monitoring to determine level of mortality at wind farms.**Landscapes** All BULs statewide migration; more common reproduction NW, North and East BULs

Common Name Southern Flying Squirrel**Scientific Name** *Glaucomys volans***G-Rank** G5**S-Rank** S1**Goal** 5**Distribution** Peripheral**Criteria for selection as Tier 1** State Threatened**Estimated population in NE** 50-1,000**Estimate based on** Field surveys**Trends since 2005 in NE** Relatively stable; may increase**Range in NE** Missouri River bluffs - Washington to Richardson counties**Habitat** Red oak-basswood-ironwood forest**Threats** Loss of mature forest with old-growth trees with cavities for nesting**Research/Inventory** Conduct surveys to assess distribution and abundance; conduct population monitoring**Landscapes** Missouri River and Bluffs

<u>Common Name</u> Swift Fox		<u>Scientific Name</u> <i>Vulpes velox</i>	
<u>G-Rank</u> G3	<u>S-Rank</u> S2	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> State listed, G3			
<u>Estimated population in NE</u> < 1,000		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Stable			
<u>Range in NE</u> Panhandle and Southwest Nebraska			
<u>Habitat</u> Short-grass prairie, western mixed-grass prairie			
<u>Threats</u> Predator control, conversion to cropland, fragmentation of habitat, loss of prairie dog colonies			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; conduct population monitoring			
<u>Landscapes</u> Kimball Grasslands, Oglala Grasslands, Panhandle Prairies, Pine Ridge, Upper Niobrara River, Wildcat Hills, Sandhills Alkaline Lakes			

<u>Common Name</u> Tricolored Bat		<u>Scientific Name</u> <i>Perimyotis subflavus</i>	
<u>G-Rank</u> G3G4	<u>S-Rank</u> S3	<u>Goal</u> 1	<u>Distribution</u> Peripheral
<u>Criteria for selection as Tier 1</u> G3G4, declining species			
<u>Estimated population in NE</u> <7,000		<u>Estimate based on</u> Survey data, expert opinion	
<u>Trends since 2005 in NE</u> Stable to declining			
<u>Range in NE</u> Eastern third of state			
<u>Habitat</u> Deciduous woodlands			
<u>Threats</u> High mortality from White-nose Syndrome (WNS). Susceptible to mortality from strikes with turbines at wind farms.			
<u>Research/Inventory</u> Research to determine specific areas and habitats used for maternal roosting and rearing of young. Surveys to identify timing of migration and potential migration corridors. Continue White-nose Syndrome (WNS) monitoring and assess impacts to populations.			
<u>Landscapes</u> Middle Niobrara River, Running Water, Missouri River and Bluffs, Southeast Prairies, Sandstone Prairies, Lower Platte River, Saline Wetlands, Upper Loup Rivers and Tributaries			

Species of Greatest Information Need

Plains Pocket Mouse (*Perognathus flavescens perniger*)

- Population size
- Short-term trends
- Long-term monitoring to understand booms and busts

Southern Bog Lemming (*Synaptomys cooperi*)

- Population size
- Range extent
- Inventory methodology

Spotted Ground Squirrel (*Xerospermophilus spilosoma obsoletus*)

- Population size
 - Range extent
 - Population trends
-

Mollusks

<u>Common Name</u>	Creeper	<u>Scientific Name</u>	<i>Strophitus undulatus</i>
<u>G-Rank</u>	G5	<u>S-Rank</u>	S1
<u>Goal</u>	4	<u>Distribution</u>	Widespread
<u>Criteria for selection as Tier 1</u>	Declining in most states in its range, S1		
<u>Estimated population in NE</u>	50-250	<u>Estimate based on</u>	Expert opinion, surveys
<u>Trends since 2005 in NE</u>	Declining		
<u>Range in NE</u>	Central third of the state		
<u>Habitat</u>	Small streams to large rivers with slow flows over mud, sand, and gravel substrates. Presence of host fish.		
<u>Threats</u>	Dewatering of artificial systems, habitat loss, habitat fragmentation, barriers to host fish movement, predation, invasive species, siltation, degradation of water quality		
<u>Research/Inventory</u>	Conduct surveys to assess distribution and abundance; determine specific habitat requirements; explore propagation potential		
<u>Landscapes</u>	Central Platte River, Cherry County Wetlands, Lower Platte River, Missouri River and Bluffs, North Platte River, Platte Confluence, Sandsage Prairie, Upper Loup Rivers and Tributaries, Rainwater Basin, Sandstone Prairies, Southeast Prairies		
<u>Additional Priority Watersheds</u>	Elkhorn River		

<u>Common Name</u>	Fatmucket	<u>Scientific Name</u>	<i>Lampsilis siliquoidea</i>
<u>G-Rank</u>	G5	<u>S-Rank</u>	S1
<u>Goal</u>	4	<u>Distribution</u>	Widespread
<u>Criteria for selection as Tier 1</u>	Propagation species; at risk of extirpation from the state		
<u>Estimated population in NE</u>	2,500-10,000	<u>Estimate based on</u>	Expert opinion, surveys
<u>Trends since 2005 in NE</u>	Declining; increasing with successful propagation		
<u>Range in NE</u>	Naturally in eastern third of the state and has expanded into central region through propagation and stocking efforts		
<u>Habitat</u>	Small streams to large rivers with slow to moderate flows over mud, sand, and gravel substrates. Presence of host fish.		
<u>Threats</u>	Habitat loss, habitat fragmentation, barriers to host fish movement, predation, invasive species, siltation, degradation of water quality		
<u>Research/Inventory</u>	Identify locations of most successful reintroductions, natural recruitment		
<u>Landscapes</u>	Cherry County Wetlands, Missouri River and Bluffs, Rainwater Basin, Sandstone Prairies, Southeast Prairies, Running Water, Upper Niobrara River, North Platte River		
<u>Additional Priority Watersheds</u>	Big Blue with West Fork Big Blue River, Birdwood, Cedar River, Elkhorn River, South Loup River		

<u>Common Name</u>	Flat Floater	<u>Scientific Name</u>	<i>Utterbackiana suborbiculata</i>
<u>G-Rank</u>	G5	<u>S-Rank</u>	S1S2
		<u>Goal</u>	4
		<u>Distribution</u>	Widespread
<u>Criteria for selection as Tier 1</u>	Declining; ranked as imperiled or vulnerable in nearly all states in its range		
<u>Estimated population in NE</u>	50-1,000	<u>Estimate based on</u>	Expert opinion
<u>Trends since 2005 in NE</u>	Unknown		
<u>Range in NE</u>	Missouri River - Boyd through Richardson counties		
<u>Habitat</u>	Quiet water of sloughs, oxbows, and backwaters of Missouri River. Presence of host fish.		
<u>Threats</u>	Drainage, filling and siltation of sloughs, oxbows, and back waters; channelization, degradation of water quality, invasive species		
<u>Research/Inventory</u>	Conduct surveys to assess distribution and abundance; determine specific habitat requirements		
<u>Landscapes</u>	Missouri River and Bluffs		
<u>Common Name</u>	Niobrara Ambersnail	<u>Scientific Name</u>	<i>Oxyloma haydeni</i>
<u>G-Rank</u>	G3	<u>S-Rank</u>	SNR
		<u>Goal</u>	4
		<u>Distribution</u>	Widespread
<u>Criteria for selection as Tier 1</u>	G3		
<u>Estimated population in NE</u>	Unknown	<u>Estimate based on</u>	N/A
<u>Trends since 2005 in NE</u>	Unknown		
<u>Range in NE</u>	Unknown		
<u>Habitat</u>	Moist soil by stream		
<u>Threats</u>	Unknown		
<u>Research/Inventory</u>	Conduct survey work to determine extant populations, current distribution and population status. Conduct research to determine specific habitat requirements and assess threats.		
<u>Landscapes</u>	Platte Confluence		

<u>Common Name</u> Oxbow Snail			<u>Scientific Name</u> <i>Fossaria cockerelli</i>
<u>G-Rank</u> G3G4	<u>S-Rank</u> S1	<u>Goal</u> 1	<u>Distribution</u> Peripheral
<u>Criteria for selection as Tier 1</u> G3G4			
<u>Estimated population in NE</u> <500		<u>Estimate based on</u> Single known occurrence	
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> One known location in South Platte River near Ogallala			
<u>Habitat</u> Oxbows and backwaters			
<u>Threats</u> Loss of oxbows and backwaters on South Platte River due to encroachment of phragmites and flow modifications			
<u>Research/Inventory</u> Conduct survey work to determine extant populations, current distribution and population status. Conduct research to determine specific habitat requirements and assess threats.			
<u>Landscapes</u> None			

<u>Common Name</u> Pistolgrip		<u>Scientific Name</u> <i>Tritogonia verrucosa</i>	
<u>G-Rank</u> G4G5	<u>S-Rank</u> S1	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> Declining			
<u>Estimated population in NE</u> 1-250		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Declining, possibly extirpated			
<u>Range in NE</u> Streams in southeast portion of state			
<u>Habitat</u> Large streams to medium rivers with slow to high flow over mud, sand, and gravel substrates. Presence of host fish.			
<u>Threats</u> Habitat fragmentation, habitat loss, barriers to fish movement, channelization, siltation, degradation of water quality, predation, loss of host fish			
<u>Research/Inventory</u> Conduct surveys in the Big Blue River to assess distribution and abundance; determine specific habitat requirements; develop culture techniques; identify reintroduction sites			
<u>Landscapes</u> Southeast Prairies			
<u>Additional Priority Watersheds</u> Big Blue with West Fork Big Blue River			

Common Name Plain Pocketbook **Scientific Name** *Lampsilis cardium*

G-Rank G5 **S-Rank** S2 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 Declining

Estimated population in NE 2,500-10,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Unknown, increasing with successful propagation

Range in NE Naturally in eastern third of the state and has expanded into central region through propagation and stocking efforts

Habitat Small creeks to medium rivers with slow to fast flow over mud, sand, and gravel substrates. Presence of host fish.

Threats Habitat fragmentation, habitat loss, barriers to fish movement, channelization, siltation, degradation of water quality, predation

Research/Inventory Conduct surveys to assess distribution and abundance; determine specific habitat requirements; identify locations of most successful reintroductions; natural recruitment

Landscapes Cherry County Wetlands, Elkhorn River Headwaters, Rainwater Basin, Running Water, Sandstone Prairies, Southeast Prairies, Upper Niobrara River, Missouri River and Bluffs, Elkhorn Confluence

Additional Priority Watersheds Big Blue with West Fork Big Blue River, Birdwood Creek, Cedar River, Elkhorn River, South Loup River

Common Name Pondmussel

Scientific Name *Sagittunio subrostratus*

G-Rank G5 **S-Rank** S1 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 At risk of extirpation from the state

Estimated population in NE <50 **Estimate based on** Expert opinion, surveys

Trends since 2005 in NE Declining; possibly extirpated

Range in NE Eastern third of Nebraska. In 1993, only two live specimens were found in the upper Elkhorn in Holt County

Habitat Small creeks and rivers with slow flow over mud and sand substrates. Presence of host fish.

Threats Habitat loss, habitat fragmentation, barriers to host fish movement, predation, invasive species, siltation, degradation of water quality

Research/Inventory Explore propagation potential; conduct surveys to assess distribution and abundance

Landscapes Southeast Prairies, Rainwater Basin, Sandstone Prairies, Missouri River and Bluffs

Additional Priority Watersheds Elkhorn River

<u>Common Name</u>	Scaleshell	<u>Scientific Name</u>	<i>Potamilus leptodon</i>
<u>G-Rank</u>	G1G2	<u>S-Rank</u>	S1
<u>Goal</u>	7	<u>Distribution</u>	Limited
<u>Criteria for selection as Tier 1</u>	State and federally listed, G1		
<u>Estimated population in NE</u>	< 10	<u>Estimate based on</u>	Expert opinion
<u>Trends since 2005 in NE</u>	Unknown		
<u>Range in NE</u>	Upper reaches of Missouri River		
<u>Habitat</u>	Large rivers with moderate to fast flow over mud, sand, and gravel substrates. Presence of host fish.		
<u>Threats</u>	Channelization, degradation of water quality, habitat loss, siltation, invasive species		
<u>Research/Inventory</u>	Conduct surveys to assess distribution and abundance; determine specific habitat requirements		
<u>Landscapes</u>	Missouri River and Bluffs		
<u>Common Name</u>	Yellow Sandshell	<u>Scientific Name</u>	<i>Lampsilis teres</i>
<u>G-Rank</u>	G5	<u>S-Rank</u>	S1
<u>Goal</u>	4	<u>Distribution</u>	Widespread
<u>Criteria for selection as Tier 1</u>	Nearly extirpated from the state; declining in nearly all states in range		
<u>Estimated population in NE</u>	250-1,000	<u>Estimate based on</u>	Expert opinion, surveys
<u>Trends since 2005 in NE</u>	Declining		
<u>Range in NE</u>	Streams in eastern third of the state.		
<u>Habitat</u>	Medium to large rivers with slow to moderate flows over mud, sand and gravel substrates with presence of host fish.		
<u>Threats</u>	Habitat loss, habitat fragmentation, barriers to host fish movement, predation, invasive species, siltation, degradation of water quality, invasive species		
<u>Research/Inventory</u>	Conduct surveys to assess distribution and abundance; determine specific habitat requirements; develop culture techniques; identify reintroduction streams/sites		
<u>Landscapes</u>	Saline Wetlands, Southeast Prairies, Missouri River and Bluffs, Elkhorn Confluence, Sandstone Prairies		
<u>Additional Priority Watersheds</u>	Big Blue with West Fork Big Blue River		

Species of Greatest Information Need

Black Sandshell (*Ligumia recta*)

- Monitor success of propagation and reintroduction efforts
- Document recruitment
- Track population size

Lilliput (*Toxolasma parvum*)

- Surveys to estimate population size
 - Range extent in NE
 - Area of occupancy in NE
-

Reptiles

Common Name Blanding's Turtle

Scientific Name *Emydoidea blandingii*

G-Rank G4

S-Rank S4

Goal 7

Distribution Limited

Criteria for selection as Tier 1 Ranked as imperiled or vulnerable in all but one state in its range

Estimated population in NE > 150,000

Estimate based on Expert opinion

Trends since 2005 in NE Stable

Range in NE Primarily Sandhills marshes, very locally in eastern portion of state

Habitat Requires proximity to water; Sandhills fens, Sandhills freshwater marsh, northern cordgrass wet prairie, small tributaries, Sandhills prairies (upland habitat), marshes and oxbows in eastern portion of state

Threats Vehicle mortality, habitat fragmentation and loss of wetlands in eastern part of range, collection for pet trade

Research/Inventory Conduct surveys along eastern edge of range, population monitoring

Landscapes Cherry County Wetlands, Dismal River Headwaters, Elkhorn Confluence, Elkhorn River Headwaters, Lower Loup Rivers, Lower Platte River, Middle Niobrara, Upper Loup Rivers and Tributaries, Running Water, Keya Paha, Snake River, Oglala Grasslands, Pine Ridge, Platte Confluence, Willow Creek

Common Name Glossy Snake

Scientific Name *Arizona elegans*

G-Rank G5

S-Rank S1

Goal 1

Distribution Disjunct

Criteria for selection as Tier 1 Disjunct population

Estimated population in NE 1,000-10,000

Estimate based on Expert opinion

Trends since 2005 in NE Unknown

Range in NE Extreme southwest portion of the state; specimen reported in Thomas County in 1988 but unsure if this is a transported animal or disjunct population. Gravid females found in Dundy and Chase Counties.

Habitat Arid mixed to shortgrass prairies with sandy soil and sparse vegetation

Threats Vehicle mortality; habitat fragmentation; conversion to row-crop agriculture; installation of center pivot irrigation

Research/Inventory Conduct surveys to assess distribution and abundance; determine specific habitat management requirements; determine size and extent of Thomas County population; conduct population monitoring

Landscapes Sandsage Prairies, possibly Upper Loup Rivers and Tributaries, though the specimen reports from that location may be spurious

Common Name Red-bellied Snake **Scientific Name** *Storeria occipitomaculata*

G-Rank G5 **S-Rank** S2 **Goal** 1 **Distribution** Disjunct

Criteria for selection as Tier 1 Disjunct population

Estimated population in NE 1,000-10,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Unknown

Range in NE Central Nebraska along the Platte River Valley

Habitat Riverbanks and riparian woodlands, often with dense layers of leaf litter providing shelter and moisture.

Threats Lack of water flow at the landscape level; increased fluvial islands; fragmentation of habitat

Research/Inventory Conduct surveys to assess distribution and abundance; determine specific habitat management requirements; conduct natural history studies.

Landscapes Central Platte River

Common Name Sagebrush Lizard **Scientific Name** *Sceloporus graciosus*

G-Rank G5 **S-Rank** S1 **Goal** 1 **Distribution** Peripheral

Criteria for selection as Tier 1 Disjunct

Estimated population in NE < 500 **Estimate based on** Expert opinion

Trend since 2005 Unknown

Range in NE Central portion of the Panhandle

Habitat Open, rocky, short-grass prairie, usually associated with sagebrush, higher elevations

Threats Grassland management that increases vegetative cover, elimination of sagebrush, habitat fragmentation

Research/Inventory Conduct surveys to assess distribution and abundance; determine specific habitat requirements; conduct population monitoring; no voucher specimen available

Landscapes Panhandle Prairies, Wildcat Hills

<u>Common Name</u> Timber Rattlesnake			<u>Scientific Name</u> <i>Crotalus horridus</i>
<u>G-Rank</u> G4	<u>S-Rank</u> S1	<u>Goal</u> 4	<u>Distribution</u> Peripheral
<u>Criteria for selection as Tier 1</u> Declining: ranked as imperiled or vulnerable in nearly all states in its range			
<u>Estimated population in NE</u> < 1,000		<u>Estimate based on</u> Field surveys	
<u>Trends since 2005 in NE</u> Declining			
<u>Range in NE</u> Very southeast portion of state			
<u>Habitat</u> Deciduous woodland, riparian woodland - both in conjunction with rock outcrops			
<u>Threats</u> Cedar encroachment, malicious killing, limestone quarrying			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; determine life history dynamics; determine specific habitat management best practices			
<u>Landscapes</u> Missouri River and Bluffs, Sandstone Prairies, Southeast Prairies			

<u>Common Name</u> Western Massasauga			<u>Scientific Name</u> <i>Sistrurus tergeminus</i>
<u>G-Rank</u> G3	<u>S-Rank</u> S1	<u>Goal</u> 10	<u>Distribution</u> Peripheral
<u>Criteria for selection as Tier 1</u> State listed, G3			
<u>Estimated population in NE</u> 1,000 - 2,500		<u>Estimate based on</u> Field surveys	
<u>Trends since 2005 in NE</u> Stable			
<u>Range in NE</u> Very southeast portion of state			
<u>Habitat</u> Wet mesic tall-grass prairie, wet meadow/marsh/wet prairie, lower-middle tall-grass prairie, cordgrass wet prairie, crayfish burrows			
<u>Threats</u> Loss/degradation of tall-grass prairie habitat, woody invasion, tilling for agriculture, vehicle mortality			
<u>Research/Inventory</u> Determine size/extent of Colfax County population; conduct surveys to assess distribution and abundance; conduct annual population monitoring			
<u>Landscapes</u> Lower Platte River, Sandstone Prairies, Southeast Prairies			

Species of Greatest Information Need

Yellow Mud Turtle (*Kinosternon flavescens*)

- Distribution
- Population Size
- Relative Genetics

Great Plains Ratsnake (*Pantherophis emoryi*)

- Area of occupancy
- Minimum viable population estimate
- Distribution of populations

Diamondback Water Snake (*Nerodia rhombifer*)

- Population size
- Range extent

Common Lesser Earless Lizard (*Holbrookia maculata*)

- Population size
 - Area of occupancy
 - Minimum viable population size
 - Current vs. historic range
-

Plants

<u>Common Name</u> A Moss			<u>Scientific Name</u> <i>Molendoa ogalalensis</i>
<u>G-Rank</u> G1	<u>S-Rank</u> S1?	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> G1, only known from 1 site in NE and 3 sites in KS			
<u>Estimated population in NE</u> Unknown		<u>Estimate based on</u> N/A	
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> Hitchcock County			
<u>Habitat</u> The species typically inhabits outcrops of eroded mortar bed, which are cemented arkosic sand and gravel deposits within a mixed-grass prairie matrix			
<u>Threats</u> Unknown			
<u>Research/Inventory</u> Determine range and abundance in NE			
<u>Landscapes</u> None			

<u>Common Name</u> American Ginseng			<u>Scientific Name</u> <i>Panax quinquefolius</i>
<u>G-Rank</u> G3G4	<u>S-Rank</u> S1	<u>Goal</u> 1	<u>Distribution</u> Peripheral
<u>Criteria for selection as Tier 1</u> State listed, G3			
<u>Estimated population in NE</u> <250		<u>Estimate based on</u> Expert opinion	
<u>Trend since 2005 in NE</u> Unknown			
<u>Range in NE</u> Missouri River bluffs			
<u>Habitat</u> Oak-hickory-ironwood forest, bur oak-basswood-ironwood forest, red oak- basswood-ironwood forest			
<u>Threats</u> Over-collecting, grazing of woodlands, logging, housing development, invasive species, lack of woodland management, brush encroachment			
<u>Research/Inventory</u> Conduct population monitoring and further surveys known sites			
<u>Landscapes</u> Missouri River and Bluffs			

Common Name Barr's Milkvetch**Scientific Name** *Astragalus barrii***G-Rank** G3G4**S-Rank** S1**Goal** 7**Distribution** Limited**Criteria for selection as Tier 1** G3G4**Estimated population in NE** < 250 **Estimate based on** Expert opinion**Trend since 2005 in NE** Stable**Range in NE** Dawes County**Habitat** Badland, rock outcrop**Threats** Off-road vehicle use, erosion**Research/Inventory** Conduct surveys to assess distribution and abundance; conduct population monitoring**Landscapes** Oglala Grasslands

Common Name Blowout Penstemon**Scientific Name** *Penstemon haydenii***G-Rank** G2**S-Rank** S1**Goal** 10**Distribution** Endemic**Criteria for selection as Tier 1** State and federally listed, G2**Estimated population in NE** 15,000-20,000 **Estimate based on** Based on most recent surveys**Trend since 2005 in NE** Wild (non-introduced) populations are declining as well as some native populations**Range in NE** Sandhills ecoregion**Habitat** Sandhills dune prairie (blowouts)**Threats** Loss of blowouts because of present range management practices, lack of fire, recent climatic conditions**Research/Inventory** Determine methods for establishing and maintaining populations**Landscapes** Central Platte River (introduced population), Cherry County Wetlands, Dismal River Headwaters, Elkhorn River Headwaters, Panhandle Prairies, Sandhills Alkaline Lakes, Middle Niobrara, Upper Niobrara River, Upper Loup Rivers and Tributaries

Common Name Butternut **Scientific Name** *Juglans cinerea*

G-Rank G3 **S-Rank** S1 **Goal** 1 **Distribution** Peripheral

Criteria for selection as Tier 1 G3

Estimated population in NE 5 **Estimate based on** Survey

Trends since 2005 in NE Stable

Range in NE Nemaha County

Habitat Red oak-basswood-ironwood forests

Threats Invasive species, lack of woodland management, brush encroachment

Research/Inventory Conduct surveys near known population

Landscapes Missouri River and Bluffs

Common Name Colorado Butterfly Plant

Scientific Name *Gaura neomexicana ssp. coloradensis*

G-Rank G3T2 **S-Rank** S1 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 State listed, G3

Estimated population in NE < 100 **Estimate based on** 2008 field survey

Trend since 2005 in NE Declining

Range in NE Kimball County

Habitat Western floodplain terrace grassland

Threats Canada thistle invasion of habitat, herbicide spraying, groundwater level decline, haying and heavy grazing of habitat

Research/Inventory Conduct survey for the species. Landowner permission is difficult to obtain in this region.

Landscapes Kimball Grasslands

Common Name Fremont's Evening Primrose

Scientific Name *Oenothera macrocarpa ssp. fremontii*

G-Rank G5T3 **S-Rank** S1 **Goal** 10 **Distribution** Endemic

Criteria for selection as Tier 1 T3, endemic to Kansas and Nebraska

Estimated population in NE 1, 000 to 5,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Unknown

Range in NE Franklin, Red willow, and Franklin counties in the Mixed-grass Prairie Ecoregion

Habitat Rocky, calcareous prairies and slopes in mixed-grass prairie

Threats Tree encroachment, invasive species, herbicide spraying

Research/Inventory Conduct surveys to assess distribution and abundance

Landscapes No known populations in BULs

Common Name Hall's Bulrush

Scientific Name *Schoenoplectus hallii*

G-Rank G3 **S-Rank** S3 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 G3

Estimated population in NE 1,000-20,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Stable

Range in NE Eastern portion of the Sandhills ecoregion

Habitat Northern sedge wet meadow, northern cordgrass wet prairie, Sandhills freshwater marsh (open sand edge of wetlands)

Threats Wetland drainage, invasive species, specifically narrow-leaf/hybrid cattail

Research/Inventory Conduct surveys to determine the species range extent.

Landscapes Elkhorn River Headwaters, Upper Loup Rivers and Tributaries

Common Name Large-Spike Prairie-Clover **Scientific Name** *Dalea cylindriceps*

G-Rank G3 **S-Rank** S2 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 G3

Estimated population in NE 1,000 - 5,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Unknown

Range in NE Shortgrass Prairie and Mixed-grass Prairie ecoregions

Habitat Gravelly terrace prairie and sand prairies

Threats Invasive species, possibly heavy grazing

Research/Inventory Conduct surveys to assess distribution and abundance

Landscapes North Platte River, Middle Niobrara, Sandsage Prairie, Panhandle Prairie, Upper Niobrara River, Platte Confluence, Sandhills Alkaline Lakes

Common Name Meadow Lousewort **Scientific Name** *Pedicularis crenulata*

G-Rank G4 **S-Rank** S1 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 Regional endemic, ranked as imperiled or vulnerable in most states in its range

Estimated population in NE 500 - 1,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Stable to declining

Range in NE Sioux County

Habitat Western sedge wet meadow

Threats Annual haying, heavy grazing, exotic plant invasion, lowering of groundwater table

Research/Inventory Conduct surveys to assess distribution and abundance

Landscapes Upper Niobrara River, Panhandle Prairies

<u>Common Name</u> Missouri Sedge		<u>Scientific Name</u> <i>Carex missouriensis</i>	
<u>G-Rank</u> G5	<u>S-Rank</u> S1	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> Regional endemic, ranked as imperiled or vulnerable in most states in its range			
<u>Estimated population in NE</u> 100 - 5,000		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Unknown			
<u>Range in NE</u> Johnson, Richardson, Saline, and Otoe counties			
<u>Habitat</u> Eastern cordgrass wet prairie, eastern sedge wet meadow, wet-mesic tall-grass prairie			
<u>Threats</u> Conversion of prairie to cropland, herbicide spraying, invasive species, heavy grazing, tree encroachment, annual mid-summer haying			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance			
<u>Landscapes</u> Southeast Prairies			

<u>Common Name</u> Nodding-pogonia		<u>Scientific Name</u> <i>Triphora trianthophora</i> var. <i>trianthophora</i>	
<u>G-Rank</u> G4?T4?	<u>S-Rank</u> S1	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> NE populations are disjunct			
<u>Estimated population in NE</u> 500 – 1,000		<u>Estimate based on</u> Expert opinion	
<u>Trend since 2005 in NE</u> Unknown			
<u>Range in NE</u> Southeast Nebraska, Missouri River bluffs			
<u>Habitat</u> Red oak-basswood-ironwood forest, oak-hickory-ironwood forest			
<u>Threats</u> Grazing of woodlands, invasive species, lack of woodland management, brush encroachment			
<u>Research/Inventory</u> Conduct surveys to assess distribution and abundance; conduct population monitoring			
<u>Landscapes</u> Missouri River and Bluffs			

Common Name Prairie Moonwort **Scientific Name** *Botrychium campestre*

G-Rank G3G4 **S-Rank** S1 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 G3G4

Estimated population in NE 1,000 – 50,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Unknown

Range in NE Brown County, but likely occurs elsewhere in northern Nebraska

Habitat Bur oak-basswood-ironwood forest

Threats Unknown

Research/Inventory Conduct surveys to assess distribution and relative abundance

Landscapes Middle Niobrara, Keya Paha

Common Name Rocky Mountain Bulrush **Scientific Name** *Schoenoplectus saximontanus*

G-Rank G5 **S-Rank** S1 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 Ranked imperiled or vulnerable in all states in its range

Estimated population in NE 500 - 1,500 **Estimate based on** Expert opinion

Trend since 2005 Declining

Range in NE Northwest and Rainwater Basin; historically known from Perkins County, and Niobrara River drainage

Habitat Ephemeral wetland shores, playas

Threats Siltation, wetland drainage, conversion of wetlands to cropland, invasive species

Research/Inventory Conduct surveys to assess distribution and abundance

Landscapes Oglala Grasslands, Rainwater Basin, Central Niobrara River, Running Water, Upper Niobrara River

Common Name Saltwort **Scientific Name** *Salicornia rubra*

G-Rank G5 **S-Rank** S1 **Goal** 1 **Distribution** Disjunct

Criteria for selection as Tier 1 State listed, disjunct

Estimated population in NE 1,000 – 10,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Likely declining

Range in NE Lancaster and southern Saunders counties

Habitat Eastern saline meadow

Threats Wetland drainage, development, reduced groundwater levels, loss of salinity in wetlands, invasive plants

Research/Inventory Research needed on how to restore and manage saline wetlands; determine methods for controlling narrowleaf cattail and reed canary grass in saline wetlands

Landscapes Saline Wetlands

Common Name Sand Fame-flower **Scientific Name** *Phemeranthus rugospermus*

G-Rank G3 **S-Rank** S3 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 G3, ranked imperiled or vulnerable in most states in its range

Estimated population in NE 10,000 – 100,000 **Estimate based on** Expert Opinion

Trends since 2005 in NE Stable

Range in NE Sandhills Ecoregion and the dunes southeast of the Sandhills along the Loup rivers

Habitat Sandhills dune prairie, usually on eroding slopes near dune crests, less common on level hardpan sands.

Threats Unknown

Research/Inventory Conduct surveys on the Niobrara Valley Preserve and other protected sites to determine population numbers.

Landscapes Central Niobrara River, Cherry County Wetlands, Dismal River Headwaters, Elkhorn River Headwaters, Lower Loup Rivers (associated dunes), Upper Loup Rivers (associated dunes), Middle Niobrara

Common Name Sandhill Goosefoot **Scientific Name** *Chenopodium cycloides*

G-Rank G3G4 **S-Rank** S1 **Goal** 7 **Distribution** Limited

Criteria for selection as Tier 1 G3G4, Disjunct

Estimated population in NE 1,500-20,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Unknown

Range in NE Perkins, Chase and Dundy counties

Habitat Sandsage prairie

Threats Heavy grazing, herbicide spraying, conversion of prairie to cropland

Research/Inventory Conduct surveys to assess distribution and abundance

Landscapes Sandsage Prairie

Common Name Small White Lady's-Slipper **Scientific Name** *Cypripedium candidum*

G-Rank G4 **S-Rank** S1 **Goal** 4 **Distribution** Widespread

Criteria for selection as Tier 1 State listed

Estimated population in NE 1,000 - 2,000 **Estimate based on** Field surveys

Trends since 2005 in NE Declining

Range in NE Loup River valleys in the Mixed-grass Prairie Ecoregion and eastern Sandhills Ecoregion. Niobrara Valley Preserve on the Middle Niobrara ecoregion

Habitat Northern sedge wet meadow, northern cordgrass wet prairie, wet-mesic tall-grass prairie

Threats Conversion of meadows to cropland and development, invasive species, reduced groundwater levels in meadows, annual mid-summer haying, herbicide spraying

Research/Inventory Research to determine best management practices; continue surveys to assess distribution and abundance

Landscapes Elkhorn River Headwaters, Lower Loup Rivers, Middle Niobrara, Willow Creek, Keya Paha, Upper Loup Rivers and Tributaries, Lower Platte River

Common Name Snow Trillium **Scientific Name** *Trillium nivale*

G-Rank G4 **S-Rank** S1 **Goal 1** **Distribution** Peripheral

Criteria for selection as Tier 1 Ranked as imperiled or vulnerable in nearly all states in its range

Estimated population in NE 500 - 1,000 **Estimate based on** Expert opinion

Trends since 2005 in NE Unknown

Range in NE Cass County, Indian Cave State Park (transplanted population)

Habitat Oak-hickory-ironwood forest, bur oak-basswood-ironwood forest, red oak- basswood-ironwood forest

Threats Invasive species, lack of management in woodlands, brush encroachment

Research/Inventory Re-inventory known site

Landscapes Only known native population is not in a BUL; Missouri River and Bluffs (transplanted population)

Common Name Ute Ladies'-tresses **Scientific Name** *Spiranthes diluvialis*

G-Rank G2G3 **S-Rank** S1 **Goal 2** **Distribution** Limited

Criteria for selection as Tier 1 State and federally listed, G2G3

Estimated population in NE 6,000-10,000 **Estimate based on** Field surveys

Trends since 2005 in NE The population on one ranch is declining, while the population on the other ranch is increasing. This is due to different land management practice between ranches.

Range in NE Sioux County

Habitat Western alkaline meadow

Threats Reduced groundwater levels, invasive species, conversion of meadows to cropland, annual haying of meadows, intense summer grazing

Research/Inventory Determine best management practices, continue surveys

Landscapes Upper Niobrara River

<u>Common Name</u> Western Prairie Fringed Orchid			<u>Scientific Name</u> <i>Platanthera praeclara</i>
<u>G-Rank</u> G3	<u>S-Rank</u> S2	<u>Goal</u> 7	<u>Distribution</u> Limited
<u>Criteria for selection as Tier 1</u> State and federally listed, G3			
<u>Estimated population in NE</u> 2,000 - 5,000		<u>Estimate based on</u> Expert opinion, surveys	
<u>Trends since 2005 in NE</u> Cyclical with weather; declined during dry years; overall trend is decline			
<u>Range in NE</u> Tallgrass Prairie and Sandhills ecoregions			
<u>Habitat</u> Eastern cordgrass wet prairie, northern cordgrass wet prairie, wet-mesic tallgrass prairie, tallgrass prairie			
<u>Threats</u> Invasive species, herbicide spraying, conversion of prairie to cropland and development, annual mid-summer haying, specific livestock grazing methods.			
<u>Research/Inventory</u> Determine best management practices, continue surveys			
<u>Landscapes</u> Central Platte River, Cherry County Wetlands, Elkhorn River Headwaters, Lower Platte River, Upper Loup Rivers and Tributaries, Willow Creek, Middle Niobrara, Missouri River and Bluffs			

<u>Common Name</u> Woolly Milkweed		<u>Scientific Name</u> <i>Asclepias lanuginosa</i>	
<u>G-Rank</u> G3	<u>S-Rank</u> S2S4	<u>Goal</u> 4	<u>Distribution</u> Widespread
<u>Criteria for selection as Tier 1</u> G3, endemic to the northern Great Plains, seed production rarely observed			
<u>Estimated population in NE</u> 10,000 - 50,000		<u>Estimate based on</u> Expert opinion	
<u>Trends since 2005 in NE</u> Likely declining			
<u>Range in NE</u> Widespread in the state excluding the Panhandle			
<u>Habitat</u> Mostly dry sandy or gravelly soils, but also loams, in mixed-grass prairie			
<u>Threats</u> Invasive species, heavy grazing, herbicide spraying, tree encroachment, possibly lack of pollinators			
<u>Research/Inventory</u> Surveys to access distribution and abundance			
<u>Landscapes</u> Southeast Prairies, Sandstone Prairies, Running Water, Middle Niobrara River, Keya Paha, Central Loess Hills, Upper Loup Rivers, Cherry County Wetlands, Elkhorn River Headwaters, Dismal River Headwaters, Sandsage Prairie, Missouri River and Bluffs, Central Platte River, Rainwater Basin			

Appendix 6: Tier II at-risk species.

Tier II species include those that did not meet the Tier I criteria but were ranked by the Nebraska Natural Heritage Program and the taxon experts (see Appendix 1) as either State Critically Imperiled (S1), State Imperiled (S2) or State Vulnerable (S3) (see appendix 4 for explanation of ranks). In some instances, the full process of answering each ranking factor question was not completed and taxon experts adjusted ranks based on their expertise and research. Because of the large number of at-risk plant species, only those species listed as S1 or S2 are included in the following list. The Tier II list is used to help prioritize conservation planning/actions and does not have legal or regulatory ramifications. Tier II species are typically those that are not at-risk from a global or national perspective but are rare or imperiled within Nebraska. Conservation of these species is needed to ensure they remain a part of Nebraska's flora and fauna.

During the development of the Nebraska Natural Legacy Project, the "S-Ranks" were reviewed and revised for amphibians, birds, mammals, fish, reptiles, mollusks, plants and a limited number of insects.

The Tier II at-risk species lists will be periodically reviewed and revised by taxon experts. This revision will occur on an on-going basis as new information on the abundance, distribution, and population trends becomes available. The Tier II list was reviewed and revised with input from taxon experts in workshops held in 2025.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Grank</u>	<u>Srank</u>
Amphibians			
Northern Cricket Frog	<i>Acris blanchardi</i>	G5	S3
American Toad	<i>Anaxyrus americanus</i>	G5	S1
Great Plains Narrowmouth Toad	<i>Gastrophryne olivacea</i>	G5	S2
Northern Leopard Frog	<i>Lithobates pipiens</i>	G5	S3
Birds			
Clark's Grebe	<i>Aechmophorus clarkii</i>	G5	S2
Western Grebe	<i>Aechmophorus occidentalis</i>	G5	S3
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	G5	S3
White-throated Swift	<i>Aeronautes saxatalis</i>	G5	S3
Northern Pintail	<i>Anas acuta</i>	G5	S3
American Wigeon	<i>Anas americana</i>	G5	S2
Cinnamon Teal	<i>Anas cyanoptera</i>	G5	S1S2
Golden Eagle	<i>Aquila chrysaetos</i>	G5	S3
Canvasback	<i>Aythya valisineria</i>	G5	S3
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>	G5	S3
Whip-poor-will	<i>Caprimulgus vociferus</i>	G5	S3
Brown Creeper	<i>Certhia americana</i>	G5	S2

Snowy Plover	<i>Charadrius nivosus</i>	G3	S1B
Marsh Wren	<i>Cistothorus palustris</i>	G5	S3
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	G5	S3
Trumpeter Swan	<i>Cygnus buccinator</i>	G4	S2
Western Flycatcher	<i>Empidonax difficilis</i>	G5	S1
Acadian Flycatcher	<i>Empidonax virescens</i>	G5	S2?
Prairie Falcon	<i>Falco mexicanus</i>	G5	S2
Peregrine Falcon	<i>Falco peregrinus</i>	G4	S1
Kentucky Warbler	<i>Geothlypis formosa</i>	G5	S3
Sandhill Crane	<i>Grus canadensis</i>	G5	S3
Black-necked Stilt	<i>Himantopus mexicanus</i>	G5	S3
Mississippi Kite	<i>Ictinia mississippiensis</i>	G5	S1B
Dark-eyed (White-winged) Junco	<i>Junco hyemalis aikenii</i>	G5T4	S3
Hudsonian Godwit	<i>Limosa haemastica</i>	G4	S3
Lewis's Woodpecker	<i>Melanerpes lewis</i>	G4	S1
Black-and-white Warbler	<i>Mniotilta varia</i>	G5	S3
Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	G5	S3
Louisiana Waterthrush	<i>Parkesia motacilla</i>	G5	S3
Cassin's Sparrow	<i>Peucaea cassinii</i>	G5	S3
Summer Tanager	<i>Piranga rubra</i>	G5	S3S4
King Rail	<i>Rallus elegans</i>	G4	S1
American Avocet	<i>Recurvirostra americana</i>	G5	S3
American Woodcock	<i>Scolopax minor</i>	G5	S3
Pygmy Nuthatch	<i>Sitta pygmaea</i>	G5	S3
Forster's Tern	<i>Sterna forsteri</i>	G5	S2
Eastern Meadowlark	<i>Sturnella magna</i>	G5	S3
Greater Prairie-chicken	<i>Tympanuchus cupido</i>	G4	S3S4
Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>	G5	S3
Cassin's Kingbird	<i>Tyrannus vociferans</i>	G5	S3
Barn Owl	<i>Tyto alba</i>	G5	S3
Yellow-throated Vireo	<i>Vireo flavifrons</i>	G5	S3
Plumbeous Vireo	<i>Vireo plumbeus</i>	G5	S2

Fish

American Eel	<i>Anguilla rostrata</i>	G4	SNR
Longnose Sucker	<i>Catostomus catostomus</i>	G5	S2
Blue Sucker	<i>Cycleptus elongatus</i>	G3G4	S3
Burbot	<i>Lota lota</i>	G5	S1
Common Shiner	<i>Luxilus cornutus</i>	G5	S3
Tadpole Madtom	<i>Noturus gyrinus</i>	G5	S3
Bluntnose Minnow	<i>Pimephales notatus</i>	G5	S3
Paddlefish	<i>Polyodon spathula</i>	G4	S3?
Western Blacknose Dace	<i>Rhinichthys obtusus</i>	G5	S3

Insects

Great Plains Giant Tiger Beetle	<i>Amblycheila cylindriformis</i>	G4G5	S1
Mottled Little Skipper	<i>Amblyscirtes nysa</i>	G5	S1
Oslar's Roadside Skipper	<i>Amblyscirtes oslari</i>	G4	S2
Creeping Water Bug	<i>Ambrysus mormon</i>	GNR	S2
Aphrodite Fritillary	<i>Argynnis aphrodite</i>	G5	S3
Callippe Fritillary	<i>Argynnis callippe</i>	G5	S1
Coronis Fritillary	<i>Argynnis coronis</i>	G5	S3
Mormon Fritillary	<i>Argynnis mormonia</i>	G5	S1
Zerene Fritillary	<i>Argynnis zerene</i>	G5	S1S2
Tawny Emperor	<i>Asterocampa clyton</i>	G5	S3
Dusted Skipper	<i>Atrytonopsis hianna</i>	G4G5	S3
Black-and-gold Bumble Bee	<i>Bombus auricomus</i>	G5	S3
Western Green Hairstreak	<i>Callophrys affinis homoperplexa</i>	G4TNR	S1S2
Agrippina Underwing	<i>Catocala agrippina</i>	G5?	S1
Aholibah Underwing	<i>Catocala aholibah</i>	G5	S1
Angus' Underwing	<i>Catocala angusi</i>	G4	S1
Clinton's Underwing	<i>Catocala clintonii</i>	G4G5	S1
Habilis Underwing	<i>Catocala habilis</i>	G5	S1
Hermia's Underwing Moth	<i>Catocala hermia</i>	G5	SNR
Yellow-grey Underwing	<i>Catocala luctuosa</i>	G4	S1
Married Underwing	<i>Catocala nuptialis</i>	G3	S3
Obscure Underwing	<i>Catocala obscura</i>	G4G5	S1
Residua Underwing	<i>Catocala residua</i>	G4G5	S1
Robinson's Underwing	<i>Catocala robinsonii</i>	G4?	S1
Serene Underwing	<i>Catocala serena</i>	G4G5	S1
Ulalume Underwing	<i>Catocala ulalume</i>	G4	S1
Widow Underwing	<i>Catocala vidua</i>	G5	S1
Whitney Underwing	<i>Catocala whitneyi</i>	G2G3	S2S3
Mead's Wood Nymph	<i>Cercyonis meadii</i>	G4	S1
Small Wood Nymph	<i>Cercyonis oetus</i>	G5	S1
Acastus Checkerspot	<i>Chlosyne acastus</i>	G5	S1
Silvery Checkerspot	<i>Chlosyne nycteis</i>	G5	S3
Badlands Tiger Beetle	<i>Cicindela decemnotata</i>	G4G5	SNR
Prairie Long-lipped Tiger Beetle	<i>Cicindela nebraskana</i>	G5	S1
Nevada Tiger Beetle	<i>Cicindela nevadica knausii</i>	G5T5	S2
Beautiful Tiger Beetle	<i>Cicindela pulchra</i>	G4	S1
White-cloaked Tiger Beetle	<i>Cicindela togata</i>	G5	S1
Transverse Lady Beetle	<i>Coccinella transversoguttata</i>	G5	S2
Large Heath	<i>Coenonympha californica</i>	G5	S2
Queen Alexandra's Sulphur	<i>Colias alexandra</i>	G4G5	S3

Dogface	<i>Colias cesonia</i>	G5	S3
A Grasshopper	<i>Encoptolophus subgracilis</i>	G5	S1
Northern Pearlyeye	<i>Enodia anthedon</i>	G5	S3
Afranius Duskywing	<i>Erynnis afranius</i>	G5	S2
Wild Indigo Duskywing	<i>Erynnis baptisiae</i>	G5	S3
Sleepy Duskywing	<i>Erynnis brizo</i>	G5	S2
Horace's Duskywing	<i>Erynnis horatius</i>	G5	S3
Juvenal's Duskywing	<i>Erynnis juvenalis</i>	G5	S3
Creamy Marblewing	<i>Euchloe ausonides</i>	G4?	S1
Dotted Blue	<i>Euphilotes ancilla</i>	G5	S1
Anicia Checkerspot	<i>Euphydryas anicia</i>	G5	S3
Dion Skipper	<i>Euphyes dion</i>	G5	S2
Dun Skipper	<i>Euphyes vestris</i>	G5	S3
Zebra Swallowtail	<i>Eurytides marcellus</i>	G5	S3
Western Tailed Blue	<i>Everes amyntula</i>	G5	S1
Harvester	<i>Feniseca tarquinius</i>	G5	S2
Silvery Blue	<i>Glaucopsyche lygdamus</i>	G5	S3
Arrowhead Blue	<i>Glaucopsyche piasus</i>	G4G5	S1
Sagebrush Buck Moth	<i>Hemileuca hera</i>	G5	S1
Common Branded Skipper	<i>Hesperia colorado</i>	G5	S3
Cobweb Skipper	<i>Hesperia metea</i>	G4	S1
Pahaska Skipper	<i>Hesperia pahaska</i>	G5	S2
Uncas Skipper	<i>Hesperia uncas</i>	G4G5	S2
Green Skipper	<i>Hesperia viridis</i>	G5	S1
Shasta Blue	<i>Icaricia shasta</i>	G4	S2
Henry's Elfin	<i>Incisalia henrici</i>	G5	S2
Desert Forktail	<i>Ischnura barberi</i>	G4	S1
Weidemeyer's Admiral	<i>Limenitis weidemeyerii</i>	G5	S3
Purplish Copper	<i>Lycaena helloides</i>	G5	S3
American Copper	<i>Lycaena hypophlaeas</i>	G5	S1S2
Ruddy Copper	<i>Lycaena rubida</i>	G4?	S3
Strecker's Giant Skipper	<i>Megathymus streckeri</i>	G5	S3
Yucca Skipper	<i>Megathymus yuccae coloradensis</i>	G5T5	S3S4
Grizzly Spur-throat Grasshopper	<i>Melanoplus punctulatus</i>	G5	S1
Olive Hairstreak	<i>Mitoura grynea</i>	G5	S3
Riding's Satyr	<i>Neominois ridingsii</i>	G5	S2
Pine White	<i>Neophasia menapia</i>	G5	S2
Milbert's Tortoiseshell	<i>Nymphalis milberti</i>	G5	S3
Garita Skipperling	<i>Oarisma garita</i>	G4G5	S2
Uhler's Arctic	<i>Oeneis uhleri</i>	G5	S2S3
Western Black Swallowtail	<i>Papilio bairdii</i>	G5T5	S3
Indra Swallowtail	<i>Papilio indra</i>	G4?	S1S2
Anise Swallowtail	<i>Papilio zelicaon</i>	G5	S3

A Mayfly	<i>Paraleptophlebia gregalis</i>	G3G4	S1
A Woodland Grasshopper	<i>Paratylotropidia brunneri</i>	G4G5	S1
Phoebus' Parnassian	<i>Parnassius smintheus</i>	G5	S1
Variable Tiger Beetle	<i>Parvindela terricola cinctipennis</i>	G5T5	S1
Northern Crescent	<i>Phyciodes cocyta</i>	G5	S1S2
Mylitta Crescent	<i>Phyciodes mylitta</i>	G5	S1
Pallid Crescentspot	<i>Phyciodes pallidus</i>	G5	S1
Painted Crescentspot	<i>Phyciodes pictus</i>	G5	S2
Field Crescentspot	<i>Phyciodes pratensis</i>	G5	S1
Greenish Blue	<i>Plebejus saepiolus</i>	G5	S1
Hobomok Skipper	<i>Poanes hobomok</i>	G5	S3S4
Mulberry Wing	<i>Poanes massasoit</i>	G4	SNR
Taxiles Skipper	<i>Poanes taxiles</i>	G5	S2S3
Broad-winged Skipper	<i>Poanes viator viator</i>	G5T4	S2
Zabulon Skipper	<i>Poanes zabulon</i>	G5	S2
Arachne Checkerspot	<i>Poladryas arachne</i>	G5	S1
Long Dash	<i>Polites mystic</i>	G5	S3
Crossline Skipper	<i>Polites origenes</i>	G5?	S3
Plains Gray Skipper	<i>Polites rhesus</i>	G3?	S2
Gray Comma	<i>Polygonia progne</i>	G5	S3
Little Glassywing	<i>Pompeius verna</i>	G5	S2S3
Western White	<i>Pontia occidentalis</i>	G5	S2
Spring White	<i>Pontia sisymbrii</i>	G5	S3
A Scarab	<i>Rhyssalus neglectus</i>	GNR	S1
Banded Hairstreak	<i>Satyrium calanus</i>	G5	S2S3
Hickory Hairstreak	<i>Satyrium caryaevorus</i>	G4	S1S2
Striped Hairstreak	<i>Satyrium liparops</i>	G5	S2
Coral Hairstreak	<i>Satyrium titus</i>	G5	S3
Scalloped Sootywing	<i>Staphylus hayhurstii</i>	G5	S3
Fulvia Checkerspot	<i>Thessalia fulvia</i>	G4	S2S3
Southern Cloudywing	<i>Thorybes bathyllus</i>	G5	S2
Hoary Edge	<i>Thorybes lycaides</i>	G5	S1
Salt Creek Grasshopper	<i>Trimerotropis salina</i>	G5	S2?
Great Basin Grasshopper	<i>Trimerotropis sparsa</i>	G5	S3
Northern Broken Dash	<i>Wallengrenia egeremet</i>	G5	S3

Mammals

Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	G4	S1
Black-tailed Prairie Dog	<i>Cynomys ludovicianus</i>	G4	S3
White-tailed Jackrabbit	<i>Lepus townsendii</i>	G5	S3
Woodland Vole	<i>Microtus pinetorum</i>	G5	S1
Long-tailed Weasel	<i>Mustela frenata</i>	G5	S2
Long-legged Myotis	<i>Myotis volans</i>	G4G5	S1

Bushy-tailed Woodrat	<i>Neotoma cinerea</i>	G5	S3
Olive-backed Pocket Mouse	<i>Perognathus fasciatus</i>	G5	S1
Silky Pocket Mouse	<i>Perognathus flavus</i>	G5	S1
Mountain Lion	<i>Puma concolor</i>	G5	S3
Merriam's Shrew	<i>Sorex merriami</i>	G4	S1
Dwarf Shrew	<i>Sorex nanus</i>	G4	S1
Least Chipmunk	<i>Tamias minimus</i>	G5	S1
Eastern Chipmunk	<i>Tamias striatus</i>	G5	S1

Mollusks

Threeridge	<i>Amblema plicata</i>	G5	S1
A freshwater Snail	<i>Galba techella</i>	G4	SNR
Pink Heelsplitter	<i>Potamilus alatus</i>	G5	SNR
Pimpleback	<i>Pustulosa pustulosa</i>	G5	S2
Deertoe	<i>Truncilla truncata</i>	G5	SNR

Reptiles

Copperhead	<i>Agkistrodon contortrix</i>	G5	S2
Smooth Softshell Turtle	<i>Apalone mutica</i>	G5	S2
Worm Snake	<i>Carphophis vermis</i>	G5	S2
Five-lined Skink	<i>Eumeces fasciatus</i>	G5	S1
Eastern Hognose Snake	<i>Heterodon platirhinos</i>	G5	S3
Prairie Kingsnake	<i>Lampropeltis calligaster</i>	G5	S2
Speckled Kingsnake	<i>Lampropeltis holbrooki</i>	G5	S1
Smooth Green Snake	<i>Liochlorophis vernalis</i>	G5	S1
Slender Glass Lizard	<i>Ophisaurus attenuatus</i>	G5	S1
Fox Snake	<i>Pantherophis ramspotti</i>	G5	S2
Mountain Short-horned Lizard	<i>Phrynosoma hernandesi</i>	G5	S3
Graham's Crayfish Snake	<i>Regina grahamii</i>	G5	S2
Plains Blackhead Snake	<i>Tantilla nigriceps</i>	G5	S1
Western Terrestrial Garter Snake	<i>Thamnophis elegans</i>	G5	S1
Western Ribbon Snake	<i>Thamnophis proximus</i>	G5	S2
Red-eared Slider	<i>Trachemys scripta</i>	G5	S1

Plants

American Sweetflag	<i>Acorus americanus</i>	G5	S2
White Baneberry	<i>Actaea pachypoda</i>	G5	S1
Ohio Buckeye	<i>Aesculus glabra</i> var. <i>arguta</i>	G5T4?Q	S1S2
Roundstem Agalinis	<i>Agalinis gattereri</i>	G4	S1S3
Smooth False Foxglove	<i>Agalinis purpurea</i>	G5	S1S3
Lavender Giant-hyssop	<i>Agastache foeniculum</i>	G5	S1
Purple Giant-hyssop	<i>Agastache scrophulariifolia</i>	G4	S1

Spikebent	<i>Agrostis exarata</i> var. <i>minor</i>	G5	S1
Fraser's Wild Onion	<i>Allium canadense</i> var. <i>fraseri</i>	G5T4T5	S2
Drummond's Wild Onion	<i>Allium drummondii</i>	G5	S1
Ramp	<i>Allium tricoccum</i> var. <i>burdickii</i>	G5T5	S2
California Amaranth	<i>Amaranthus californicus</i>	G4	S2
Ear-leaf Toothcup	<i>Ammannia auriculata</i>	G5	S1
Dwarf Indigo-bush	<i>Amorpha nana</i>	G5	S1
Nevada Bulrush	<i>Amphiscirpus nevadensis</i>	G4	S2
Pearly Everlasting	<i>Anaphalis margaritacea</i>	G5	S1
Hudson Bay Anemone	<i>Anemone multifida</i> var. <i>multifida</i>	G5T5	S1
Low Pussytoes	<i>Antennaria dimorpha</i>	G5	S1
Spikenard	<i>Aralia racemosa</i>	G5	S1
Bearberry	<i>Arctostaphylos uva-ursi</i>	G5	S1
Arrowfeather Three-awn	<i>Aristida purpurascens</i>	G5	S1
Carruth's Sagewort	<i>Artemisia carruthii</i>	G4?	S1
Clasping-leaf Milkweed	<i>Asclepias amplexicaulis</i>	G5	S1
Antelope-horns	<i>Asclepias asperula</i> ssp. <i>capricornu</i>	G5TNR	S1
Purple Milkweed	<i>Asclepias purpurascens</i>	G4G5	S2
Saltmarsh Aster	<i>Aster subulatus</i> var. <i>subulatus</i>	G5	S1S3
Field Milk-vetch	<i>Astragalus agrestis</i>	G5	S1
Bodin's Milk-vetch	<i>Astragalus bodinii</i>	G4	S1
Summer Orophaca	<i>Astragalus hyalinus</i>	G4	S2
Tine-leaf Milk-vetch	<i>Astragalus pectinatus</i>	G5	S1
Short's Milk-vetch	<i>Astragalus shortianus</i>	G4	S1
Gardner's Saltbush	<i>Atriplex gardneri</i> var. <i>gardneri</i>	G5	S1
Powell's Saltbush	<i>Atriplex powellii</i> var. <i>powellii</i>	G4	S1
Rillscale	<i>Atriplex suckleyi</i>	G4	S1
Texas Bergia	<i>Bergia texana</i>	G5	S1
Mountain Birch	<i>Betula occidentalis</i>	G5	S1
Sandberg's Beggar-ticks	<i>Bidens connata</i> var. <i>gracilipes</i>	G5	S1
Coreopsis Beggar-ticks	<i>Bidens polylepis</i>	G5	S2
Wood Mint	<i>Blephilia hirsuta</i>	G5	S1
Cut-leaf Grape-fern	<i>Botrychium dissectum</i>	G5	S1
Watershield	<i>Brasenia schreberi</i>	G5	S2
Mountain Brome	<i>Bromus marginatus</i>	G5	S2
Northern Water-starwort	<i>Callitriche hermaphroditica</i>	G5	S2
Vernal Water-starwort	<i>Callitriche palustris</i>	G5	S2
Gunnison's Mariposa	<i>Calochortus gunnisonii</i> var. <i>gunnisonii</i>	G5TNR	S1
Yellow Marsh-marigold	<i>Caltha palustris</i>	G5	S2
Spring Bitter Cress	<i>Cardamine bulbosa</i>	G5	S1S3
Pennsylvania Bitter Cress	<i>Cardamine pennsylvanica</i>	G5	S1

White Bear Sedge	<i>Carex albursina</i>	G5	S1
Water Sedge	<i>Carex aquatilis</i> var. <i>substricta</i>	G5T5	S2
Bebb's Sedge	<i>Carex bebbii</i>	G5	S1S3
Yellow-fruit Sedge	<i>Carex brachyglossa</i>	G5	S1S3
Brown Bog Sedge	<i>Carex buxbaumii</i>	G5	S2
Raven Foot Sedge	<i>Carex crus-corvi</i>	G5	S1
Frank's Sedge	<i>Carex frankii</i>	G5	S1S2
Hairy Wood Sedge	<i>Carex hirtifolia</i>	G5	S1
Woolly-fruit Sedge	<i>Carex lasiocarpa</i> var. <i>americana</i>	G5T5	S1
Mud Sedge	<i>Carex limosa</i>	G5	S1
Hop Sedge	<i>Carex lupulina</i>	G5	S1
Eastern Star Sedge	<i>Carex radiata</i>	G5	S1
Copycat Sedge	<i>Carex simulata</i>	G5	S1
Texas Sedge	<i>Carex texensis</i>	G5	S1
Low Sedge	<i>Carex umbellata</i>	G5	S1
Northwest Territory Sedge	<i>Carex utriculata</i>	G5	S1
Inflated Sedge	<i>Carex vesicaria</i> var. <i>monile</i>	G5T4	S1
White-scale Sedge	<i>Carex xerantica</i>	G5	S2
Blue Cohosh	<i>Caulophyllum thalictroides</i>	G5	S1
Nodding Mouse-ear Chickweed	<i>Cerastium nutans</i> var. <i>nutans</i>	G5T5	S1
Southern Chervil	<i>Chaerophyllum tainturieri</i> var. <i>tainturieri</i>	G5T4T5	S1
Rose Heath Daisy	<i>Chaetopappa ericoides</i>	G5	S2
Slender Lip Fern	<i>Cheilanthes feei</i>	G5	S2
Pale Goosefoot	<i>Chenopodium pallescens</i>	G5	S1
Virginia Spring-beauty	<i>Claytonia virginica</i>	G5	S1
Fremont's Leather-flower	<i>Clematis fremontii</i>	G5	S1
Sugarbowls	<i>Clematis hirsutissima</i> var. <i>scottii</i>	G4T4?	S1
Pitcher's Leather-flower	<i>Clematis pitcheri</i> var. <i>pitcheri</i>	G4G5TNR	S1
Eastern Cleomella	<i>Cleomella angustifolia</i>	G5	S2
Pitted Jointgrass	<i>Coelarchis cylindrica</i>	G4	SU
Summer Coral-root	<i>Corallorhiza maculata</i>	G5	S1
Autumn Coral-root	<i>Corallorhiza odontorhiza</i>	G5	S1?
Striped Coral-root	<i>Corallorhiza striata</i>	G5	S1
Coral-root Orchid	<i>Corallorhiza striata</i> var. <i>vreelandii</i>	G5T3T5	S1
Spring Coral-root	<i>Corallorhiza wisteriana</i>	G5	S1
Hairy Bugseed	<i>Corispermum villosum</i>	G4?	S1
Golden Fumewort	<i>Corydalis aurea</i>	G5	SNR
Spike Hawthorn	<i>Crataegus macracantha</i> var. <i>occidentalis</i>	G5	S1
Cut-leaf Cyclanthera	<i>Cyclanthera dissecta</i>	G5	S1
Englemann's Flatsedge	<i>Cyperus engelmannii</i>	G5	S2
Yellow Lady's-slipper	<i>Cypripedium parviflorum</i>	G5	S1

Bulblet Bladder Fern	<i>Cystopteris bulbifera</i>	G5	S1
Long-bract Green Orchid	<i>Dactylorhiza viridis</i>	G5	S1
Round-head Prairie-clover	<i>Dalea multiflora</i>	G5	S1
Poverty Oatgrass	<i>Danthonia spicata</i>	G5	S1
Geyer's Larkspur	<i>Delphinium geyeri</i>	G5	S1
Blue Larkspur	<i>Delphinium nuttallianum</i>	G5	S1
Long-leaf Tick-clover	<i>Desmodium cuspidatum</i> var. <i>longifolium</i>	G5T5?	S1S3
Sessile-leaf Tick-clover	<i>Desmodium sessilifolium</i>	G5	S1
Starved Spring-panicum	<i>Dichanthelium depauperatum</i>	G5	S1
Broad-leaf Spring-panicum	<i>Dichanthelium latifolium</i>	G5	S1
Rough Buttonweed	<i>Diodia teres</i> var. <i>teres</i>	G5T5	S1
Wild Yam	<i>Dioscorea villosa</i>	G4G5	S1
Persimmon	<i>Diospyros virginiana</i>	G5	S1
Rough-fruit Fairybells	<i>Disporum trachycarpum</i>	G5	S1
Flat-top Aster	<i>Doellingeria umbellata</i> var. <i>pubens</i>	G5T5	S2
Short-pod Draba	<i>Draba brachycarpa</i>	G4G5	S1
Wedge-leaf Draba	<i>Draba cuneifolia</i>	G5	S1
American Dragon's-head	<i>Dracocephalum parviflorum</i>	G5	S1
Spinulose Wood Fern	<i>Dryopteris carthusiana</i>	G5	S2
Crested Wood Fern	<i>Dryopteris cristata</i>	G5	S1
Pale Purple Coneflower	<i>Echinacea pallida</i>	G5	S1
Green-flower Hedgehog Cactus	<i>Echinocereus viridiflorus</i>	G5	S2
Short-seed Waterwort	<i>Elatine brachysperma</i>	G5	S1
Purple Spikerush	<i>Eleocharis atropurpurea</i>	G4G5	S1
Dwarf Spikerush	<i>Eleocharis coloradoensis</i>	G4	S1
Capitate Spikerush	<i>Eleocharis geniculata</i>	G5	S1
Beaked Spikerush	<i>Eleocharis rostellata</i>	G5	S1
Wolf's Spikerush	<i>Eleocharis wolfii</i>	G3G5	S4
Two-leaf Waterweed	<i>Elodea bifoliata</i>	G4G5	S1
Awned Slender Wheatgrass	<i>Elymus trachycaulus</i> var. <i>andinus</i>	G5T5	S1
Water Horsetail	<i>Equisetum fluviatile</i>	G5	S1
Lace Grass	<i>Eragrostis capillaris</i>	G5	S1
Playa Lovegrass	<i>Eragrostis pilosa</i> var. <i>perplexa</i>	G4TNR	S1
Creeping Lovegrass	<i>Eragrostis reptans</i>	G5	S1
Red Lovegrass	<i>Eragrostis secundiflora</i> var. <i>capitata</i>	G5TNR	S1
Spreading Fleabane	<i>Erigeron divergens</i>	G5	S2
Short-ray Fleabane	<i>Erigeron lonchophyllus</i>	G5	S1
Buff Fleabane	<i>Erigeron ochroleucus</i>	G5	S2
Three-nerve Fleabane	<i>Erigeron subtrinervis</i>	G3G5,GNR	S2
Short-stem Wild-buckwheat	<i>Eriogonum brevicaule</i> var. <i>brevicaule</i>	G4T4?	S1

Nodding Wild-buckwheat	Eriogonum cernuum	G5	S1
Gordon's Wild Buckwheat	Eriogonum gordonii	G4	S2
Tall Cotton-grass	Eriophorum angustifolium var. angustifolium	G5T5	S2
Slender Cotton-grass	Eriophorum gracile	G5	S2
Button-snakeroot	Eryngium yuccifolium	G5	S1
Small-flower Wallflower	Erysimum inconspicuum	G5	S2
Prairie Fawn-lily	Erythronium mesochoreum	G4G5	S2
Missouri Spurge	Euphorbia missurica var. missurica	G5	S1S3
Rocky Mountain Fescue	Festuca saximontana	G5	S1
Leopard-lily	Fritillaria atropurpurea	G5	S2
Indian Blanket-flower	Gaillardia pulchella	G4G5	S2?
Showy Orchis	Galearis spectabilis	G5	S1
Purple Cudweed	Gamochaeta purpurea	G5	S1
Pale Gentian	Gentiana alba	G4	S1
Sticky Crane's-bill	Geranium viscosissimum	G5	S1
Spring Avens	Geum vernum	G5	S1
Sea Milkwort	Glaux maritima	G5	S1
Western Marsh Cudweed	Gnaphalium palustre	G5	S1S3
Western Rattlesnake-plantain	Goodyera oblongifolia	G5	S1
Clammy Hedge-hyssop	Gratiola neglecta	G5	S1
American False-pennyroyal	Hedeoma pulegioides	G5	S1
Purple-head sneezeweed	Helenium flexuosum	G5	S1
Ashy Sunflower	Helianthus mollis	G4G5	S1
Seaside Heliotrope - var. curassavicum	Heliotropium curassavicum var. curassavicum	G5T5	S1
Seaside Heliotrope - var. obovatum	Heliotropium curassavicum var. obovatum	G5T5	S1
Bouquet Mud-plantain	Heteranthera missouriensis	G5?	S1
Canada Hawkweed	Hieracium canadense	G5	S1
Narrow-leaf Hawkweed	Hieracium umbellatum	G5	S1
Mare's-tail	Hippuris vulgaris	G5	S1
Midwestern Summer Bluets	Houstonia purpurea var. calycosa	G5T5	S1
Small Bluets	Houstonia pusilla	G5	S1
Notch-bract Waterleaf	Hydrophyllum appendiculatum	G5	S1
Dwarf St. John's-wort	Hypericum mutilum	G5	S1
Spotted St. John's-wort	Hypericum punctatum	G5	S1
Giant St. John's-wort	Hypericum pyramidatum	G5	S2?
Round-pod St. John's-wort	Hypericum sphaerocarpum	G5	S1
Bigroot Morning-glory	Ipomoea pandurata	G5	S1
Rocky Mountain Iris	Iris missouriensis	G5	S1
Black-foot Quillwort	Isoetes melanopoda	G5	S1
Taper-tip Rush	Juncus acuminatus	G5	S1

Joint-leaf Rush	<i>Juncus articulatus</i>	G5	S1
Soft Rush	<i>Juncus effusus</i> ssp. <i>solutus</i>	G5T5	S1
Ground Juniper	<i>Juniperus communis</i>	G5	S1
Creeping Juniper	<i>Juniperus horizontalis</i>	G5	S1
Dwarf-dandelion	<i>Krigia cespitosa</i>	G5	S1
Yellow Vetchling	<i>Lathyrus ochroleucus</i>	G5	S2
Marsh Vetchling	<i>Lathyrus palustris</i>	G5	S1S3
Hairy Pinweed	<i>Lechea mucronata</i>	G5	S1
Prairie Pinweed	<i>Lechea stricta</i>	G3G4	S1
Narrow-leaf Pinweed	<i>Lechea tenuifolia</i>	G5	S1
Inflated Duckweed	<i>Lemna gibba</i>	G4G5	S2
Least Duckweed	<i>Lemna minuta</i>	G5	S1
Star Duckweed	<i>Lemna trisulca</i>	G5	SNR
Violet Bush-clover	<i>Lespedeza frutescens</i>	G5	S1
Narrow-leaf Paleseed	<i>Leucospora multifida</i>	G5	S1
Hairy Gayfeather	<i>Liatris hirsuta</i>	G4?	S1S3
Matted Prickly-phlox	<i>Linanthus caespitosus</i>	G4	S1
Berlandier's Flax	<i>Linum berlandieri</i> var. <i>berlandieri</i>	G5T5?	S1
Western Prairie Flax	<i>Linum lewisii</i> var. <i>lewisii</i>	G5T5	S1
Loesel's Twayblade	<i>Liparis loeselii</i>	G5	S1
Small-flower Prairie Star	<i>Lithophragma parviflorum</i>	G5	S1
Cardinal Flower	<i>Lobelia cardinalis</i>	G5	S1
Indian-tobacco	<i>Lobelia inflata</i>	G5	S1
Spreading Pygmyleaf	<i>Loeflingia squarrosa</i> var. <i>texana</i>	G5T4?	S1
Dog-parsley	<i>Lomatium nuttallii</i>	G3	S2
Bushy Seedbox	<i>Ludwigia alternifolia</i>	G5	S1
Wild Lily-of-the-valley	<i>Maianthemum canadense</i> var. <i>interius</i>	G5	S1
Iowa Crab Apple	<i>Malus ioensis</i>	G4G5	S1S3
Three-flower Melic Grass	<i>Melica nitens</i>	G5	S1
White-stem Blazing-star	<i>Mentzelia albicaulis</i>	GNR	S1
Stickleaf	<i>Mentzelia oligosperma</i>	G4	S1
Prairie Bluebells	<i>Mertensia lanceolata</i>	G5	S2
Dwarf-phlox	<i>Microsteris gracilis</i> var. <i>humilior</i>	G5T5	S1
Sharpwing Monkey-flower	<i>Mimulus alatus</i>	G5	S1S2
Seep Monkey-flower	<i>Mimulus guttatus</i>	G5	S1
Texas Sandwort	<i>Minuartia michauxii</i> var. <i>texana</i>	G5	S2
Smooth Four-o'clock	<i>Mirabilis glabra</i>	G5	S2
Pinesap	<i>Monotropa hypopithys</i>	G5	S1
Pull-up Muhly	<i>Muhlenbergia filiformis</i>	G5	S1
Spiked Muhly	<i>Muhlenbergia glomerata</i>	G5	S2
Mat Muhly	<i>Muhlenbergia richardsonis</i>	G5	S1
Slim-flower Muhly	<i>Muhlenbergia tenuiflora</i>	G5	S1

Bay Forget-me-not	<i>Myosotis laxa</i>	G5	S1
Spring Forget-me-not	<i>Myosotis verna</i>	G5	S1
Whorled Water-milfoil	<i>Myriophyllum verticillatum</i>	G5	S1
Rocky Mountain Navarretia	<i>Navarretia saximontana</i>	G4?	S1
False-garlic	<i>Nothoscordum bivalve</i>	G4	S1
Yellow Pond-lily	<i>Nuphar variegata</i>	G5T5	S2
Spotted Evening-primrose	<i>Oenothera canescens</i>	G4G5	S2
Fremont's Evening-primrose	<i>Oenothera macrocarpa</i> ssp. <i>fremontii</i>	G5T3	S1
Small Sundrops	<i>Oenothera perennis</i>	G5	S2
Limestone Adder's-tongue	<i>Ophioglossum engelmannii</i>	G5	S1
Northern Adder's-tongue	<i>Ophioglossum pusillum</i>	G4	S2
One-flower Broomrape	<i>Orobanche uniflora</i>	G5	S1
One-sided Wintergreen	<i>Orthilia secunda</i>	G5	S1
Dwarf Locoweed	<i>Oxytropis multiceps</i>	G5	S2
Butterweed	<i>Packera glabella</i>	G5	S1
Streambank Ragwort	<i>Packera pseud aurea</i> var. <i>semicordata</i>	G5T3T5	S1
Canada Nailwort	<i>Paronychia canadensis</i>	G5	S1
Black-seed Ricegrass	<i>Patis racemosa</i>	G5	S2
Canada Lousewort	<i>Pedicularis canadensis</i>	G5	S1
Slim-leaf Scurf-pea	<i>Pedimelum linearifolium</i>	G4?	S1
Purple-stem Cliff-brake	<i>Pellaea atropurpurea</i>	G5	S2
Smooth Cliff-brake	<i>Pellaea glabella</i> var. <i>glabella</i>	G5T5	S1
Gilia Beardtongue	<i>Penstemon ambiguus</i>	G4G5	S1
Buckley's Penstemon	<i>Penstemon buckleyi</i>	G4G5	S1
Foxglove Penstemon	<i>Penstemon digitalis</i>	G5	S1
Tube Penstemon	<i>Penstemon tubiflorus</i> var. <i>tubiflorus</i>	G5T4T5	S1
Rockpink Fame-flower	<i>Phemeranthus calycinus</i>	G5	S1S2
New Mexico fame-flower	<i>Phemeranthus confertiflorus</i>	GU	SU
Alyssum-leaf Phlox	<i>Phlox alyssifolia</i>	G5	S1
Moss Phlox	<i>Phlox bryoides</i>	G5	S2
Downy Ground-cherry	<i>Physalis missouriensis</i>	G2	S1
Dwarf Ground-cherry	<i>Physalis pumila</i>	G5	S1
Secund Bladder-pod	<i>Physaria arenosa</i> var. <i>arenosa</i>	G5T5	S1
Great Plains Twinpod	<i>Physaria brassicoides</i>	G5	S1
Mountain Bladder-pod	<i>Physaria montana</i>	G5	S2
Prairie Ninebark	<i>Physocarpus intermedius</i>	G5T3T5	S2
False Dragon's-head	<i>Physostegia parviflora</i>	G4G5	S1
American Pillwort	<i>Pilularia americana</i>	G4?	S1
Limber Pine	<i>Pinus flexilis</i>	G4	S1
Red-seed Plantain	<i>Plantago rhodosperma</i>	GNR	S1

Chapman's Bluegrass	<i>Poa chapmaniana</i>	G5	S1
Creeping Polemonium	<i>Polemonium reptans</i>	G5	S1
Seneca Snakeroot	<i>Polygala senega</i>	G4G5	S1
Douglas' Knotweed	<i>Polygonum douglasii</i>	G5	S2
Rocky Mountain Knotweed	<i>Polygonum sawatchense</i> ssp. <i>sawatchense</i>	GNRTNR	S2
James's Rush-pea	<i>Pomaria jamesii</i>	G5	S1
Narrow-leaf Cottonwood	<i>Populus angustifolia</i>	G5	S1
Quaking Aspen	<i>Populus tremuloides</i>	G5	S2?
Lance-leaf Cottonwood (Hybrid)	<i>Populus x acuminata</i>	GNA	S1
Smith's Hybrid Aspen	<i>Populus x smithii</i>	GNA	S1
Large-leaf Pondweed	<i>Potamogeton amplifolius</i>	G5	S1
Fries' Pondweed	<i>Potamogeton friesii</i>	G5	S2
Floating-leaved Pondweed	<i>Potamogeton natans</i>	G5	SNR
White-stem Pondweed	<i>Potamogeton praelongus</i>	G5	S1
Straight-leaf Pondweed	<i>Potamogeton strictifolius</i>	G5	S1
Silverweed	<i>Potentilla anserina</i>	G5	S1
Platte River Cinquefoil	<i>Potentilla plattensis</i>	G4	S1
Old-field Cinquefoil	<i>Potentilla simplex</i>	G5	S1
Purple Rattlesnake-root	<i>Prenanthes racemosa</i> ssp. <i>multiflora</i>	G5	S1
Northern Shooting-star	<i>Primula pauciflora</i> var. <i>pauciflora</i>	G5T5	S2
Chickasaw Plum	<i>Prunus angustifolia</i>	G5	S1
Wild-goose Plum	<i>Prunus hortulana</i>	G4?	S1
Bluebunch Wheatgrass	<i>Pseudoroegneria spicata</i>	G5	S1
Pine-drops	<i>Pterospora andromedea</i>	G5	S2
Hairy Mountain-mint	<i>Pycnanthemum pilosum</i>	G5T5	S1
Narrow-leaf Mountain-mint	<i>Pycnanthemum tenuifolium</i>	G5	S1
Green-flower Wintergreen	<i>Pyrola chlorantha</i>	G5	S1
Wax-flower Shinleaf	<i>Pyrola elliptica</i>	G5	S1
Carolina False-dandelion	<i>Pyrrhopappus carolinianus</i>	G5	S1
White Oak	<i>Quercus alba</i>	G5	S1
Blackjack Oak	<i>Quercus marilandica</i>	G5	S1
Dwarf Chinkapin Oak	<i>Quercus prinoides</i>	G5	S1
Early Buttercup	<i>Ranunculus fascicularis</i>	G5	S1
Sagebrush Buttercup	<i>Ranunculus glaberrimus</i> var. <i>ellipticus</i>	G5T5	S1
Northern Marsh Buttercup	<i>Ranunculus hispidus</i> var. <i>caricetorum</i>	G5T5	S1
Graceful Buttercup	<i>Ranunculus inamoenus</i>	G5	S1
Hooked Buttercup	<i>Ranunculus recurvatus</i> var. <i>recurvatus</i>	G5T5	S2
Prairie Buttercup	<i>Ranunculus rhomboideus</i>	G5	S1
Short-ray Prairie-coneflower	<i>Ratibida tagetes</i>	G4G5	S1

Shining Sumac	<i>Rhus copallinum</i> var. <i>latifolia</i>	G5T5	S1
Hairy-stem Gooseberry	<i>Ribes hirtellum</i>	G5	S1
Slender Yellow Cress	<i>Rorippa tenerrima</i>	G5	S1
Dwarf Swamp Raspberry	<i>Rubus pubescens</i>	G5	S1
Red Raspberry	<i>Rubus strigosus</i>	G5T5	S1
Limestone Wild-petunia	<i>Ruellia strepens</i>	G4G5	S2
Water Dock	<i>Rumex verticillatus</i>	G5	S1
Brownish Beakrush	<i>Rynchospora capitellata</i>	G5	S1
Long-barb Arrowhead	<i>Sagittaria longiloba</i>	G5	S1
Long-beak Willow	<i>Salix bebbiana</i>	G5	S1
False-melic	<i>Schizachne purpurascens</i>	G5	S1
Wool-grass	<i>Scirpus cyperinus</i>	G5	S1
Panicked Bulrush	<i>Scirpus microcarpus</i>	G5	S1
Whip Nut-rush	<i>Scleria triglomerata</i>	G5	S1S2
River Grass	<i>Scolochloa festuacea</i>	G5	S1
Britton's Skullcap	<i>Scutellaria brittonii</i>	G4G5	S2
Yellow Stonecrop	<i>Sedum lanceolatum</i> var. <i>lanceolatum</i>	G5T5	S2
Scribner's Groundsel	<i>Senecio integerrimus</i> var. <i>scribneri</i>	G5T2T3	S1
Broom Groundsel	<i>Senecio spartioides</i>	G5	S1
Menzies' Catchfly	<i>Silene menziesii</i>	G5	S1
Zigzag Goldenrod	<i>Solidago flexicaulis</i>	G5	S1
Noble Goldenrod	<i>Solidago jejunifolia</i>	No rank	No rank
Showy-wand Goldenrod	<i>Solidago speciosa</i> var. <i>pallida</i>	G5T4	S1
Green-fruit Bur-reed	<i>Sparganium emersum</i>	G5	S2
Slender Ladies'-Tresses	<i>Spiranthes lacera</i> var. <i>gracilis</i>	G5T4T5	S1
Lesser Ladies'-tresses	<i>Spiranthes ovalis</i>	G5	S1
Hooded Ladies'-tresses	<i>Spiranthes romanzoffiana</i>	G5	S1
Spring Ladies'-tresses	<i>Spiranthes vernalis</i>	G5	S1S3
Texas Dropseed	<i>Sporobolus texanus</i>	G5	S1
Prince's-plume	<i>Stanleya pinnata</i> var. <i>pinnata</i>	G5T4T5	S1
Wire-lettuce	<i>Stephanomeria runcinata</i>	G5	S2
Thread-leaf Pondweed	<i>Stuckenia filiformis</i> ssp. <i>occidentalis</i>	G5T5	S1
Poison Suckle	<i>Suckleya suckleyana</i>	G5	S1
Intermountain Aster	<i>Symphyotrichum ascendens</i>	G5	S1
Fendler's Aster	<i>Symphyotrichum fendleri</i>	G4?	S1
White Woodland Aster	<i>Symphyotrichum lateriflorum</i> var. <i>lateriflorum</i>	G5T5	S1
Hoary-pea	<i>Tephrosia virginiana</i>	G5	S1
Hooker's Townsendia	<i>Townsendia hookeri</i>	G5	S1
Tharp's Spiderwort	<i>Tradescantia tharpaii</i>	G4	S2
Branched Noseburn	<i>Tragia ramosa</i>	G5	S1

Marsh Saint John's-wort	Triadenum fraseri	G5	S2
Glade Blue Curls	Trichostema brachiatum	G5	S1
Marsh Arrow-grass	Triglochin palustris	G5	S1
Small Venus'-looking-glass	Triodanis biflora	G5T5	S1
Small-flower Sandpuffs	Tripterocalyx micranthus	G4	S1
Humped Bladderwort	Utricularia gibba	G5	S1
Lesser Bladderwort	Utricularia minor	G5	S1
Zigzag Bladderwort	Utricularia subulata	G5	S1
American Eelgrass	Vallisneria americana	G5	S1
Narrow-leaf Vervain	Verbena simplex	G5	S1
Culver's Root	Veronicastrum virginicum	G4	S1
Nannyberry	Viburnum lentago	G5	S1
Hook-spur Violet	Viola adunca	G5	S1
Birdfoot Violet	Viola pedata	G5	S1
Yellow Valley Violet	Viola vallicola	G5?	S2
Summer Grape	Vitis aestivalis	G4, G3G4G5	S1
Graybark Grape	Vitis cinerea	G4	S1
Frost Grape	Vitis vulpina	G5	S1
Brazilian Watermeal	Wolffia brasiliensis	G5	S1
Twisted Yellow-eyed-grass	Xyris torta	G5	S2
Desert Centaury	Zeltnera exaltata	G5	S1
Mountain White-camas	Zigadenus elegans	G5	S1

Appendix 7: Terrestrial natural communities of Nebraska.

The following is the list of terrestrial natural communities for Nebraska used in developing the Nebraska Natural Legacy project. The 83 terrestrial community types include wetland and upland types (any habitat with rooted vegetation) and are part of the National Vegetation Classification (NVC) system (Grossman et al. 1998) which is the standard classification used by federal agencies (see NatureServe.org for information on the NVC). Full descriptions of each community type are found in Rolfsmeier and Steinauer (2010). The sections on biologically unique landscapes within the ecoregion chapters list the community types known from each landscape. Unfortunately, there is currently no statewide classification system for open water habitats (lakes, rivers, streams), though there is an urgent need for such a system.

Fields in the descriptions below include:

G-Rank, S-Rank: Explanation of these ranks is found in Appendix 4.

Goal: The minimum number of occurrences or examples to be conserved in Nebraska.

Distribution: The distribution of the community type in Nebraska relative to its entire range. This was a factor used in setting the goal for each type (see Chapter 3).

- Endemic: community types that are found only in Nebraska or generally have more than 90% of their range within the state.
- Limited: community types that occur primarily within one region (e.g., Great Plains).
- Widespread: community types that are common in a number of regions and widespread in Nebraska.
- Peripheral: community types that are found mainly in other regions, generally less than 10% of their range in Nebraska.

Patch Size: Refers to the amount of area a typical example of a community type would have covered prior to Euro-american settlement. This factor was also used in setting the goal for each type (see Chapter 3).

- Matrix: > 1,000 acres
- Large Patch: 100-1,000 acres
- Small Patch: < 100 acres

TERRESTRIAL NATURAL COMMUNITIES

(Upland and wetland systems with rooted vegetation)

WETLAND FOREST AND WOODLAND COMMUNITIES

Cottonwood-Diamond Willow Woodland

G-Rank: G? S-Rank: S2? Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Missouri River, Middle Loup River and Elkhorn River floodplains

Cottonwood-Peachleaf Willow Riparian Woodland

G-Rank: G3G4 S-Rank: S3 Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Mostly along streams in central and western Nebraska

Cottonwood Riparian Woodland

G-Rank: G2 S-Rank: S2? Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Mostly in the western 2/3 of state

Eastern Cottonwood – Dogwood Riparian Woodland

G-Rank: GNR S-Rank: S2? Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Missouri River floodplain from Washington County northward;
 may also be present on the lower Platte River

Eastern Riparian Forest

G-Rank: G3G5 S-Rank: S3 Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Floodplains in eastern Nebraska

Peachleaf Willow Woodland

G-Rank: G3 S-Rank: S1 Goal: 1 Distribution: Limited
 Patch size: Small patch
 Range in NE: Pine Ridge

UPLAND FOREST AND WOODLAND COMMUNITIES

Basswood-Ironwood Spring Branch Canyon Forest

G-Rank: G3 S-Rank: S2 Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Central Niobrara River Valley in northeast Cherry County; Brown, Keya Paha, and Rock counties

Bur Oak – Basswood – Ironwood Forest

G-Rank: G3 S-Rank: S2S3 Goal: 2 Distribution: Peripheral
 Patch size: Large patch
 Range in NE: Missouri River bluffs from Dakota County west to Knox County, south side of the Niobrara River to Brown County; may be present south to Omaha

Dry-Mesic Bur Oak Forest and Woodland

G-Rank: G4 S-Rank: S2S3 Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Eastern 1/4 of the state, and westward along the lower Niobrara, lower Loup, and Elkhorn rivers; most common on the Platte, Blue and Nemaha river bluffs

Dry-Mesic Ponderosa Pine Woodland

G-Rank: G3G4 S-Rank: S2 Goal: 10 Distribution: Limited
 Patch: Small patch/large patch
 Range in NE: Pine Ridge escarpment and possibly the Wildcat Hills and central Niobrara River Valley

Dry Ponderosa Pine Open Woodland and Savanna

G-Rank: G3G4 S-Rank: S3S4 Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Pine Ridge, central Niobrara River, and Wildcat Hills

Dry Upland Bur Oak Woodland

G-Rank: GNR S-Rank: S3? Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: East half of Nebraska, usually in stream valleys

Green Ash- Eastern Red-cedar Scarp Woodland

G-Rank: GNR S-Rank: S3? Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Unglaciaded mixed-grass plains in central and north-central Nebraska

Green Ash – Elm – Hackberry Canyon Bottom Woodland

G-Rank: G2G3 S-Rank: S2 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Northwest and north-central Nebraska

Mesic Bur Oak Forest and Woodland

G-Rank: G? S-Rank: S1? Goal: 5 Distribution: Limited

Patch size: Large patch
 Range in NE: Southeast Nebraska on terraces of Salt Creek, Big Blue, and Big Nemaha rivers

Oak – Hickory – Ironwood Forest

G-Rank: G3 S-Rank: S2 Goal: 2 Distribution: Peripheral
 Patch size: Large patch
 Range in NE: Occurs along the Missouri River south of Omaha, and small patches may be scattered northward to Dakota County and westward along some major tributaries

Paper Birch Springbranch Canyon Forest

G-Rank: G2? S-Rank: S1 Goal: 10 Distribution: Endemic
 Patch size: Small patch
 Range in NE: Central Niobrara River in springbranch canyons

Pine-Juniper Scarp Woodland

G-Rank: G4 S-Rank: S3 Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Wildcat Hills and southward in Panhandle on north side of escarpments, areas of the Pine Ridge

Ponderosa Pine Forest

G-Rank: G3G4 S-Rank: S2 Goal: 2 Distribution: Peripheral
 Patch size: Large patch
 Range in NE: Pine Ridge, central Niobrara Valley, and Wildcat Hills

Red Oak – Basswood – Ironwood Forest

G-Rank: G3G4 S-Rank: S2 Goal: 2 Distribution: Peripheral
 Patch size: Large patch
 Range in NE: Missouri River bluffs from Washington County southward, may be present north to Dakota County and westward along the Platte River

Rocky Mountain Juniper Woodland

G-Rank: G3G4 S-Rank: S4 Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Nebraska Panhandle, primarily on escarpments

Sandstone Upland Bur Oak Woodland

G-Rank: GNR S-Rank: S2? Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Rose Creek drainage in Jefferson County

WETLAND SHRUBLAND COMMUNITIES

Riparian Dogwood – False Indigobush Shrubland

G-Rank: G4? S-Rank: S4? Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Streams and rivers in eastern 1/2 of Nebraska on high banks and raised islands

Sandbar Willow Shrubland

G-Rank: G5 S-Rank: S4S5 Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Along streams and rivers throughout the state; on sandbars, islands, and stream banks

UPLAND SHRUBLAND COMMUNITIES

Buckbrush Shrubland

G-Rank: G4G5 S-Rank: S4 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: West 1/2 of the state in mesic swales and depressions

Buffaloberry Shrubland

G-Rank: G3G4 S-Rank: S2? Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Primarily in northern and western Nebraska

Chokecherry-Plum Shrub Thicket

G-Rank: G4? S-Rank: S3? Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Wide distribution in northern Nebraska

Mountain Mahogany Shrubland

G-Rank: G5 S-Rank: S3 Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Wildcat Hills and, to a lesser extent, other escarpments in the west; upper slopes and canyon sides

Skunkbush Sumac Shrubland

G-Rank: GNR S-Rank: S2? Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Pine Ridge in Sioux County

WETLAND HERBACEOUS COMMUNITIES

American Lotus Aquatic Wetland

G-Rank: G4? S-Rank: S1? Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Missouri River valley

Cattail Shallow Marsh

G-Rank: G5 S-Rank: S2 Goal: 5 Distribution: Widespread
 Patch size: Small patch/large patch
 Range in NE: Statewide

Eastern Bulrush Deep Marsh

G-Rank: G4G5 S-Rank: S3 Goal: 5 Distribution: Widespread
 Patch size: Small patch/large patch
 Range in NE: Banks and backwaters of river and large streams in the eastern 1/2 of the state

Eastern Cordgrass Wet Prairie

G-Rank: G3? S-Rank: S1 Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Tallgrass prairie region of eastern Nebraska on floodplains

Eastern Pondweed Aquatic Wetland

G-Rank: G4G5 S-Rank: S3? Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Shallow, freshwater basins, floodplain backwaters of large rivers in the southern 1/2 of the state

Eastern Saline Marsh

G-Rank: G1G2 S-Rank: S1 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Salt Creek drainage, in floodplain depressions with standing water most of the year

Eastern Saline Meadow

G-Rank: G2G3 S-Rank: S1 Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Salt Creek drainage, in shallow depressions and level ground of floodplains. This community contains meadow areas and salt flats

Eastern Sedge Wet Meadow

G-Rank: GNR S-Rank: S1 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Floodplain of the Missouri River and its tributaries

Freshwater Seep

G-Rank: G3 S-Rank: S3 Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Throughout the state but best developed in the Sandhills, Smokey Hills, and Pine Ridge; slope of hills, base of bluffs, and valleys where groundwater discharge is present

Northern Cordgrass Wet Prairie

G-Rank: G2G3 S-Rank: S2 Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Platte River valley and northward in central Nebraska; on upland depressions and stream floodplains and terraces

Northern Pondweed Aquatic Wetland

G-Rank: G4G5 S-Rank: S4 Goal: 20 Distribution: Endemic
 Patch size: Small patch/large patch
 Range in NE: Lakes and backwaters from Platte River northward, best developed in the Sandhills

Playa Wetland

G-Rank: G2G4 S-Rank: S1 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Throughout the state but most common in the Rainwater Basin region; shallow depressions on level ground that is temporarily flooded

Prairie Fen

G-Rank: G1 S-Rank: S1 Goal: 5 Distribution: Limited
 Patch size: Small patch
 Range in NE: Little Blue River valley in Jefferson County; associated with sandstone slopes and groundwater discharge

Reed Marsh

G-Rank: G4 S-Rank: S4 Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Northern 1/2 of the state, from Platte River valley northward

Saline/Alkaline Aquatic Wetland

G-Rank: G2 S-Rank: S3 Goal:10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Closed Basin region of the western Sandhills and Salt Creek drainage

Sandhills Fen

G-Rank: G1G2 S-Rank: S1S2 Goal:14 Distribution: Endemic
 Patch size: Large patch
 Range in NE: Sandhill valleys; areas with extensive groundwater discharge and peat and muck soils

Sandhills Hardstem Bulrush Marsh

G-Rank: G4 S-Rank: S4 Goal: 20 Distribution: Endemic
 Patch size: Small patch/large patch
 Range in NE: Eastern 1/2 of the Sandhills, possibly into the Elkhorn and Loup river drainages

Sandhills Wet Meadow

G-Rank: G3G4 S-Rank: S2? Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Sandhill valleys and sand flats, floodplains of Sandhills rivers, the Loup River and the Elkhorn River floodplains.

Spikerush Vernal Pool

G-Rank: G5 S-Rank: S1 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Northwestern and north-central Nebraska; small, relatively deep (.5-1m) basin-like depressions in streambeds or adjacent to ponds and marshes

Water-Lily Aquatic Wetland

G-Rank: G5 S-Rank: S2 Goal: 10 Distribution: Limited
 Patch size: Small patch /large patch
 Range in NE: Lakes and ponds in the Sandhills

Western Alkaline Marsh

G-Rank: G3G4 S-Rank: S3 Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Most abundant in Closed Basin region of the western Sandhills, also in North Platte River valley; in depressions and basins

Western Alkaline Meadow

G-Rank: G3 S-Rank: S3 Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: North Platte River valley and Closed Basin region of the Sandhills, level ground on river bottoms and interdunal valley bottoms in areas of alkaline lakes and marshes

Western Sedge Wet Meadow

G-Rank: G4 S-Rank: S2 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Nebraska Panhandle; occurs on stream banks and streambeds that contain standing water much of the year

Western Sub-Irrigated Alkaline Meadow

G-Rank: G3 S-Rank: S2? Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Upper Niobrara River valley, North Platte River valley; may be present in Sandhills

Wheatgrass Playa Grassland

G-Rank: G2G3 S-Rank: S1 Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Most abundant in loess plains of south-central and southwest Nebraska, but is also apparently present in extreme northwest Nebraska and Todd Valley of east-central Nebraska

UPLAND HERBACEOUS COMMUNITIES

Dakota Sandstone Tall-grass Prairie

G-Rank: G3? S-Rank: S2 Goal: 3 Distribution: Limited
 Patch size: Matrix
 Range in NE: Smokey Hills region of southern Jefferson and southwestern Gage counties

Eastern Sand Prairie

G-Rank: G3 S-Rank: S4 Goal: 5 Distribution: Limited
 Patch size: Large patch/matrix
 Range in NE: Northern, eastern, and southern periphery of the Sandhills, outliers along Elkhorn, Loup, and Platte Rivers

Greasewood Shrub Prairie

G-Rank: G4 S-Rank: S2 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Hat Creek Basin in northern Sioux County; level ground on upland terraces adjacent to stream valleys; poorly-drained alkaline clay and silty clay loam soils

Great Plains Gravel/Cobble Prairie

G-Rank: GNR S-Rank: S3 Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: On shoulders of upland bluffs above stream valleys in the Niobrara River drainage from Cherry County to Knox County; also southwest Nebraska in Deuel and Keith counties

Loess Mixed-grass Prairie

G-Rank: G3? S-Rank: S3 Goal: 3 Distribution: Limited
 Patch size: Matrix
 Range in NE: Loess mantled hills and plains of central Nebraska and portions of southeastern and northeastern Nebraska

Lowland Tall-grass Prairie

G-Rank: G2G3 S-Rank: S1 Goal: 5 Distribution: Limited
 Patch size: Large patch
 Range in NE: Along river and stream valleys within the tall-grass region, primarily on floodplains and terraces; also ravines in uplands

Missouri River Floodplain Terrace Grassland

G-Rank: GNR S-Rank: S2? Goal: 5 Distribution: Endemic
 Patch size: Small patch/large patch
 Range in NE: High terraces of the Missouri River in northeast Nebraska on sands formed from alluvium

Missouri River Valley Dune Grassland

G-Rank: GNR S-Rank: S2 Goal: 5 Distribution: Endemic
 Patch size: Small patch
 Range in NE: Terraces of the Missouri River in northeast Nebraska on moderately sloping sand dunes

Northern Loess/Shale Bluff Prairie

G-Rank: G2 S-Rank: S2 Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: South side of the Missouri River from Dixon County to Boyd County, may be westward along the Niobrara and Keya Paha Rivers to Boyd and Keya Paha counties; nearly level slopes and bluff tops of loess

Northwestern Mixed-grass Prairie

G-Rank: G4 S-Rank: S3 Goal: 3 Distribution: Limited
 Patch size: Matrix
 Range in NE: Occurs in the Hat Creek and White River basins in Dawes, Sheridan, and Sioux counties in extreme northwest Nebraska; uplands with clay soils

Sandhills Dry Valley Prairie

G-Rank: G3 S-Rank: S4 Goal: 14 Distribution: Endemic
 Patch size: Large patch
 Range in NE: Western 2/3 of Sandhills; broad to nearly level interdunal valleys and upland stream terraces; soils well drained,

Sandhills Dune Prairie

G-Rank: G4G5 S-Rank: S4S5 Goal: 3 Distribution: Limited
 Patch size: Matrix
 Range in NE: Sandhills and outlying dunes; uplands

Sandhills Mesic Tall-grass Prairie

G-Rank: G3 S-Rank: S2 Goal: 5 Distribution: Limited
 Patch size: Large patch/Matrix
 Range in NE: Eastern Sandhills west to Logan County and eastern Cherry County; mostly on low dune slopes and small sandy rises associated with wet meadows

Sandsage Prairie

G-Rank: G3 S-Rank: S3 Goal: 3 Distribution: Limited
 Patch size: Matrix
 Range in NE: Panhandle, western edge of the Sandhills, Wildcat Hills, Chase, Dundy, and Perkins counties; on rolling dunes, fine and loamy sands

Silver Sagebrush Shrub Prairie

G-Rank: G4 S-Rank: S2 Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: White River and Hat Creek drainages in Dawes and Sioux counties; terraces and floodplains of intermittent streams; poorly drained soils

Southern Sand/Gravel Prairie

G-Rank: GNR S-Rank: S2? Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Uplands on the north side of the Little Blue River and Big Sandy Creek in southwestern Jefferson and Thayer counties and on the north side of the Republican River in Nuckolls and Webster counties

Threadleaf Sedge Western Mixed-grass Prairie

G-Rank: G5 S-Rank: S3S4 Goal: 3 Distribution: Limited
 Patch size: Matrix
 Range in NE: Most of the Nebraska Panhandle with the exception of extreme northwest and portions of southwest Nebraska in Keith and Chase counties; also occurs eastward along the Niobrara River; on gentle uplands, level to moderate slopes

Upland Tall-grass Prairie

G-Rank: G2 S-Rank: S1S2 Goal: 3 Distribution: Limited
 Patch size: Matrix
 Range in NE: Eastern 1/5 of the state but westward on loess hills to central Nebraska

Western Floodplain Terrace Grassland

G-Rank: G4 S-Rank: S3 Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Along river and stream valleys in the western 1/2 of the Panhandle; level ground in the floodplains

Western Sand Prairie

G-Rank: G3 S-Rank: S3? Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Within the range of the western mixed-grass prairie in the Panhandle, on slopes below sandstone outcrops and escarpments

Wheatgrass Western Mixed-grass Prairie

G-Rank: G5 S-Rank: S4 Goal: 2 Distribution: Widespread
 Patch size: Large patch/matrix
 Range in NE: Panhandle of western Nebraska, more common northward

WETLAND SPARSELY VEGETATED COMMUNITIES

Perennial Sandbar

G-Rank: G5 S-Rank: S3S4 Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Channels of streams throughout the state; sandbars, islands, and shorelines

Sandbar/Mudflat

G-Rank: G4G5 S-Rank: S5 Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Within channels of larger streams and rivers throughout the state

UPLAND SPARSELY VEGETATED COMMUNITIES

Badlands

G-Rank: G4G5 S-Rank: S3 Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Occurs in Dawes, Scottsbluff, and Sioux counties, on eroded slopes of siltstone, clay and clay with cobbles; most sites bordered by mixed-grass prairie

Eastern Sandstone Bluff and Cliff

G-Rank: G4G5 S-Rank: S4 Goal: 5 Distribution: Widespread
 Patch size: Small patch
 Range in NE: Smoky Hills Region in Jefferson County and occasionally on the bluffs of the Missouri River, mostly in Dakota and Thurston counties

Northern Chalk Bluff and Cliff

G-Rank: GNR S-Rank: S5 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Southside of Missouri River Valley in Knox and Cedar counties; northeastern Dawes and northwestern Sheridan counties

Riverine Gravel Flats

G-Rank: G? S-Rank: S2? Goal: 10 Distribution: Limited
 Patch size: Small patch/large patch
 Range in NE: Occurs along the Platte River in Dawson County westward; occurs as patches or bands on level ground, usually on the first terrace of rivers or in level canyon bottoms; also South Platte River in Deuel and Keith counties

Rock Outcrop

G-Rank: G4? S-Rank: S4 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Escarpments in the Panhandle and southwest Nebraska; occurs on level to moderately steep (40% grade) upper and middle slopes on irregularly eroded sandstone and siltstone escarpments and ravines

Western Sandstone Cliff

G-Rank: G4G5 S-Rank: S5 Goal: 10 Distribution: Limited
 Patch size: Small patch
 Range in NE: Escarpments of the Panhandle; also central Niobrara River Valley

AQUATIC (Open water systems)

Below is a very basic classification of aquatic systems that was used to attribute the biologically unique landscapes. There is an urgent need to develop a more rigorous aquatic habitat classification system for Nebraska.

LAKES

Alkaline
 Non-alkaline

RIVERS and STREAMS

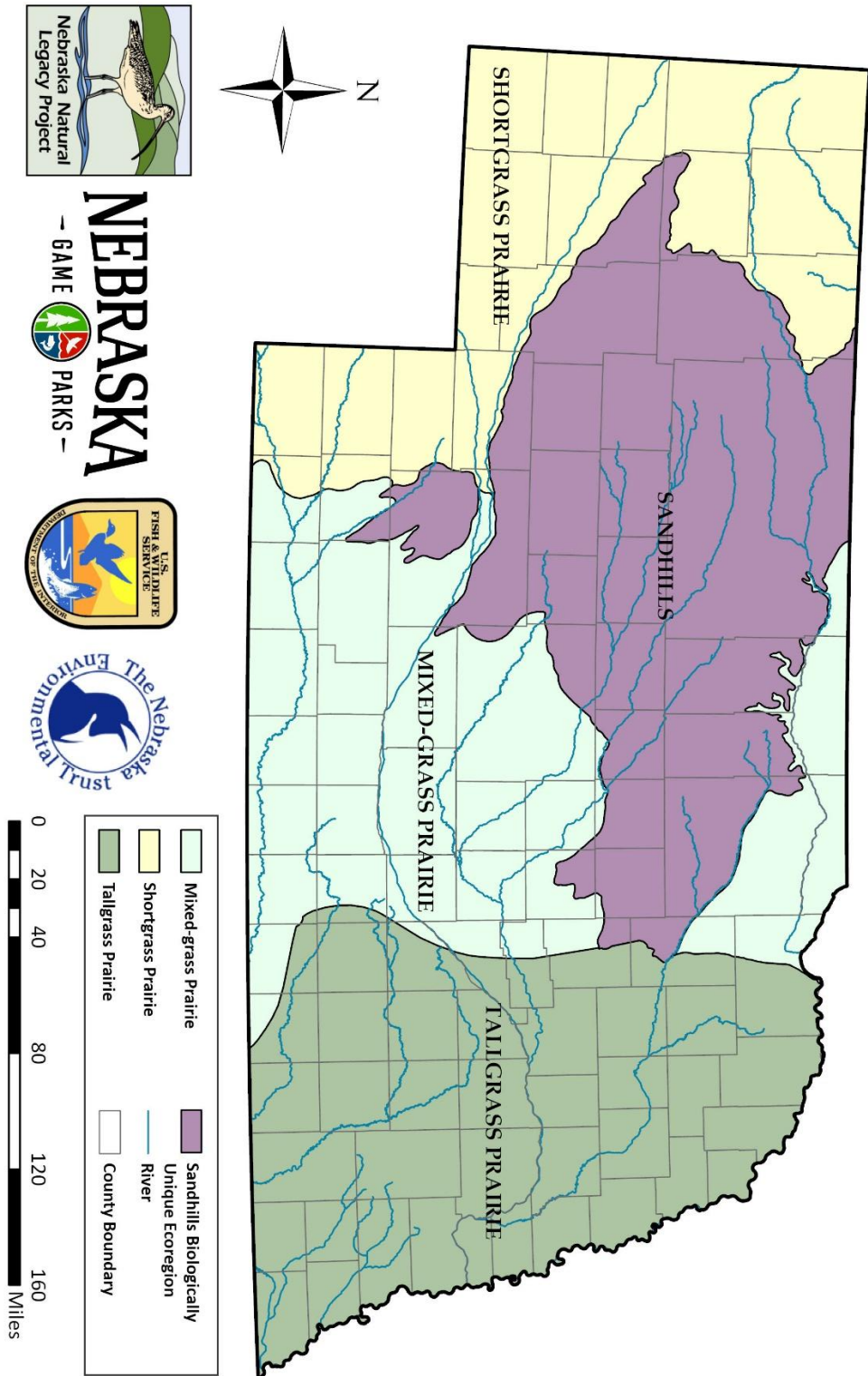
Headwater, cold water stream
 Headwater, warm water stream
 Mid-order, cold water river
 Mid-order, warm water river
 Large, warm water river

Appendix 8: Map of the ecoregions of Nebraska.

Ecoregions are relatively large units of land and water delineated by the biotic and abiotic factors (e.g., climate, topography, geology, vegetation) that regulate the structure and function of the ecosystems within them. There are two main ecoregion maps for the United States, one developed by the U.S. Forest Service (Bailey et al. 1994) and the other developed by the U.S. Environmental Protection Agency (Omernik et al. 1987). For the Nebraska Natural Legacy Project, we delineated ecoregions using primarily Level III ecoregion lines from Ecoregions of Nebraska and Kansas (Chapman et al. 2001), which was a joint project of the USFS and EPA to blend the two systems. However, we used Bailey's Section level line to delineate the western boundary of tall-grass prairie south of the Sandhills since this was a better fit with Kaul and Rolfsmeier's (1993) map of the native vegetation of Nebraska.

In this third edition of the wildlife action plan the Sandhills ecoregion has been granted an elevated priority designation of Biologically Unique Ecoregion (see Chapter 3).

Nebraska Natural Legacy Project: Ecoregions



Appendix 9: Criteria for changes to the system of Biologically Unique Landscapes

Biologically Unique Landscapes (BULs) were identified in order to increase the efficiency and effectiveness of conservation by focusing efforts in areas with concentrations of at-risk species and high quality natural communities, in a relatively intact landscape. These landscapes offer the best opportunities for conserving the full array of biological diversity in the state. These landscapes were delineated using the best available data at that time. It was recognized that BUL boundaries could be changed or new BULs added as new information became available on the distribution of at-risk species and high quality examples of natural communities.

BULs were designed with the goal of including sites where there is the highest likelihood that the populations and communities will persist over the long term. For individual species, this would include sites with a large population size, good age-class structure and evidence of successful reproduction. For natural communities, this would include sites with a good representation of expected native species, few invasive exotics, and relatively intact ecological processes that maintain these communities (e.g., fire, grazing, flooding). BULs contain high quality examples of at-risk species populations and ecological communities that are nested together and exist within functional landscapes.

Major Additions or Deletions to the BUL System

Adding new BULs or changing the size of existing BULs by more than 10%

Analysis of the distribution and abundance of species and communities within BULs indicates that the original system of BULs does not provide ample opportunity to meet the Natural Legacy conservation goals for all at-risk species and natural communities. Also, in future revisions of the Nebraska Natural Legacy Project, new species and communities will likely be added to the at-risk species and natural communities' lists and their distributions may lie outside of existing BULs. In addition, portions of, or entire, BULs may become degraded to the point that they can no longer support the objectives for which they were designated. Thus, changes in the system will be needed.

Additions to the system should complement the existing system and not merely repeat what is already there. They should provide opportunities to meet conservation goals for species and communities that can't be met in the existing system. Proposed additions should strive to include the most intact landscape available and contain multiple occurrences of at-risk species and/or natural communities.

The following criteria were developed by the Natural Legacy Science Team to guide adjustments to the system.

Criteria for additions to the BUL system (expanding existing or adding new BULs):

Addition must contain documented, high-quality occurrences of at-risk species and/or natural communities and provide opportunities to meet species and/or community goals that can't be met in the existing system of BULs. (See below for the current list of species and communities that would qualify for these criteria)

Criteria for deletions from the BUL system (removing portions of, or entire, BULs):

The area to be removed is degraded to the point that it does not contain high-quality occurrences of at-risk species and/or natural communities and does not provide opportunities to meet species and/or community goals.

Minor Boundary Adjustments

The original BUL boundaries were drawn using the best available information, typically using land-cover maps and including areas that appeared to be relatively intact natural habitats around core areas of documented species and community targets. Given the somewhat coarse scale at which the boundaries were drawn, they no doubt included some areas that are of low conservation value and excluded some adjacent areas that are of high conservation value. To increase the effectiveness of the boundaries, minor adjustments can be made to BUL boundaries. Proposals for minor boundary adjustments are encouraged to include recommendations for deletions, when appropriate, as well as additions. Again, proposed additions to a BUL should strive to include the most intact landscape available and contain multiple occurrences of at-risk species and/or natural communities. Proposals for minor boundary adjustments should meet the following criteria.

Criteria for minor boundary adjustments

Addition to a BUL must contain documented, high-quality occurrences of at-risk species and/or natural communities.

Area to be removed is degraded to the point that it does not contain high-quality occurrences of at-risk species and/or natural communities and does not provide opportunities to meet species and/or community goals.

The boundary change is minor – moving the boundary a few miles or resulting in no more than 10% increase or decrease in the size of the BUL.

Appendix 10: Scientific names of non-tier species referred to in the Nebraska Natural Legacy Project

	<u>Common Name</u>	<u>Scientific Name</u>
Amphibians	Blanchard's Cricket Frog	<i>Acris blanchardi</i>
	Boreal Chorus Frog	<i>Pseudacris maculata</i>
	Bullfrog	<i>Lithobates catesbeianus</i>
	Great Plains Toad	<i>Anaxyrus cognatus</i>
	Plains Leopard Frog	<i>Lithobates blairi</i>
	Plains Spadefoot	<i>Spea bombifrons</i>
	Western Tiger Salamander	<i>Ambystoma mavortium</i>
	Woodhouse's Toad	<i>Anaxyrus woodhousii</i>
Birds	American White Pelican	<i>Pelecanus erythrorhynchos</i>
	Baird's Sandpiper	<i>Calidris bairdii</i>
	Bald Eagle	<i>Haliaeetus leucocephalus</i>
	Blue-winged Teal	<i>Anas discors</i>
	Bobolink	<i>Dolichonyx oryzivorus</i>
	Canada Goose	<i>Branta canadensis</i>
	Dickcissel	<i>Spiza americana</i>
	European Starling	<i>Sturnus vulgaris</i>
	Field Sparrow	<i>Spizella pusilla</i>
	Franklin's Gull	<i>Larus pipixcan</i>
	Grasshopper Sparrow	<i>Ammodramus savannarum</i>
	Greater White-fronted Goose	<i>Anser albifrons</i>
	Green Heron	<i>Butorides virescens</i>
	Horned Lark	<i>Eremophila alpestris</i>
	Lark Bunting	<i>Calamospiza melanocorys</i>
	Lark Sparrow	<i>Chondestes grammacus</i>
	Lesser Yellowlegs	<i>Tringa flavipes</i>
	Mallard	<i>Anas platyrhynchos</i>
	Mountain Bluebird	<i>Sialia currucoides</i>
	Northern Bobwhite	<i>Colinus virginianus</i>
	Northern Harrier	<i>Circus hudsonius</i>
	Orchard Oriole	<i>Icterus spurius</i>
	Pine Siskin	<i>Spinus pinus</i>
	Red Crossbill	<i>Loxia curvirostra</i>
	Red-eyed Vireo	<i>Vireo olivaceus</i>
	Ring-necked Pheasant	<i>Phasianus colchicus</i>
	Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>
	Ross's Goose	<i>Chen rossii</i>
	Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>

Birds (cont.)	Snow Goose	<i>Chen caerulescens</i>
	Stilt Sandpiper	<i>Calidris himantopus</i>
	Swainson's Hawk	<i>Buteo swainsoni</i>
	Upland Sandpiper	<i>Bartramia longicauda</i>
	Vesper Sparrow	<i>Pooecetes gramineus</i>
	Western Meadowlark	<i>Sturnella neglecta</i>
	Wild Turkey	<i>Meleagris gallopavo</i>
	Wilson's Phalarope	<i>Phalaropus tricolor</i>
Fish	Wood Duck	<i>Aix sponsa</i>
	Bighead Carp	<i>Hypophthalmichthys nobilis</i>
	Bluegill	<i>Lepomis macrochirus</i>
	Brook Stickleback	<i>Culaea inconstans</i>
	Brown Trout	<i>Salmo trutta</i>
	Channel Catfish	<i>Ictalurus punctatus</i>
	Common Carp	<i>Cyprinus carpio</i>
	Cutthroat trout	<i>Oncorhynchus clarkii</i>
	Flathead catfish	<i>Pylodictis olivaris</i>
	Grass Carp	<i>Ctenopharyngodon idella</i>
	Hybrid Striped Bass	<i>Morone chrysops</i> × <i>M. saxatilis</i>
	Iowa Darter	<i>Etheostoma exile</i>
	Johnny Darter	<i>Etheostoma nigrum</i>
	Largemouth Bass	<i>Micropterus salmoides</i>
	Northern Pike	<i>Esox lucius</i>
	Paddlefish	<i>Polyodon spathula</i>
	Rainbow Trout	<i>Oncorhynchus mykiss</i>
	River Carpsucker	<i>Carpodes carpio</i>
	Sauger	<i>Sander canadensis</i>
	Shortnose Gar	<i>Lepisosteus platostomus</i>
	Shovelnose Sturgeon	<i>Scaphirhynchus platyrhynchus</i>
	Silver Carp	<i>Hypophthalmichthys molitrix</i>
	Smallmouth Bass	<i>Micropterus dolomieu</i>
	Speckled Chub	<i>Macrhybopsis aestivalis</i>
	Striped Bass	<i>Morone saxatilis</i>
	Suckermouth Minnow	<i>Phenacobius mirabilis</i>
	Walleye	<i>Sander vitreus</i>
	Western Mosquitofish	<i>Gambusia affinis</i>
	White Bass	<i>Morone chrysops</i>
	Yellow Perch	<i>Perca flavescens</i>
Insect	Dung Beetle	<i>Melanocanthon nigricornis</i>
Mammals	American Badger	<i>Taxidea taxus</i>
	American Beaver	<i>Castor canadensis</i>

	American Bison	<i>Bison bison</i>
	American Black Bear	<i>Ursus americanus</i>
	American Mink	<i>Neogale vison</i>
	Big Brown Bat	<i>Eptesicus fuscus</i>
	Black-footed Ferret	<i>Mustela nigripes</i>
	Bobcat	<i>Lynx rufus</i>
	Common Muskrat	<i>Ondatra zibethicus</i>
	Coyote	<i>Canis latrans</i>
	Domestic Cat	<i>Felis catus</i>
	Eastern Cottontail	<i>Sylvilagus floridanus</i>
	Eastern woodrat	<i>Neotoma floridana</i>
	Elk	<i>Cervus canadensis</i>
	Franklin's Ground Squirrel	<i>Poliocitellus franklinii</i>
	Gray Fox	<i>Urocyon cinereoargenteus</i>
	Gray Wolf	<i>Canis lupus</i>
	Grizzly Bear	<i>Ursus arctos horribilis</i>
	Least Weasel	<i>Mustela nivalis</i>
	Masked Shrew	<i>Sorex cinereus</i>
	Meadow Jumping Mouse	<i>Zapus hudsonius</i>
	Meadow Vole	<i>Microtus pennsylvanicus</i>
	Mule Deer	<i>Odocoileus hemionus</i>
	North American Least Shrew	<i>Cryptotis parva</i>
	North American River Otter	<i>Lontra canadensis</i>
	Northern Grasshopper Mouse	<i>Onychomys leucogaster</i>
	Ord's Kangaroo Rat	<i>Dipodomys ordii</i>
	Plains Pocket Gopher	<i>Geomys bursarius</i>
	Prairie Vole	<i>Microtus ochrogaster</i>
	Pronghorn	<i>Antilocapra americana</i>
	Raccoon	<i>Procyon lotor</i>
	Red Fox	<i>Vulpes vulpes</i>
	Striped Skunk	<i>Mephitis mephitis</i>
	Thirteen-lined Ground Squirrel	<i>Ictidomys tridecemlineatus</i>
	White-tailed Deer	<i>Odocoileus virginianus</i>
Mussels	Zebra Mussel	<i>Dreissena polymorpha</i>
Reptiles	Bullsnake	<i>Pituophis catenifer</i>
	Common Gartersnake	<i>Thamnophis sirtalis</i>
	Common Snapping Turtle	<i>Chelydra serpentina</i>
	Eastern Yellow-bellied Racer	<i>Coluber constrictor flaviventris</i>
	False Map Turtle	<i>Graptemys pseudogeographica</i>
	Great Plains Skink	<i>Plestiodon obsoletus</i>
	Lesser Earless Lizard	<i>Holbrookia maculata</i>
	Northern Painted Turtle	<i>Chrysemys picta</i>

Reptiles (cont.)	Northern Prairie Lizard	<i>Sceloporus undulatus garmani</i>
	Northern Prairie Skink	<i>Plestiodon septentrionalis</i>
	Northern Watersnake	<i>Nerodia sipedon</i>
	Ornate Box Turtle	<i>Terrapene ornata</i>
	Plains Gartersnake	<i>Thamnophis radix</i>
	Prairie Rattlesnake	<i>Crotalus viridis</i>
	Six-lined Racerunner	<i>Aspidoscelis sexlineata</i>
	Spiny Softshell	<i>Apalone spinifer</i>
	Western Fox Snake	<i>Pantherophis ramspotti</i>
	Western Hognose Snake	<i>Heterodon nasicus</i>
	Yellow Mud Turtle	<i>Kinosternon flavescens</i>
Plants	Alfalfa	<i>Medicago sativa</i> ssp. <i>sativa</i>
	Alkali Sacaton	<i>Sporobolus airoides</i>
	American Elm	<i>Ulmus americana</i>
	American Lotus	<i>Nelumbo lutea</i>
	American Plum	<i>Prunus americana</i>
	Amur honeysuckle	<i>Lonicera maackii</i>
	Annual Buckwheat	<i>Eriogonum annuum</i>
	Autumn Olive	<i>Elaeagnus umbellata</i>
	Arrowhead	<i>Sagittaria</i> spp.
	Aspen	<i>Populus</i> spp.
	Basswood	<i>Tilia americana</i>
	Bearded Flatsedge	<i>Cyperus squarrosus</i>
	Bearded Sprangletop	<i>Diplachne fusca</i>
	Bedstraw	<i>Galium</i> spp.
	Big Bluestem	<i>Andropogon gerardii</i>
	Black Walnut	<i>Juglans nigra</i>
	Bluegrass	<i>Poa</i> spp.
	Blue Grama	<i>Bouteloua gracilis</i>
	Blue Mudplantain	<i>Heteranthera limosa</i>
	Bog Buckbean	<i>Menyanthes trifoliata</i>
	Box-elder	<i>Acer negundo</i>
	Broad-leaf Cattail	<i>Typha latifolia</i>
	Broom Snakeweed	<i>Gutierrezia sarothrae</i>
	Buffaloberry	<i>Shepherdia canadensis</i>
	Buffalograss	<i>Bouteloua dactyloides</i>
	Buckbrush	<i>Symphoricarpos orbiculatus</i>
	Bur Oak	<i>Quercus macrocarpa</i>
	Bur-reed	<i>Sparganium</i> spp.
	Bush Morning Glory	<i>Ipomoea leptophylla</i>
	Bushy knotweed	<i>Polygonum ramosissimum</i> ssp.
	Canada Thistle	<i>Cirsium arvense</i>
	Canada Wild-rye	<i>Elymus canadensis</i>

Plants (cont.)

Caucasian bluestem	<i>Bothriochloa bladhii</i>
Cheatgrass	<i>Bromus tectorum</i>
Chokecherry	<i>Prunus virginiana</i>
Clustered Field Sedge	<i>Carex praegracilis</i>
Common Reed	<i>Phragmites australis</i> ssp. <i>americanus</i>
Coontail	<i>Ceratophyllum demersum</i>
Cottonwood	<i>Populus</i> spp.
Coyote Willow	<i>Salix exigua</i>
Crested Wheatgrass	<i>Agropyron cristatum</i>
Crown Vetch	<i>Securigera varia</i>
Cuman ragweed	<i>Ambrosia psilostachya</i>
Curly-leaf pondweed	<i>Potamogeton crispus</i>
Cutleaf Ironplant	<i>Xanthisma spinulosum</i>
Deervetch	<i>Lotus unifoliolatus</i>
Desert Goosefoot	<i>Chenopodium pratericola</i>
Disk Waterhyssop	<i>Bacopa rotundifolia</i>
Dogwood	<i>Cornus</i> spp.
Dotted Gayfeather	<i>Liatris punctata</i>
Downy Brome	<i>Bromus tectorum</i>
Duckweed	<i>Lemna</i> spp.
Dwarf Juniper	<i>Juniperus communis</i> var. <i>depressa</i>
Dwarf Spikerush	<i>Eleocharis parvula</i>
Eastern Bulrush	<i>Schoenoplectus acutus</i>
Eastern Cottonwood	<i>Populus deltoides</i>
Eastern Red-cedar	<i>Juniperus virginiana</i>
Eared Redstem	<i>Ammannia auriculata</i>
Elm (American)	<i>Ulmus americana</i>
Emory's Sedge	<i>Carex emoryi</i>
Entire-leaf Thelypody	<i>Thelypodium integrifolium</i>
Eurasian Phragmites	<i>Phragmites australis</i> ssp. <i>australis</i>
Eurasian Watermilfoil	<i>Myriophyllum spicatum</i>
False Indigo-bush	<i>Amorpha fruticosa</i>
Field Horsetail	<i>Equisetum arvense</i>
Flatsedge	<i>Cyperus</i> spp.
Foxtail Barley	<i>Hordeum jubatum</i>
Fragile Fern	<i>Cystopteris fragilis</i>
Garlic Mustard	<i>Alliaria Petiolata</i>
Garrison Creeping-foxtail	<i>Alopecurus arundinaceus</i>
Gilia	<i>Gilia</i> spp.
Green Ash	<i>Fraxinus pennsylvanica</i>
Green Needlegrass	<i>Nassella viridula</i>
Greasewood	<i>Sarcobatus vermiculatus</i>
Hackberry	<i>Celtis occidentalis</i>
Hairy Grama	<i>Bouteloua hirsuta</i>

Plants (cont.)

Halogeton	<i>Halogeton</i> spp.
Hard-stem Bulrush	<i>Schoenoplectus acutus</i>
Hickory	<i>Carya</i> spp.
Hood's Phlox	<i>Phlox hoodii</i>
Honey Locust	<i>Gleditsia triacanthos</i>
Honeysuckle	<i>Lonicera</i> spp.
Hound's-tongue	<i>Cynoglossum officinale</i>
Indiangrass	<i>Sorghastrum nutans</i>
Inland saltgrass	<i>Distichlis spicata</i>
Intermediate Wheatgrass	<i>Thinopyrum intermedium</i>
Ironwood	<i>Ostrya virginiana</i>
Japanese Brome	<i>Bromus japonicus</i>
Juniper	<i>Juniperus</i> spp.
Knapweeds	<i>Centaurea</i> spp.
Kentucky Bluegrass	<i>Poa pratensis</i>
Leadplant	<i>Amorpha canescens</i>
Leafy Spurge	<i>Euphorbia esula</i>
Lemon Scurf-pea	<i>Psoralea lanceolata</i>
Little Bluestem	<i>Schizachyrium scoparium</i>
Marsh Mallow	<i>Althaea officinalis</i>
Marsh Marigold	<i>Caltha palustris</i>
Marsh Muhly	<i>Muhlenbergia racemosa</i>
Medusahead	<i>Taeniatherum caput-medusae</i>
Milk-vetch	<i>Astragalus</i> spp.
Mountain Mahogany	<i>Cercocarpus montanus</i>
Narrow-leaf Cattail	<i>Typha angustifolia</i>
Needle-and-thread	<i>Hesperostipa comata</i>
Needlegrass	<i>Nassella</i> spp.
Osage Orange	<i>Maclura pomifera</i>
Paper Birch	<i>Betula papyrifera</i>
Peachleaf Willow	<i>Salix amygdaloides</i>
Pennsylvania smartweed	<i>Persicaria pensylvanica</i>
Plains Cottonwood	<i>Populus deltoides</i>
Plains Gayfeather	<i>Liatris squarrosa</i>
Plains Sunflower	<i>Helianthus petiolaris</i>
Ponderosa Pine	<i>Pinus ponderosa</i>
Prairie Blazing-star	<i>Liatris pycnostachya</i>
Prairie Clover	<i>Dalea</i> spp.
Prairie Coneflower	<i>Ratibida</i> spp.
Prairie (or Northern) Cordgrass	<i>Spartina pectinata</i>
Prairie Sandreed	<i>Calamovilfa longifolia</i>
Prairie Rose	<i>Rosa setigera</i> Michx.
Prickly Pear	<i>Opuntia</i> sp.
Purple Coneflower	<i>Echinacea angustifolia</i>

Plants (cont.)

Purple Locoweed	<i>Oxytropis lambertii</i>
Purple Loosestrife	<i>Lythrum salicaria</i>
Quackgrass	<i>Elymus repens</i>
Rayless Alkali Aster	<i>Symphotrichum ciliatum</i>
Red Clover	<i>Trifolium pratense</i>
Red Oak	<i>Quercus rubra</i>
Redtop	<i>Agrostis gigantea</i>
Reed Canary Grass	<i>Phalaris arundinacea</i>
Ripgut Sedge	<i>Carex lacustris</i>
River Bulrush	<i>Bolboschoenus fluviatilis</i>
Rough-leaf Dogwood	<i>Cornus drummondii</i>
Rubber Rabbit-brush	<i>Ericameria nauseosa</i>
Russian-olive	<i>Elaeagnus angustifolia</i>
Russian Thistle	<i>Kali</i> sp.
Sagebrush	<i>Artemisia</i> spp.
Saltbush	<i>Atriplex</i> spp.
Saltcedar	<i>Tamarix ramosissima</i>
Saltgrass	<i>Distichlis spicata</i>
Saltmarsh Bulrush	<i>Bolboschoenus maritimus</i>
Sandbar Willow	<i>Salix exigua</i>
Sand Bluestem	<i>Andropogon hallii</i>
Sand Cherry	<i>Prunus pumila</i>
Sand-lily	<i>Mentzelia nuda</i>
Sand Sagebrush	<i>Artemisia filifolia</i>
Saskatoon Serviceberry	<i>Amelanchier alnifolia</i>
Scarlet Globemallow	<i>Sphaeralcea coccinea</i>
Scarlet Gaura	<i>Oenothera suffrutescens</i>
Scratchgrass	<i>Muhlenbergia asperifolia</i>
Sea-blite	<i>Suaeda calceoliformis</i>
Sericea Lespedeza	<i>Lespedeza cuneata</i>
Showy Goldenrod	<i>Solidago speciosa</i>
Showy Ipomopsis	<i>Ipomopsis longiflora</i>
Siberian Elm	<i>Ulmus pumila</i>
Sickleweed	<i>Falcaria vulgaris</i>
Sideoats Grama	<i>Bouteloua curtipendula</i>
Silky Aster	<i>Symphotrichum sericeum</i>
Silver Buffaloberry	<i>Shepherdia argentea</i>
Silver Orache	<i>Atriplex</i> sp.
Silver Sagebrush	<i>Artemisia cana</i>
Skeletonplant	<i>Lygodesmia juncea</i>
Skunkbush Sumac	<i>Rhus aromatica</i>
Slender-flower Scurf-pea	<i>Pedimelum tenuiflorum</i>
Smartweed	<i>Persicaria</i> spp.
Smooth Brome	<i>Bromus inermis</i>

Plants (cont.)

Smooth Sumac	<i>Rhus glabra</i>
Snowberry	<i>Symphoricarpos albus</i>
Spearscale	<i>Atriplex patula</i>
Spikerush	<i>Eleocharis</i> spp.
Spreading Yellowcress	<i>Rorippa sinuata</i>
Stemless Tetraneuris	<i>Tetraneuris acaulis</i>
Stiff Sunflower	<i>Helianthus pauciflorus</i>
St. John's Wort	<i>Hypericum perforatum</i>
Sun Sedge	<i>Carex heliophila</i>
Sweet Clover	<i>Melilotus</i> spp.
Switchgrass	<i>Panicum virgatum</i>
Tall Wheatgrass	<i>Thinopyrum ponticum</i>
Thick-spike Wheatgrass	<i>Elymus lanceolatus</i>
Threadleaf sedge	<i>Carex filifolia</i>
Timothy Grass	<i>Phleum pratense</i>
Tree-of-heaven	<i>Ailanthus altissima</i>
Ventenata	<i>Ventenata dubia</i>
Viscid Camphor-daisy	<i>Rayjacksonia annua</i>
Water-lily	<i>Nymphaea</i> spp.
Western ragweed	<i>Ambrosia psilostachya</i>
Western Sea-blite	<i>Suaeda calceoliformis</i>
Western Wheatgrass	<i>Pascopyrum smithii</i> (<i>Elymus smithii</i>)
White Mulberry	<i>Morus alba</i>
White Sage	<i>Artemisia ludoviciana</i>
Wild Rice	<i>Zizania aquatica</i>
Willow	<i>Salix</i> spp.
Wolfberry	<i>Symphoricarpos occidentalis</i>
Wormwood Sage	<i>Artemisia ludoviciana</i>
Woolly Sedge	<i>Carex pellita</i>
Yellow gallium	<i>Galium verum</i>
Yucca	<i>Yucca</i> spp.

Appendix 11: Changes to the Tier 1, Tier 2 and Species of Greatest Information Need lists in the 3rd edition.

	Common Name	Scientific Name	2018 Legacy Status	2025 Legacy Status
Amphibians	Smallmouth Salamander	<i>Ambystoma texanum</i>	Tier 2	Tier 1
Birds	Baird's Sparrow	<i>Ammodramus bairdii</i>	Tier 1	SGIN
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	Tier 2	Removed
	Bullock's Oriole	<i>Icterus bullockii</i>	Tier 2	Removed
	Harris' Sparrow	<i>Zonotrichia querula</i>	Untiered	SGIN
	Hudsonian Godwit	<i>Limosa haemastica</i>	Untiered	Tier 2
	Lesser Scaup	<i>Aythya affinis</i>	Tier 2	Removed
	Merlin	<i>Falco columbarius</i>	Tier 2	Removed
	Pied-billed Grebe	<i>Podilymbus podiceps</i>	Tier 2	Removed
	Pileated Woodpecker	<i>Dryocopus pileatus</i>	Tier 2	Removed
	Pine Siskin	<i>Spinus pinus</i>	Tier 2	Removed
	Prothonotary Warbler	<i>Protonotaria citrea</i>	Tier 2	Removed
	Red-shouldered Hawk	<i>Buteo lineatus</i>	Tier 2	Removed
	Ruby-throated hummingbird	<i>Archilochus colubris</i>	Tier 2	Removed
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	Tier 2	Removed
	Short-eared Owl	<i>Asio flammeus</i>	Tier 1	SGIN
	Sprague's Pipit	<i>Anthus spragueii</i>	Tier 1	SGIN
	Swamp Sparrow	<i>Melospiza georgiana</i>	Tier 2	Removed
	Townsend's Solitaire	<i>Myadestes townsendi</i>	Tier 2	Removed
	Tufted Titmouse	<i>Baeolophus bicolor</i>	Tier 2	Removed
	Violet-Green Swallow	<i>Tachycineta thalassina</i>	Tier 2	Removed
	Yellow-throated warbler	<i>Setophaga dominica</i>	Tier 2	Removed
Fish	Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	Untiered	SGIN
	Black Buffalo	<i>Ictiobus niger</i>	Tier 2	SGIN
	Blue Sucker	<i>Cycleptus elongatus</i>	Tier 1	Tier 2
	Northern Pearl Dace	<i>Margariscus nachtriebi</i>	Tier 2	Tier 1
	Shoal Chub	<i>Macrhybopsis hyostoma</i>	Tier 2	Tier 1
	Silver Chub	<i>Macrhybopsis storeriana</i>	Tier 2	Tier 1
	Skipjack Herring	<i>Alosa chrysochloris</i>	Tier 2	Removed
	Smallmouth Buffalo	<i>Ictiobus bubalus</i>	Untiered	SGIN
Insects	A wool-carder bee	<i>Anthidium psoraleae</i>	Untiered	SGIN
	Black-and-gold Bumble Bee	<i>Bombus auricomus</i>	Untiered	Tier 2
	Morrison's Bumble Bee	<i>Bombus morrisoni</i>	Untiered	Tier 1
	Variable Cuckoo Bumble Bee	<i>Bombus variabilis</i>	Tier 2	Tier 1

	Angus' Underwing	<i>Catocala angusi</i>	Untiered	Tier 2
	Clinton's Underwing	<i>Catocala clintonii</i>	Untiered	Tier 2
	Married Underwing	<i>Catocala nuptialis</i>	Tier 1	Tier 2
	Whitney's Underwing	<i>Catocala whitneyi</i>	Tier 1	Tier 2
	Transverse Lady Beetle	<i>Coccinella transversoguttata</i>	Untiered	Tier 2
	Common Name	Scientific Name	2018 Legacy Status	2025 Legacy Status
Insects	A Sweat Bee	<i>Dieunomia apacha</i>	Untiered	SGIN
	A Dieunomia Bee	<i>Dieunomia triangulifera</i>	Untiered	SGIN
	Large Marble	<i>Euchloe ausonides</i>	Tier 2	Tier 1
	Evening Primrose Leafcutter	<i>Megachile anograe</i>	Untiered	SGIN
	A Leafcutter Bee	<i>Megachile dakotensis</i>	Untiered	SGIN
	A Leafcutter Bee	<i>Megachile deflexa</i>	Untiered	SGIN
	Spiny-legged Leafcutter Bee	<i>Megachile dentitarsus</i>	Untiered	SGIN
	Robust Sunflower Leafcutter Bee	<i>Megachile fortis</i>	Untiered	SGIN
	A Leafcutter Bee	<i>Megachile mucorosa</i>	Untiered	SGIN
	A Leafcutter Bee	<i>Megachile rugifrons</i>	Untiered	SGIN
	A Nomia Bee	<i>Nomia universitatis</i>	Untiered	SGIN
	Simius' Roadside Skipper	<i>Notamblyscirtes simius</i>	Tier 2	Tier 1
	Blue Shining Mason Bee	<i>Osmia cyaneonitens</i>	Untiered	SGIN
	Juanita Sphinx	<i>Proserpinus juanita</i>	Untiered	SGIN
	Elusive Clubtail	<i>Stylurus notatus</i>	Tier 2	Tier 1
	Great Basin Grasshopper	<i>Trimerotropis sparsa</i>	Untiered	Tier 2
Mammals	Eastern Gray Squirrel	<i>Sciurus carolinensis</i>	Tier 2	Removed
	Plains Pocket Mouse	<i>Perognathus flavescens perniger</i>	Tier 1	SGIN
	Southern Bog Lemming	<i>Synaptomys cooperi</i>	Untiered	SGIN
	Spotted Ground Squirrel	<i>Xerospermophilus spilosoma obsoletus</i>	Untiered	SGIN
Mollusks	Black Sandshell	<i>Ligumia recta</i>	Untiered	SGIN
	Creeper	<i>Strophitus undulatus</i>	Untiered	Tier 1
	Deertoe	<i>Truncilla truncata</i>	Untiered	Tier 2
	Fatmucket	<i>Lampsilis siliquoidea</i>	Tier 2	Tier 1
	Lilliput	<i>Toxolasma parvum</i>	Untiered	SGIN
	Pimpleback	<i>Pustulosa pustulosa</i>	Tier 1	Tier 2
	Pink Heelsplitter	<i>Potamilus alatus</i>	Untiered	Tier 2
	Pondmussel	<i>Sagittunio subrostratus</i>	Tier 2	Tier 1
	Yellow Sandshell	<i>Lampsilis teres</i>	Tier 2	Tier 1
Plants	Nodding Wild Onion	<i>Allium cernuum</i>	Tier 2	Removed

	Perennial Bursage	<i>Ambrosia tomentosa</i>	Tier 2	Removed
	Prairie Broomweed	<i>Amphiachyris dracunculoides</i>	Tier 2	Removed
	Green Dragon	<i>Arisaema dracontium</i>	Tier 2	Removed
	Pale Indian-plantain	<i>Arnoglossum atriplicifolium</i>	Tier 2	Removed
	Woolly Milkweed	<i>Asclepias lanuginosa</i>	Untiered	Tier 1
	Ebony Spleenwort	<i>Asplenium platyneuron</i>	Tier 2	Removed
	Short's Milkvetch	<i>Astragalus shortianus</i>	Tier 1	Tier 2
			2018 Legacy Status	2025 Legacy Status
	Common Name	Scientific Name		
Plants	Short's Rock Cress	<i>Boechera dentata</i>	Tier 2	Removed
	Bearded Short-husk	<i>Brachyelytrum erectum</i>	Tier 2	Removed
	Cut-leaf Toothwort	<i>Cardamine concatenata</i>	Tier 2	Removed
	Bush's Sedge	<i>Carex bushii</i>	Tier 2	Removed
	Common Buttonbush	<i>Cephalanthus occidentalis</i>	Tier 2	Removed
	Pale Fumewort	<i>Corydalis favula</i>	Tier 2	Removed
	Plains Frostweed	<i>Crocianthemum bicknellii</i>	Tier 2	Removed
	Big-fruit Dodder	<i>Cuscuta umbrosa</i>	Tier 2	Removed
	Big-leaf Mullein-foxtail	<i>Dasistoma macrophylla</i>	Tier 2	Removed
	Dwarf Larkspur	<i>Delphinium tricornis</i>	Tier 2	Removed
	Wolf's Spikerush	<i>Eleocharis wolfii</i>	Tier 1	Tier 2
	Montana Wild-rye	<i>Elymus albicans</i>	Tier 2	Removed
	Tufted Fleabane	<i>Erigeron caespitosus</i>	Tier 2	Removed
	Early Blue-top Fleabane	<i>Erigeron vetensis</i>	Tier 2	Removed
	Gordon's Wild Buckwheat	<i>Eriogonum gordonii</i>	Tier 1	Tier 2
	Butternut	<i>Juglans cinerea</i>	Untiered	Tier 1
	Star Duckweed	<i>Lemna trisulca</i>	Untiered	Tier 2
	Spike-fescue	<i>Leucopoa kingii</i>	Tier 2	Removed
	Rocky Mountain Gayfeather	<i>Liatris ligulistylis</i>	Tier 2	Removed
	Thickspike Gayfeather	<i>Liatris pycnostachya</i> var. <i>pycnostachya</i>	Tier 2	Removed
	Matted Prickly Phlox	<i>Linanthus caespitosus</i>	Tier 1	Tier 2
	Dog Parsley	<i>Lomatium nuttallii</i>	Tier 1	Tier 2
	Ostrich Fern	<i>Matteuccia struthiopteris</i> var. <i>pennsylvanica</i>	Tier 2	Removed
	A moss	<i>Molendia ogalalensis</i>	Untiered	Tier 1
	Indian-pipe	<i>Monotropa uniflora</i>	Tier 2	Removed
	Cut-leaf Water-milfoil	<i>Myriophyllum pinnatum</i>	Tier 2	Removed
	Prickly Naiad	<i>Najas marina</i>	Tier 2	Removed
	American Lotus	<i>Nelumbo lutea</i>	Tier 2	Removed
	Fremont's Evening Primrose	<i>Oenothera macrocarpa</i> ssp. <i>fremontii</i>	Untiered	Tier 1
	Scorpion-weed	<i>Phacelia hastata</i>	Tier 2	Removed
	Sand Fame-flower	<i>Phemeranthus rugospermus</i>	Untiered	Tier 1

Water-thread Pondweed	<i>Potamogeton diversifolius</i>	Tier 2	Removed
Floating-leaved Pondweed	<i>Potamogeton natans</i>	Untiered	Tier 2
Saskatchewan Cinquefoil	<i>Potentilla effusa</i> var. <i>effusa</i>	Tier 2	Removed
Northern Dewberry	<i>Rubus flagellaris</i>	Tier 2	Removed
Southern Wild Senna	<i>Senna marilandica</i>	Tier 2	Removed
Hispid Hedge-nettle	<i>Stachys hispida</i>	Tier 2	Removed
Plains Cutleaf Violet	<i>Viola viarum</i>	Tier 2	Removed

	Common Name	Scientific Name	2018 Legacy Status	2025 Legacy Status
Reptiles	Common Lesser Earless Lizard	<i>Holbrookia maculata</i>	Untiered	SGIN
	Yellow Mud Turtle	<i>Kinosternon flavescens</i>	Untiered	SGIN
	Diamondback Water Snake	<i>Nerodia rhombifer</i>	Untiered	SGIN
	Great Plains Rat Snake	<i>Pantherophis emoryi</i>	Untiered	SGIN
	Dekay's Brownsnake	<i>Storeria dekayi</i>	Tier 2	Removed

Appendix 12: Tier I Species by Biologically Unique Landscape

	Tallgrass Prairie Ecoregion								Mixed-grass Prairie Ecoregion								Sandhills Ecoregion								Shortgrass Prairie Ecoregion								
	Elkhorn Confluence	Lower Platte River	Missouri River and Bluffs	Saline Wetlands	Sandstone Prairies	Southeast Prairies	Willow Creek		Central Loess Hills	Central Platte River	Keya Paha	Loess Canyons	Lower Loup Rivers	Platte Confluence	Rainwater Basin	Running Water		Cherry County Wetlands	Dismal River Headwaters	Elkhorn River Headwaters	Middle Niobrara	Sandhills Alkaline Lakes	Snake River	Upper Loup Rivers		Kimball Grasslands	North Platte River	Oglala Grasslands	Panhandle Prairies	Pine Ridge	Sandsage Prairies	Upper Niobrara River	Wildcat Hills
Amphibian																																	
Smallmouth Salamander		X	X		X	X																											
Birds																																	
Black-billed Cuckoo	X	X	X						X	X	X	X	X	X		X					X			X									
Black-billed Magpie	X						X					X								X							X	X	X	X	X	X	X
Black Tern																		X	X	X		X		X									
Brewer's Sparrow																										X		X	X	X		X	X
Buff-breasted Sandpiper															X	X																	
Burrowing Owl								X		X	X				X	X		X	X	X	X	X		X		X	X	X	X	X	X	X	X
Chestnut-collared Longspur										X																X		X	X				
Ferruginous Hawk																		X								X		X	X	X	X	X	X
Henslow's Sparrow					X	X			X						X																		

	Elkhorn Confluence	Lower Platte River	Missouri River and Bluffs	Saline Wetlands	Sandstone Prairies	Southeast Prairies	Willow Creek			Central Loess Hills	Central Platte River	Keya Paha	Loess Canyons	Lower Loup Rivers	Platte Confluence	Rainwater Basin	Running Water			Cherry County Wetlands	Dismal River Headwaters	Elkhorn River Headwaters	Middle Niobrara	Sandhills Alkaline Lakes	Snake River	Upper Loup Rivers			Kimball Grasslands	North Platte River	Ogala Grasslands	Panhandle Prairies	Pine Ridge	Sandsage Prairies	Upper Niobrara River	Wildcat Hills	
Interior Least Tern	X	X	X							X				X			X					X				X											
Loggerhead Shrike					X	X	X		X		X	X	X				X			X	X	X		X		X			X		X	X		X			
Long-billed Curlew															X					X	X		X	X		X				X	X				X	X	
Mountain Plover																														X							
Pinyon Jay																														X			X			X	
Piping Plover		X	X							X				X			X						X			X											
Thick-billed Longspur																														X		X	X				
Whooping Crane									X	X				X	X	X	X			X		X	X			X				X	X	X					
Wood Thrush		X	X			X											X																				
Crustaceans																																					
Ornate Fairy Shrimp																						X															
Potassium-loving Fairy Shrimp																								X													
Fish																																					
Blacknose Shiner												X								X						X										X	

	Elkhorn Confluence	Lower Platte River	Missouri River and Bluffs	Saline Wetlands	Sandstone Prairies	Southeast Prairies	Willow Creek		Central Loess Hills	Central Platte River	Keya Paha	Loess Canyons	Lower Loup Rivers	Platte Confluence	Rainwater Basin	Running Water		Cherry County Wetlands	Dismal River Headwaters	Elkhorn River Headwaters	Middle Niobrara	Sandhills Alkaline Lakes	Snake River	Upper Loup Rivers		Kimball Grasslands	North Platte River	Ogala Grasslands	Panhandle Prairies	Pine Ridge	Sandsage Prairies	Upper Niobrara River	Wildcat Hills
Finescale Dace											X		X	X				X	X	X		X	X						X			X	
Flathead Chub	X	X	X						X	X	X		X			X		X			X			X			X	X				X	
Lake Sturgeon		X	X										X																				
Northern Pearl Dace											X		X	X		X		X	X	X	X		X	X					X			X	
Northern Redbelly Dace									X		X			X				X	X		X		X	X					X			X	
Pallid Sturgeon		X	X													X																	
Plains Minnow	X	X	X	X		X			X	X	X		X	X	X	X		X		X				X			X	X			X		
Plains Topminnow		X	X				X		X	X	X		X	X		X		X	X	X	X	X	X	X		X	X		X		X	X	X
Shoal Chub	X	X	X	X					X	X			X							X				X									
Sicklefin Chub			X																														
Silver Chub	X	X	X	X		X			X	X			X			X				X				X									
Sturgeon Chub		X	X																														
Topeka Shiner																		X						X									
Western Silvery Minnow	X	X	X	X		X				X	X		X	X		X		X		X	X		X	X			X				X	X	

	Elkhorn Confluence	Lower Platte River	Missouri River and Bluffs	Saline Wetlands	Sandstone Prairies	Southeast Prairies	Willow Creek		Central Loess Hills	Central Platte River	Keya Paha	Loess Canyons	Lower Loup Rivers	Platte Confluence	Rainwater Basin	Running Water		Cherry County Wetlands	Dismal River Headwaters	Elkhorn River Headwaters	Middle Niobrara	Sandhills Alkaline Lakes	Snake River	Upper Loup Rivers		Kimball Grasslands	North Platte River	Oglala Grasslands	Panhandle Prairies	Pine Ridge	Sandsage Prairies	Upper Niobrara River	Wildcat Hills	
Insects																																		
American Burying Beetle											X	X			X	X		X		X	X			X								X		
Bucholz Black Dash	X						X									X				X														
Byssus Skipper					X	X																												
Colorado Rita Dotted Blue																										X								
Elusive Clubtail			X													X					X			X										
Fox Mayfly						X																										X		
Ghost Tiger Beetle			X											X				X	X	X				X							X			
Hourglass Drone Fly																		X					X							X				
Iowa Skipper			X		X	X				X	X			X	X	X					X			X										
Kohler's Fritillary																		X				X		X						X		X		
Lakota Mayfly															X																			
Large Marble																												X	X	X			X	X
Lichen Grasshopper																										X	X		X					X
Long-nosed Mayfly																																		

	Elkhorn Confluence	Lower Platte River	Missouri River and Bluffs	Saline Wetlands	Sandstone Prairies	Southeast Prairies	Willow Creek		Central Loess Hills	Central Platte River	Keya Paha	Loess Canyons	Lower Loup Rivers	Platte Confluence	Rainwater Basin	Running Water		Cherry County Wetlands	Dismal River Headwaters	Elkhorn River Headwaters	Middle Niobrara	Sandhills Alkaline Lakes	Snake River	Upper Loup Rivers		Kimball Grasslands	North Platte River	Ogala Grasslands	Panhandle Prairies	Pine Ridge	Sandsage Prairies	Upper Niobrara River	Wildcat Hills
Monarch	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Morrison's Bumble Bee																																	X
Mottled Duskywing			X															X		X										X			
Nebraska Fritillary	X	X		X						X			X							X													
Nine-spotted Ladybird Beetle																						X						X	X	X		X	X
Ottoo Skipper		X			X							X	X	X		X					X			X							X		
Pawnee Stonefly			X																													X	
Platte River Caddisfly	X	X								X			X	X						X				X									
Regal Fritillary	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Salt Creek Tiger Beetle				X																													
Sandy Tiger Beetle														X				X	X			X		X					X				
Simius Roadside-Skipper																												X	X	X			
Smoky-eyed Brown	X									X			X					X		X	X			X							X	X	
Southern Plains Bumble Bee		X	X	X	X				X	X			X		X			X			X	X				X		X	X	X		X	

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Suckley's Cuckoo Bumble Bee																													X	X			
Tawny Crescent																														X			
Two-lined Stonefly			X										X			X					X			X									
Two-spotted Skipper	X	X	X							X			X	X		X		X		X	X	X		X					X			X	
Variable Cuckoo Bumble Bee		X		X					X					X																			
Western Bumble Bee																												X	X	X			
Winnebago Mayfly																																	
Mammals																																	
Bailey's Eastern Woodrat											X										X		X									X	
Cheyenne Northern Pocket Gopher																										X							
Eastern Red Bat	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Fringed Myotis																										X		X		X			X
Hoary Bat	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X

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Little Brown Myotis		X	X			X										X				X							X	X	X	X		X	
Northern Long-eared Myotis		X	X	X	X	X										X				X				X						X		X	
Pierre Northern Pocket Gopher																												X		X			
Plains Spotted Skunk										X	X			X	X	X		X		X							X		X				X
Rocky Mountain Bighorn Sheep																													X				X
Silver-haired Bat	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Southern Flying Squirrel			X																														
Swift Fox																					X					X		X	X	X		X	X
Tricolored Bat		X	X	X	X	X										X				X				X									
Mollusks																																	
Creeper		X	X	X	X	X				X				X	X			X						X			X				X		
Fatmucket			X	X	X	X									X	X		X									X						X
Flat Floater			X																														
Niobrara Ambersnail														X																			

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Oxbow Snail																																	
Pistolgrip						X																											
Plain Pocketbook	X		X		X	X									X	X		X		X												X	
Pondmussel			X	X	X	X									X																		
Scaleshell Mussel			X																														
Yellow Sandshell	X		X	X	X	X																											
Reptiles																																	
Blanding's Turtle	X	X					X				X		X	X		X		X	X	X	X		X	X				X		X			
Glossy Snake																																X	
Red-bellied Snake										X																							
Sagebrush Lizard																													X				X
Timber Rattlesnake			X		X	X																											
Western Massasauga		X			X	X																											
Plants																																	
A moss																																	

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American Ginseng			X																														
Barr's Milkvetch																												X					
Blowout Penstemon										X								X	X	X	X	X		X					X			X	
Butternut			X																														
Colorado Butterfly Plant																										X							
Fremont’s Evening Primrose																																	
Hall's Bulrush																			X					X									
Large-spike Prairie-clover														X							X	X					X		X		X	X	
Meadow Lousewort																													X			X	
Missouri Sedge						X																											
Nodding-pogonia			X																														
Platte River Dodder																											X						
Prairie Moonwort											X										X												
Rocky Mountain Bulrush															X	X												X				X	

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Saltwort				X																													
Sand Fame-flower													X					X	X	X	X			X									
Sandhill Goosefoot																															X		
Small White Lady's Slipper		X					X				X		X							X	X			X									
Snow Trillium			X																														
Ute Ladies'-tresses																												X				X	
Western Prairie Fringed Orchid		X	X				X			X								X		X	X			X									
Woolly Milkweed			X		X	X			X	X	X				X	X		X	X	X	X			X							X		