GUIDE TO NEBRASKA'S WETLANDS

and their conservation needs

Nebraska
Game and Parks Commission

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and their conservation needs

Second Edition, 2005

Nebraska Game and Parks Commission
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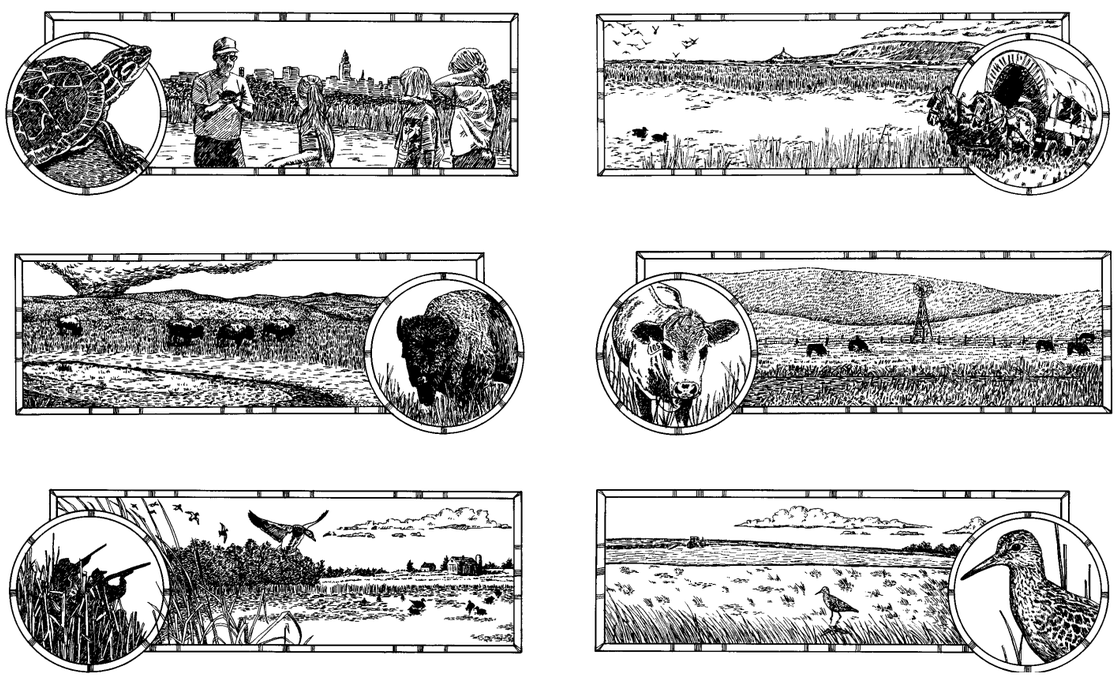
Funding provided by

Nebraska Game and Parks Commission

and

U.S. Environmental Protection Agency



Acknowledgments:

The following individuals served on the Wetland Education Steering Committee and provided invaluable oversight for this project: McKenzie Barry- Lower Platte South Natural Resources District; Betty Bricker- Holdrege Middle School; Diane Brown, Mark Danley, and Rosemary Thornton- Lincoln Public Schools; Penny Businga- Educational Service Unit 13; Lois Herbel- Cedar Canyon School; Sara Krug- Fontenelle Nature Center; Marian Langan- Audubon Nebraska; Brooke Levey- University of Nebraska- Lincoln, Cooperative Extension/ 4H; Jeanine Lackey, Karen Palazzolo, and Jeff Rawlinson- Nebraska Game and Parks Commission; Tom Taylor, Larry Long, and Jennifer Ousley- U.S. Environmental Protection Agency; Elbert Traylor- Nebraska Department of Environmental Quality; Joe Turco- Nebraska Educational Telecommunications; Rick Warhurst and Ryan Heiniger- Ducks Unlimited; and Jim Woodland- Nebraska Department of Education.

Much of the content of this document was built on information compiled by Dick Gersib and Randy Stutheit of the Nebraska Game and Parks Commission. Many of the references were compiled by Steve Gaul of the Nebraska Department of Natural Resources. Staff from the following agencies/organizations helped to review this document: Audubon Society, Ducks Unlimited, Nebraska Cattlemen, Nebraska Wildlife Federation, Pheasants Forever, Prairie Plains Resource Institute, Platte River Crane Trust, Sandhills Task Force, Rainwater Basin Joint Venture, The Nature Conservancy, Nebraska Department of Environmental Quality, Nebraska Department of Natural Resources, Nebraska Department of Roads, National Park Service, Natural Resources Conservation Service, Federal Highway Administration, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and the U.S. Fish and Wildlife Service.

Photos provided by the Nebraska Game and Parks Commission, Jon Farrar page 46 top left and Lowell Washburn (Iowa Department of Natural Resources) page 15.

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American White pelicans use many of Nebraska's wetlands.

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Sandhill cranes on a Platte River wet meadow.

Wetlands - a source of great interest, and at times conflict. Wetlands represent different things to different people. At times they're viewed as shallow, muddy nuisances while at other times they're viewed as wonderful, varied and productive assets. This is because wetlands take on many roles as part of a complex and dynamic system. Understanding wetlands and wetland issues requires understanding the complex and varying roles that wetlands can play. To aid in this understanding, this guide defines wetlands, discusses their importance and dynamics, identifies threats and losses, describes conservation programs, and takes an in-depth look at Nebraska's regional wetland complexes.

Great Blue Heron.

NEBRASKA'S WETLANDS

Nebraska's wetland resources are as diverse and dynamic as those of any state in the nation. They include marshes, lakes, river and stream backwaters, oxbows, wet meadows, fens, forested swamps, and seep areas. These wetlands vary greatly in nature and appearance due to physical features such as geographic location, water source and permanence, and chemical properties. Some wetlands hold water for only a few weeks or less during the spring while others never go completely dry. Many wetlands receive their water from groundwater aquifers while others are totally dependent on precipitation and runoff. And finally, the water chemistry of wetlands ranges from fresh to saline, and from acidic to basic. These descriptions identify the extremes of wetland characteristics. Nebraska's wetland resources possess these extremes and virtually every combination in between.

What Is a Wetland?

There has been a tremendous amount of controversy about how to define wetlands. Much of this controversy is related to the fact that wetlands are regulated by several laws, and to apply these laws, the wetland boundary needs to be determined (a process termed wetland delineation). Delineation of wetlands is difficult because they occupy a transitional zone on the landscape, and frequently become dry.

The State of Nebraska has adopted the federal definition that wetlands are "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (USACE 1987).

Wetland delineation in Nebraska is currently based on the 1987 Corps of Engineers Wetlands Delineation Manual (USACE 1987). This manual uses three diagnostic environmental characteristics to delineate wetlands. The three characteristics are:

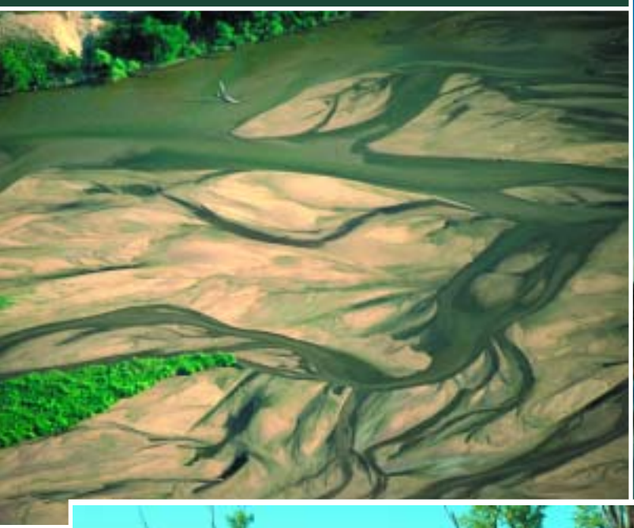
- Vegetation - defined by a prevalence of hydric (water-loving) plants adapted to growing in inundated or saturated conditions.
- Hydric soils - the presence of soils that developed under inundated or saturated conditions that limit oxygen (anaerobic conditions).
- Hydrology - defined by inundation or saturation by water at some time during the growing season (the time when plants are actively growing).

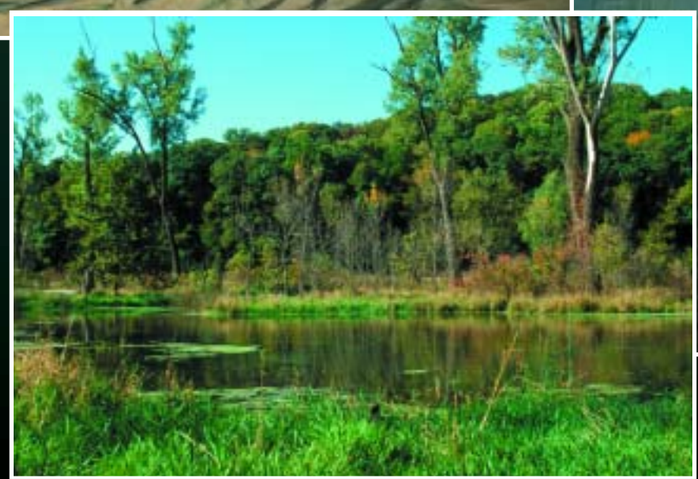
Wetlands occupy a transitional zone on the landscape. They are characterized by the presence of water loving plants, hydric soils, and water even if only for a short period of time.

NEBRASKA'S WETLANDS

Nebraska's wetland resources are as diverse and dynamic as those of any state in the nation. They include marshes, lakes, river and stream backwaters, oxbows, wet meadows, fens, forested swamps, and seep areas.

(Below top) Platte River, Buffalo County. (Below bottom) forested Missouri River wetland, Sarpy County. (Right top) farmed southwest playa, Keith County. (Right center) sandhills lake and marsh, Sheridan County. (Far right top) hayed Platte River wet meadow, Lincoln County. (Far right center) wetland fringe along a stream, Jefferson County. (Far right bottom) Eastern Saline wetland mud flat, Lancaster County.





Functions and Values:
Why Are Wetlands Important?

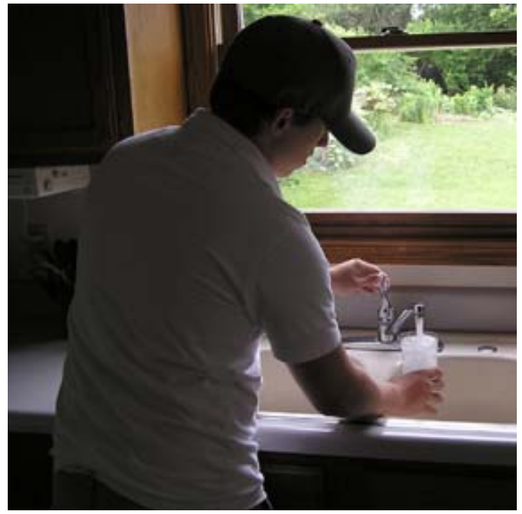
Why should we care that Nebraska has lost some of its wetland resources? And why are some agencies now trying to protect wetlands when not long ago they were paying to drain them? Two main factors have contributed to this change in approach and attitude. The first is that our knowledge of how wetlands function has increased dramatically in the past few decades. Wetlands are now known to serve numerous functions, many of which have value to society as a whole. Secondly, as wetland losses increased, the system that was dependent on these functions began to break down. Put another way, the loss of a small percentage of a region's wetlands probably had little effect, but as losses increased, a threshold was crossed and negative impacts began to occur. Examples include declining wildlife diversity and abundance, increased flooding that has occurred in some watersheds, and deteriorating water quality that has become a problem in many regions. This is why there is now a recognized need for wetlands conservation in Nebraska.

There is a great deal of confusion generated by the term "functions and values". Functions are defined as the things that a wetland does and value is the worth of that function to either an individual or society. Based on these definitions, functions can be measured and documented, while values may vary from person to person. For example, we can measure the function that a wetland serves by holding water and reducing downstream flooding. This may have no value to a person living outside of the watershed, but a great deal of value to a downstream landowner or society as a whole which pays indirectly for the costs of flooding. Ascribing and quantifying values is extremely complex (Leitch and Hovde 1996, Hubbard 1989) and is beyond the scope of this guide.

It is important to note that not all wetlands serve all the functions listed below. Nor will a given wetland necessarily serve these functions equally within a year or over a series of years.

Some of the recognized functions of wetlands include:

Improving Water Quality - When most people consider wetlands, the last thing they think about is clean water. Wetlands can produce foul smelling gas (rotten egg odor) and contain numerous floating plants, algae, bacteria, bugs, and other animals that hardly make you want to drink the water. However, due to these plants and animals, and the chemical processes that produce the smelly gas, wetlands are a great natural cleanser of many common water pollutants. Wetlands act as a filter, slowing water down and allowing sediment and many pollutants to settle out. As the water slowly moves through the wetland, a series of chemical transformations take place that tie-up or alter a variety of pollutants. The net result is that, as a general rule, the water leaving a wetland is of higher quality than the water entering the wetland. In fact, studies have shown that up to 80% of the nitrate pollution entering wetlands is converted to harmless nitrogen gas by the time the water exits the wetland. Wetlands are increasingly being used for water pollution control and waste water treatment due to their water cleansing functions.



Wetlands assist in improving water quality and supply.

Providing Habitat for Wildlife, Fish, and Unusual Plants - Wetlands are among the most productive biological systems known. They produce more plant and animal life per acre than cropland, prairies, or forests. This high level of productivity makes wetlands important habitat for an abundance of different kinds of wildlife and fish. Wetlands provide migration, breeding, nesting, and feeding habitat for millions of waterfowl, shorebirds, songbirds, and other wildlife. Wetlands are home to thousands of

Wetlands Provide the Following Functions

- Improving Water Quality
- Providing Habitat for Wildlife, Fish, and Unusual Plants
- Reducing Flooding and Soil Erosion
- Supplying Water
- Producing Food and Fiber
- Providing Recreational and Educational Opportunities

Number of species of plants and animals using Nebraska wetlands.

	Plants	Amphibians	Reptiles	Birds	Mammals
Number of species that use Nebraska wetlands[1]	990	13	18	176	29
Number of species occurring in Nebraska	2,000	13	47	352	80
Percent of all Nebraska species that use wetlands	50%	100%	38%	50%	36%

[1] *Estimate based on use of wetlands as important habitat at some point in the species' life cycle.*

Wetlands provide important habitat for wildlife, including 70 percent of the state's endangered and threatened species such as these whooping cranes.

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different plant and animal species including many that are threatened or endangered. Nine of Nebraska's 12 federal endangered and threatened species use wetland areas, as do 19 of Nebraska's 27 state-listed endangered and threatened species. Many wetlands provide important feeding and rearing habitat for fish. All the state's amphibians, as well as many reptiles and invertebrates, use wetlands. Wetlands also provide important winter cover for pheasants, deer and other resident wildlife.

Nebraska is unique in that it possesses three major wetland complexes that are of international importance to wildlife. The Rainwater Basin area in south-central Nebraska provides critical spring staging and migration habitat for waterfowl, shorebirds, wading birds and endangered species. Immediately north of this area is the Central Platte River which provides critical migration habitat for the endangered whooping crane, spring staging habitat for 80% of all North American sandhill cranes, breeding habitat for threatened and endangered species, and migration habitat for waterfowl and other waterbirds. Finally, the Sandhills wetland complex in north-central Nebraska is recognized as providing important breeding and migration habitat for waterfowl, shorebirds, and endangered species.

Reducing Flooding and Soil Erosion - Many wetlands act as a sponge by storing water temporarily and allowing it to percolate into the ground, evaporate, or be slowly released back into a stream or river. This temporary storage reduces flooding after a storm. Wetlands also slow the overland flow of water, reducing downstream soil erosion.

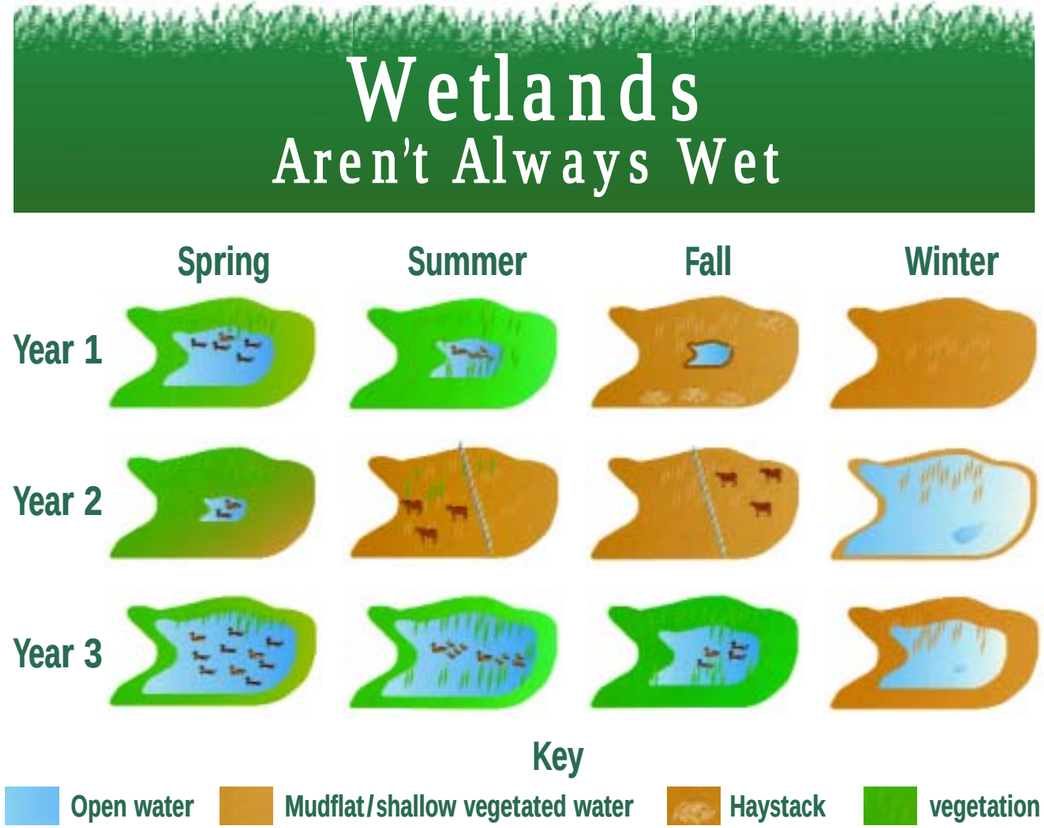
Supplying Water - Wetlands store rainwater and runoff. Many wetlands slowly release water into the ground to recharge groundwater. Some wetlands also slowly release water to streams and rivers, helping to maintain stream flows. These water supply functions can benefit municipal and agricultural water users, and provide water for livestock.

Producing Food and Fiber - Some of our most productive cropland is located on completely drained wetland soils. Many of the same factors that make drained wetlands productive for agriculture make existing wetland areas productive for food and fiber. These functions are already recognized by many in agriculture who tap the capability of existing wetlands to produce hay and

Wetlands are important for agriculture, recreation and education.

forage for livestock. Less conventional uses are also possible, such as raising fish, crayfish and frogs; growing alternative crops like wild rice, and new strains of crops adapted to wetlands; or using wetland plants for biomass or ethanol production (USEPA 1991).

Providing Recreational and Educational Opportunities - Wetlands provide numerous recreational opportunities, including hunting, trapping, wildlife watching, photography, and enjoyment of the serenity that a wetland can offer. Anglers also benefit from wetlands because many species of fish use these areas for spawning, hiding, or because the foods used by the fish are produced in wetlands. Wetlands provide an excellent setting for environmental education because of the many unusual life forms present and because they are unique features of the landscape. Wetlands also serve a heritage function because they represent a landscape as it once appeared in the past.



Temporary and seasonally flooded wetlands do not contain water year-round. They undergo a wet/dry cycle that is essential to their continued productivity and functioning. These wetlands provide valuable wildlife habitat, groundwater recharge capabilities, water storage (often reducing downstream flooding) and other important functions.

Small, shallow wetlands warm up quickly in the spring and soon teem with insects and other invertebrates that ducks and shorebirds can easily reach.

The productivity of temporary and seasonal wetlands is maintained by the wet/dry cycle and disturbances such as grazing and fire. During dry periods, some wetland plants will start growing. Many of these plants produce seeds or tubers sought after by water birds and other wildlife.

Invertebrates found in these wetlands are specially adapted to the wet/dry cycle. They reproduce quickly and profusely once the water returns. Wetland wildlife are well adapted to these changes.

Based on original chart courtesy of Ducks Unlimited and Natural Resources Conservation Service

Wetland Dynamics

Wetlands are highly dynamic and productive systems. Wetlands produce more plant and animal life per unit area than woodlands, prairies, or cropland. Because wetlands occupy a continuum between wet and dry conditions, they undergo a variety of unique changes both seasonally and from year-to-year. Wetlands become dry and then flood, are burned by prairie fires, and are subjected to other disturbances such as grazing. These are natural processes that don't harm the wetland. In fact, it is the interaction of all of these dynamic processes that make wetlands so productive. If some of these processes are altered, for example, by maintaining a constant water-level, the wetland will actually begin to deteriorate. Other factors that can cause the wetland to deteriorate are human-induced factors such as permanent drainage, water diversion,

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sedimentation from erosion, and filling with soil, concrete, or trash.

Wetland Restoration and Management

Conducting wetland restoration and management activities requires a detailed understanding of site-specific soils, engineering, hydrologic, and biologic issues that are too extensive to address within this guide. To obtain more information, please check the publications on restoration and management that are listed in the General References section near the back of this guide. In addition, prior to undertaking a restoration or management project, please contact your local Nebraska Game and Parks district office (see map on page 56) to obtain help.

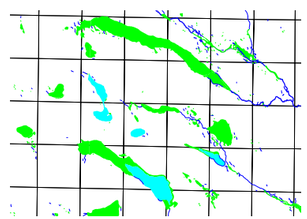
Wetland Classification

Numerous classification systems have been developed for wetlands. The one most commonly used today is the Cowardin system (Cowardin et al. 1979). This is a hierarchical system that classifies wetlands according to system, plant community and substrate, water regime, water chemistry, and numerous special modifiers such as the presence of dikes, drainage, and excavations. In many cases portions of the same wetland can be classified differently.

- Systems - The three wetland systems that occur in Nebraska are palustrine, lacustrine, and riverine. Palustrine systems usually are marshes and are dominated by vegetation. Lacustrine systems are lakes, usually deeper than 6.6 feet. Riverine systems are rivers and streams that flow in a defined channel.
- Water Regime - Water regime describes the duration and timing of inundation or saturation in a wetland. In Nebraska, most palustrine wetlands are of the temporarily, seasonally, or semipermanently-flooded water regime. Temporarily-flooded wetlands contain water for brief periods, often only a few weeks, during the growing season. Seasonally-flooded wetlands have water present for extended periods during the growing season, but they tend to dry up by the end of the season in most years. Semipermanently-flooded wetlands have water in them throughout the year and only occasionally dry up.

Wetland Inventories and Maps

Many different techniques have been used to inventory the past and current number and acreage of wetlands, and to track the conversion or loss of wetlands in Nebraska. Because of this, the numbers derived statewide or within a complex are not always in agreement, and care needs to be taken when interpreting these numbers. Nevertheless, these numbers are useful in examining the major, long-term trends in wetland numbers and acreage in Nebraska.

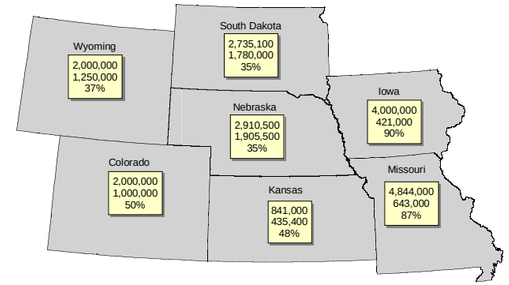


Wetlands are present in every county in Nebraska. This map shows wetlands identified by the National Wetland Inventory for a portion of Brown County. The black lines show square miles. Lakes are in light blue, marshes and wet meadows in green and streams in dark blue.

The most complete wetland inventory for Nebraska was conducted by the National Wetlands Inventory (NWI) of the U.S. Fish and Wildlife Service. NWI produced maps that depict wetlands by the Cowardin classification (Cowardin et al. 1979). They are an excellent tool for locating wetlands and determining wetland types but they are not delineation maps. The maps were produced from aerial photographs taken in the early 1980s, so some inaccuracies are present in the mapping. NWI maps for Nebraska can be ordered by calling (402) 472-7523. Digital maps are available for much of the state and can be accessed via the internet at http://www.nwi.fws.gov/.

Statewide Wetland Resources

At the time of statehood in 1867, Nebraska contained an estimated 2,910,500 acres of wetlands covering about 6% of the state (Dahl 1990). Through much of the state's history, wetlands were viewed as an impediment to transportation, agriculture, and development. The federal government actively encouraged the conversion of wetland areas to other uses through



Estimated acres of wetlands in Nebraska and surrounding states in 1780 (top numbers) and 1980 (middle numbers), and percent loss (bottom numbers). Source - Dahl 1990.

land give-aways, direct financial assistance, technical assistance, crop subsidies, and tax incentives. Wetlands have been impacted directly by filling, ditching, tiling, digging concentration pits, channelization, and declining water tables, and indirectly by changes in the surrounding uplands that caused increased sedimentation or the diversion of surface runoff away from wetlands. Wetlands and water areas were also created in some regions due to the construction of farm and livestock ponds, and locally rising water tables due to irrigation canal and reservoir seepage. However, the net result of all of these activities statewide was a reduction in wetlands by an estimated 35%, to 1,905,500 acres covering only 3.9% of the state (Dahl 1990). The destruction of wetlands was much higher in some regions of the state, but the statewide figure is buffered by the large wetland resource still remaining in the Sandhills. Temporarily-flooded and seasonally-flooded wetlands were lost at the highest rate throughout the state, and much of this acreage was not compensated for by the construction of lakes and ponds. Most states surrounding Nebraska have lost a greater percentage of their wetlands (Dahl 1990).

Many organizations and agencies have put a great deal of effort into conserving and managing some outstanding examples of Nebraska's wetland resources. These entities have acquired, or in other ways protected, approximately 50,000 acres of wetlands in Nebraska; however, this represents less than 3% of the remaining wetlands in the state. Examples of some public areas to visit are provided in the section entitled Nebraska's Regional Wetland Complexes. A statewide list of public Wildlife Management Areas, many of which contain wetlands, is available from the Nebraska Game and Parks Commission.

Wetland Conservation Efforts

It is beyond the scope of this publication to deal in-depth with all of the wetland conservation efforts underway in Nebraska. Listed below are statewide initiatives, while regional initiatives are covered in the respective sections under Nebraska's Regional Wetland Complexes.

Wetland Restoration, Enhancement, and Management Assistance - Programs are available to assist landowners with the restoration, enhancement, and management of their wetland areas. These programs provide up to 100% cost-share and are flexible enough to meet the needs of most landowners. For assistance or additional information, contact your nearest Nebraska Game and Parks Commission office or the headquarters office at P.O. Box 30370, Lincoln, NE 68503, (402) 471-5436. The U.S. Fish and Wildlife Service or your local Natural Resources Conservation Service (formerly SCS) office can also provide assistance.

Acquisition - Several agencies have programs to acquire wetlands, on a willing seller-willing buyer basis, by fee title (e.g., state Wildlife Management Areas) or by easement (e.g., the Wetlands Reserve Program). Contact your nearest Nebraska Game and Parks Commission office, or the headquarters office, P.O. Box 30370, Lincoln, NE 68503, (402) 471-5436 or 5536. The U.S. Fish and Wildlife Service or your local Natural Resources Conservation Service (formerly SCS) office may also be able to help.

Water Quality Programs - Wetlands are incorporated into several water quality improvement programs. Contact the Nebraska Department of Environmental Quality, P.O. Box 98922, Lincoln, NE 68509, (402) 471-2875.

Protection - Several laws are in place to protect existing wetland areas and the functions that they provide. The federal Clean Water Act may require that a Section 404 permit be obtained from the U.S. Army Corps of Engineers prior to draining, filling, placing objects, or digging in a wetland or other water area. Contact the U.S. Army Corps of Engineers, 8901 South 154th St., Suite 1, Omaha, NE 68138, (402) 896-0723. The Department of Environmental Quality considers wetlands to be waters of the state and protects them from degradation (Nebraska Surface Water Quality Standards, Title 117). Contact the Nebraska

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Department of Environmental Quality, P.O. Box 98922, Lincoln, NE 68509, (402) 471-2875.

Landowners who receive federal farm program benefits need to follow the wetland rules contained in the Swampbuster provision of the federal Farm Bill in order to maintain their eligibility for benefits. This program is administered by the Natural Resources Conservation Service.

Outreach, Education, and Planning - A variety of outreach, education, and planning efforts address wetlands. Project WILD and Project WET provide teachers and school children with wildlife and wetland curricula materials. For Project WILD information contact the Nebraska Game and Parks Commission, P.O. Box 30370, Lincoln, NE 68503, (402) 471-5581. For Project Wet contact the University of Nebraska-Lincoln Cooperative Extension, 114 Ag. Hall, Lincoln, NE 68583-0700, (404) 472-1478). Additional outreach materials are available from the Wetland Program Manager, Nebraska Game and Parks Commission, P.O. Box 30370, Lincoln, NE 68503, (402) 471-5436.

Wetland Conservation Approaches

Because of the importance of wetlands, there is a need for continued conservation. This is especially important for some areas due to past wetland losses and continued threats to the wetlands. The following list provides some general statewide recommendations for wetland conservation. These approaches should be tailored to meet the unique needs of each regional wetland complex.

Protection - Since a vast majority of Nebraska's wetlands are in private ownership, the conservation of these areas requires understanding and meeting the unique needs of landowners. A variety of tools are already available to allow this to happen, but new ones also need to be developed.

There is a need to develop alternative ways to protect our remaining wetlands. These should include the use of easements to protect areas while allowing them to remain in private ownership, changes in the tax code that favor wetland protection, and seeking ways to help landowners generate income from their wetland areas.

In addition, efforts to acquire important wetland areas need to be continued. The Nebraska Game and Parks Commission gives wetlands top priority in their habitat acquisition program.

Finally, laws that protect existing wetlands, such as the Clean Water Act and Farm Bill, need to be maintained. However, it is important that these laws continue to recognize the complex dynamics of wetlands and the fact that not all wetlands serve the same functions. It is also important to continue to work with landowners in finding ways to make wetland protection compatible with their interests and needs.

Restoration - Simply protecting our remaining wetland areas will not be adequate to ensure the conservation of our wetland systems and the functions they provide. This is especially true for some wetland complexes where over 90% of the wetlands have been eliminated or severely degraded. Efforts to restore wetlands, both on public and private land, need to be increased.

Management - Given that wetlands are dynamic systems that were historically disturbed frequently, it may not be adequate to simply put a fence around a wetland and "walk away" from it. In the absence of natural processes and disturbances, wetlands need some management. Management might include water-level changes, tree removal, burning, controlled grazing and haying, and sediment removal. There is a need to provide management assistance, especially to private landowners.

Inventory - For many of Nebraska's wetland complexes, our knowledge of the number and distribution of wetlands is very limited. This is especially true for many of our riparian, or streamside, wetlands. Inventories need to be completed and/or analyzed for these areas. National Wetland Inventory maps for Nebraska are based on aerial photography from the early 1980's. This inventory is in need of updating.

Research - There is a need to obtain better information on how wetlands function. This is especially true for some of the lesser known wetland complexes in Nebraska.

Education - Wetlands will be conserved only if we all understand wetland functions and place value on them. Emphasis on, and support for, wetlands education must continue.

A wide variety of options are available to help restore and manage wetlands.

What You Can Do

If you are interested in helping to conserve wetland resources there are many ways to help:

- Purchase a Federal Migratory Bird Hunting and Conservation Stamp (duck stamp) and a Nebraska Habitat Stamp. Wetlands conservation is a high priority of the Nebraska Game and Parks Commission, and these efforts are funded through the sale of habitat stamps, and hunting, big game, fishing, and fur harvest permits. Funds raised by the sale of duck and habitat stamps all go into wildlife habitat projects. Some contributions to the Nebraska Game and Parks Commission's Nongame and Endangered Species Fund also go toward wetland projects.
- Join and support wetlands conservation groups.
- Volunteer to adopt a wetland area. There are many projects that could use your help.
- Participate in wetland restoration and management. If you own land, there are numerous programs available to help you with your wetland. If you don't own land, inform your friends and neighbors who do about these opportunities and encourage them to participate.
- Support wetlands conservation legislation, programs and proposals. Be active in policy decisions - your voice counts.
- Seek to incorporate wetlands conservation into city, county, and natural resources district planning.
- Report illegal wetland drainage. Many activities are allowed in wetlands; however, if you're uncertain, contact the U.S. Army Corps of Engineers at (402) 896-0723 and/or your local Natural Resources Conservation Service office.
- Learn more about wetlands and share your knowledge with others including school classes and youth groups.

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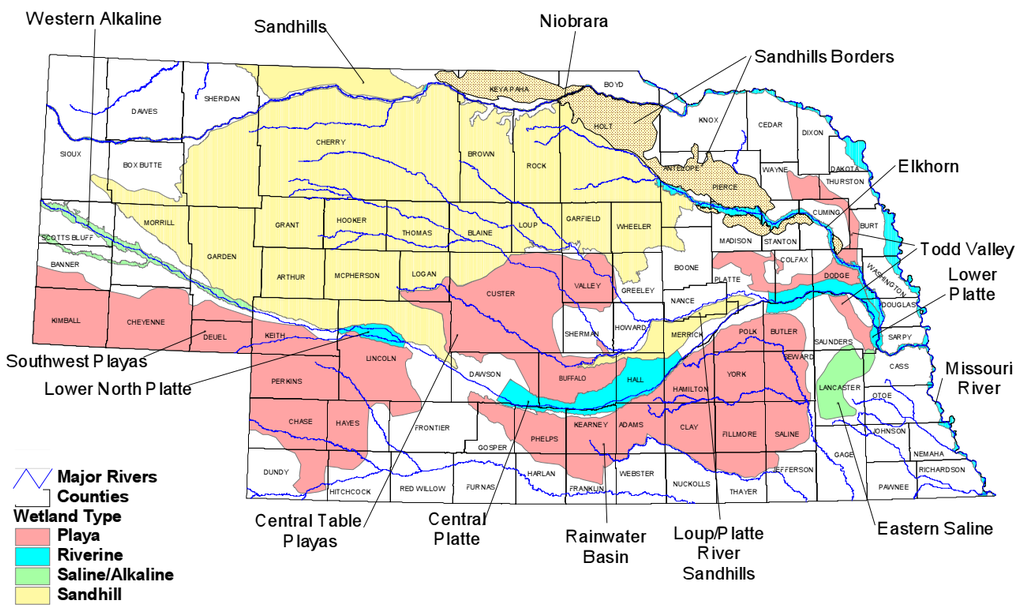


Nebraska's Regional Wetland Complexes.

NEBRASKA'S REGIONAL WETLAND COMPLEXES

Wetlands occur throughout Nebraska, but for many purposes it is useful to identify some of the larger wetland complexes in the state. A complex is considered a geographically definable concentration of wetlands that are similar in form and function. The basis for these complexes and much of the information was adapted from the Nebraska Game and Parks Commission's Nebraska Wetlands Priority Plan (Gersib 1991). These boundaries were refined, new boundaries added and wetland acreage and number statistics generated following procedures described by LaGrange et al. (2004).

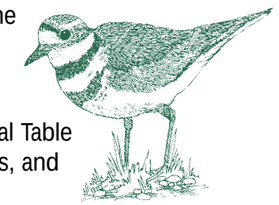
The wetland complexes are grouped into four categories: playas, sandhills, saline/alkaline, and riverine. Six of the complexes were ranked by Gersib (1991) in the Nebraska Wetlands Priority Plan, and the rankings were based on wetland functions, losses, and threats. The remaining eight complexes were not discussed or scored by Gersib (1991) and the information available for these complexes is considerably less.

It needs to be strongly emphasized that even if a wetland is not located within one of the complexes, this does not mean it is unimportant or does not perform valuable functions. There are numerous wetlands, especially along Nebraska's many streams and rivers, that are important components of the ecosystem.

Forested streamside wetland.

PLAYA WETLANDS

Playa wetlands are wind-formed, nearly circular depressions located in semi-arid areas. They have a clay layer in the soil under the wetland that slows runoff water from seeping into the ground. This clay layer was formed by water movement over thousands of years. Most playas are not directly connected to groundwater. Playa wetlands are located throughout the northwest three-fourths of the state, except in the Sandhills. The major playa complexes in Nebraska include the Rainwater Basins, Central Table Playas, Southwest Playas, and the Todd Valley.



Rainwater Basin

Profile

The Rainwater Basin complex was named for the abundant natural wetlands that formed where clay-bottomed depressions catch and hold rain and runoff water. The landscape of the complex is characterized by flat to gently rolling plains formed by deep deposits of loess (wind blown) silt-loam soil. The wetlands were formed by wind action and tend to have a northeast to southwest orientation. There frequently is a hill located immediately south or southeast of the wetland where the windblown loess was deposited.

Acres of wetlands by complex

Complex Name	Estimated wetland acres remaining[1]	Status[2]
Rainwater Basin	34,103	Endangered
Central Table Playas	7,317	
Southwest Playas	21,680	
Todd Valley	2,662	Endangered
Sandhills	369,606	
Loup/Platte River Sandhills	8,174	
Eastern Saline	3,244	Endangered
Western Alkaline	10,703	
Central Platte	40,761	Endangered
Lower North Platte	15,708	Endangered
Lower Platte	33,422	Endangered
Missouri River	61,430	Endangered
Elkhorn	26,396	
Niobrara	30,633	

[1] *Based on analysis of National Wetland Inventory Data (LaGrange et al. 2005).*

[2] *Based on past losses and projected future threats. The other complexes face threats but are not considered endangered.*

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Rainwater basin wetland in York County.

Surface water drainage in the region is poorly developed resulting in numerous closed watersheds draining into these wetlands. Most of the wetlands in this region do not receive groundwater inflow. Wetlands range in size from less than one acre to over one thousand acres.

Loss and Threats

Original soil survey maps from the early 1900s indicate that approximately 4,000 major wetlands totaling nearly 100,000 acres were present at the time of settlement. Schildman et al. (1984) estimated that less than 10 percent (374) of the original major wetlands and 22 percent (20,942) of the original wetland acres identified on early soil surveys remained in 1982. This trend study did not attempt to estimate the quantity and quality of smaller wetlands that were not identified on early soil surveys. However, because small wetlands are more vulnerable to destruction, it is likely that the proportion of loss documented by Shildman for larger wetlands is even greater for the smaller wetlands.

Using National Wetland Inventory (NWI) digital data and recent soil survey maps, a multi-agency wetland team in 1990 identified 34,103 acres of Rainwater Basin wetlands remaining (Raines et al. 1990), and of these only 28,260 acres were naturally occurring palustrine basins (Smith and Higgins 1990). These studies indicated that palustrine (marsh-like) emergent wetlands were decreasing, and virtually all remaining wetlands have been degraded in some fashion. Rainwater Basin wetlands were identified by the U.S. Fish and Wildlife Service as one of nine areas in the U.S. of critical concern for wetland losses (Tiner 1984).

Rainwater Basin wetlands were given the highest ranking, a priority 1, in the Nebraska Wetlands Priority Plan (Gersib 1991). The remaining wetland resources of the Rainwater Basin complex continue to face numerous threats, mostly related to conversion to cropland. Rainwater Basin wetlands face the direct threat of elimination by drainage and/or filling. The construction of concentration pits (also called dugouts or reuse pits) is common and threatens the functions of wetlands by converting shallow productive water spread over a large area into a smaller, deep and less productive water pit. Water pollution, especially sediment, can seriously reduce the functions of Rainwater Basin wetlands. Additionally, nearly all Rainwater Basin wetlands are threatened by changes to their watershed that divert water away from wetlands or concentrate upland runoff water into concentration pits. Of greatest concern is the cumulative impact of all of these threats that cause shallow wetlands to lose a few inches of water and become dry uplands.

The spread of an aggressive cultivar of reed canary grass *(Phalaris arundinacea)* is a major threat. Reed canary grass forms dense, uniform stands in wetlands and provides minimal habitat for water birds. The spread of purple loosestrife *(Lythrum salicaria)* is an additional threat. Purple loosestrife is an introduced plant of little value to wildlife that out-competes desirable native plants. No information is available on the extent of purple loosestrife abundance or distribution throughout the Rainwater Basin complex; however it has been observed in a few Basins wetlands and along the Platte River.

Functions and Values

Rainwater Basin wetlands are most noted for their importance to waterfowl, especially during the spring migration (Gersib et al. 1992, Gersib et al. 1989(a), U.S. Fish and Wildlife Service and Canadian Wildlife Service 1986). They host seven to fourteen million spring-migrating ducks and geese annually, providing the nutrient reserves necessary for migration and reproduction further to the north (M. Vrtiska, Nebraska Game and Parks, pers. comm.). Approximately 90% of the mid-continent population of greater white-fronted geese, 50% of the mid-continent population of lesser snow geese, 50% of the mid-continent population of mallards and 30% of the continent population of northern pintails use the Basins during spring migration. In some years the Basins also produce substantial numbers of ducks (Evans and Wolfe 1967). Over 257 species of birds have been recorded in the Rainwater Basin and 131 species may breed there (Mollhoff, 2001). Recent surveys have identified that a minimum of 200,000-300,000 shorebirds representing 34 different species migrate through the Basins during the spring (Adrian Farmer, USGS, Pers. Comm). Thirty-four species of waterbirds including herons, egrets, rails, terns and gulls have been observed in the Rainwater Basin. These wetlands are regularly used by the federally endangered whooping crane, the threatened bald eagle and the threatened piping plover.

Rainwater Basin wetlands provide water quality functions in the form of flood storage, nutrient retention, and sediment trapping (Gersib et al. 1989(b)). Because of the impermeable clay pan characteristic of Rainwater Basins and water table elevations that lie more than 50 feet below the wetlands, groundwater discharge does not normally occur. One exception occurs in Phelps County where Platte River irrigation water has

> Rainwater Basin wetlands are internationally recognized for their importance to millions of spring migrating water birds.

30% of the continental population of Northern Pintails use the Rainwater Basin during spring migration. Mallards are also pictured.

resulted in groundwater discharges into some basins (Gersib et al. 1989(b)). Groundwater recharge has not been measured in the Basins but does occur in some other playa systems.

Nearly all Rainwater Basin wetlands provide for recreation activities, particularly hunting and fur harvesting. The public is showing increased interest in using Rainwater Basin wetlands for other recreation such as bird watching and nature photography.

Select Public Use Areas

This is not a complete listing of public areas but instead is a list of representative areas that are geographically dispersed and accessible

- Cottonwood Waterfowl Production Area (WPA), 2 miles W., 1 miles N. of Bertrand, Phelps Co.
- Sacramento Wildlife Management Area (WMA), 2 miles W. of Wilcox, Phelps Co.
- Lake Seldom, ½ mile south of Holdrege, Phelps Co.
- Funk WPA, 1 mile N. of Funk, Phelps Co.
- Gleason WPA, 4 miles S., 4 miles W. of Minden, Kearney Co.
- Jensen WPA, 6 miles N. of Campbell, Kearney Co.
- Harvard WPA, 3 miles W. of Harvard, Clay Co.
- Springer WPA, 2 miles S., 7miles W. of Aurora, Hamilton Co.
- Kissinger WMA, 1 mile N. of Fairfield, Clay Co.
- Massie WPA, 3 miles S. of Clay Center, Clay Co.
- Pintail WMA, 5 miles S., 2 miles E. of Aurora, Hamilton Co.
- Hultine WPA, 6 miles E. of Harvard, Clay Co.
- Eckhardt WPA, 4 miles N., 3 miles W. of Ong, Clay Co.
- Mallard Haven WPA, 2 miles N of Shickley, Fillmore Co.
- Rauscher WPA 1 mile S., 4 miles E. of Sutton, Fillmore, Co.
- Kirkpatrick Basin North WMA, 4 miles W., 2 miles S. of York, York Co.
- Sinninger WPA, 2 miles S., 3 miles E. of McCool Junction, York Co.
- Father Hupp WMA, 2 miles W. of Bruning, Thayer Co.
- North Lake Basin WMA, 1 mile N. of Utica, Seward Co.

Conservation Programs and Contacts

Rainwater Basin Joint Venture - The Rainwater Basin Joint Venture was established in 1991 as a component of the North American Waterfowl Management Plan. It involves numerous partner agencies, organizations and individuals. Its objectives are to: 1) protect, restore, and create an additional 25,000 wetland acres, plus 25,000 acres of adjacent uplands; 2) provide reliable water sources for a minimum of 1/3 of all protected wetland acres to assure sufficient water quantity, quality, and distribution to meet migratory waterfowl and waterbird needs; and 3) develop and implement wetland enhancement strategies to optimize those values wetlands provide to waterfowl, endangered species, and other waterbirds. Participation in acquisition and private lands projects is strictly voluntary. Contact the Rainwater Basin Joint Venture Coordinator, 2550 N. Diers Ave., Suite L, Grand Island, NE 68803, (308) 382-8112.

Other contacts include the Nebraska Game and Parks Commission District Office in Kearney (308) 865-5310 and the U.S. Fish and Wildlife Service office in Kearney (308) 236-5015.

Central Table Playas

Profile

Central Table Playa wetlands are situated on relatively flat, loess soil tablelands surrounded by a landscape that is highly dissected by drainages. The largest cluster of wetlands is located near the town of Arnold in Custer County, but similar wetlands are scattered in some of the surrounding counties. A particularly large wetland basin located 11 miles east of Arnold has been the source of much speculation that its formation was caused by meteorite impact. However, recent investigations suggest it is of wind-formed origin, similar to other playa wetlands (Flowerday 2001). Central Table Playas receive water from runoff and are small (mostly less than 5 acres), temporarily

and seasonally-flooded wetlands. The complex may represent an extension of the Southwest Playas east toward the Rainwater Basin and Todd Valley complexes. The wetlands in this complex are possibly remnants of a larger complex of wetlands that was naturally eroded, breached and drained by streams. It's unknown why this area has a more developed natural drainage pattern than the other complexes.

Loss and Threats

Losses and threats to the wetlands in this complex are less well known than for many other complexes in the state. Casual observation indicates that the loss of these wetlands falls somewhere between the loss levels of the Southwest Playas and the Rainwater Basin. Some of the wetlands have been modified by concentration pits or drained by drainage ditches. In some locations, the hydrology of the watershed has been altered by the placement of terraces and diversions that reduces the amount of water entering the wetlands. Most of the Central Table Playas are farmed as conditions allow.

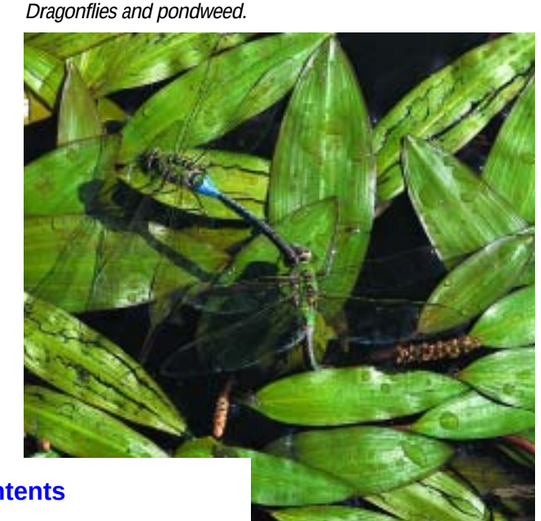
Functions and Values

Our understanding of the functions and values of the Central Table Playa wetlands is limited by the lack of information. The wetlands are often visited by endangered whooping cranes during migration. These wetlands also provide habitat for migrating waterbirds, including waterfowl, shorebirds, and wading birds.

Select Public Use Areas.

None

Dragonflies and pondweed.



Conservation Programs and Contacts

Contact the Nebraska Game and Parks Commission District Office in North Platte (308) 535-8025.

Southwest Playas

Profile

The playa wetlands of southwest Nebraska occupy small clay-lined depressions on nearly flat tablelands of loess soil. These freshwater wetlands receive water from runoff and are small (mostly less than 5 acres), temporarily and seasonally-flooded wetlands. Most have no natural outlet for water. In most years these wetlands dry early enough in the growing season to be farmed. Southwest Playa wetlands are similar to Rainwater Basin wetlands farther east, except that the Rainwater Basin complex receives greater rainfall, and the wetlands there tend to be larger.

Loss and Threats

Due to the small amount of rainfall received (16-18 inches per year) in the Southwest Playa region, there has been less drainage of these wetlands than has occurred in many other complexes. Some of the wetlands are drained into concentration pits or road ditches, but most simply dry up naturally and are farmed. Wheat is the dominant crop in the area, but corn and even soybean acreage has been increasing. In some locations, the hydrology of the watershed has been altered by the placement of terraces that reduce the amount of water entering the wetlands. These terraces also reduce the amount of eroded soil entering the wetlands. Since eroded soil filling the wetlands is an added threat to the Playas, soil erosion treatments are needed in the watershed of these wetlands. However, care needs to be taken to ensure that the erosion treatments do not reduce the wetland's water source.

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Ring-necked pheasants often seek out wetlands for cover.

Aerial of Southwest Playas in cropland, Perkins County.

Northern Cricket Frog.

Functions and Values

Our understanding of the functions and values of the Southwest Playa wetlands is limited. Casual observations indicate that these wetlands provide important habitat for migrating waterfowl and shorebirds, and cover for pheasants. These water areas are especially important to wildlife in the dry High Plains region of the United States where wetlands are often scarce.

Select Public Use Areas

None

Conservation Programs and Contacts

The Playa Lakes Joint Venture is a multi-state partnership for wetland and bird conservation that covers portions of western Nebraska. Contact the Playa Lakes Joint Venture Coordinator, 103 East Simpson Street, LaFayette, CO 80026, (303) 926-0777, or contact the Nebraska Game and Parks Commission District Office in North Platte (308) 535-8025.

Todd Valley

Profile

This complex is split into two regions. The region south of the Platte River is located in an ancient valley of the Platte River (termed the Todd Valley) that runs northwest to southeast through part of Saunders County (Lueninghoener 1947). The valley has partially filled with sand deposits and fine, wind-blown loess soils after the river moved to its present location. The region north of the Platte River is located on an ancient floodplain terrace between the Platte River and Shell Creek and along Logan Creek. Todd Valley wetlands occupy small, clay-lined, closed depressions located in loess soils. They are mostly fresh-water, seasonally and temporarily-flooded wetlands that receive most of their water from runoff.

Loss and Threats

Losses within this wetland complex have not been quantified. However, examination of soil maps and wetland maps, combined with limited site visits, suggest that many Todd Valley wetlands have been altered or eliminated. These losses have been caused by concentration pits, drainage and road ditches, tile lines, and in some areas by agricultural drainage wells that drain water into the underlying sand layers. The principal threat facing Todd Valley wetlands is continued conversion to agricultural production.

Functions and Values

Todd Valley wetlands provide functions similar to those of Rainwater Basin wetlands. Since the individual wetlands tend to be smaller than Rainwater Basin wetlands, and the total complex is smaller in geographic extent, they don't attract concentrations of migratory waterbirds as large as the Rainwater Basin wetlands. Little is known about the hydrologic functions of the Todd Valley wetlands.

Select Public Use Areas.

- Wilkinson WMA, 2 miles south of Platte Center.

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Conservation Programs and Contacts

Todd Valley Wetland Foundation, P.O. Box 759, Columbus, NE 69602-0749. Other contacts include the Nebraska Game and Parks Commission District Office in Lincoln (402) 471-5561 or Norfolk (402) 370-3374.

SANDHILL WETLANDS

These wetlands are formed in depressions in sandhill areas where groundwater intercepts the surface of the land. The most notable complex is the Sandhills, a 20,000 square mile area containing over 1 million wetland acres. The other complex is the Loup/Platte River Sandhills. Additionally, sandhill type wetlands are located in southwest Nebraska, in the Sandhills Borders area along the Elkhorn and Niobrara rivers, and in scattered pockets south of the Platte River.

Sandhills

Profile

The Sandhills region of north-central Nebraska comprises the largest contiguous tract of grassland remaining in the United States and the largest stabilized sand dune area in the Western Hemisphere. This region encompasses 19,300 square miles and overlies several extensive aquifers of the Ogallala Formation which contain a storage capacity of nearly one billion acre-feet of water. This vast water resource occurs both in the underground aquifer and above ground in the form of wetland areas. Sandhills wetlands are mostly freshwater and include saturated wet meadows, shallow marshes, and open-water lakes. It has been estimated that 177,000 acres of open water and marsh and 1,130,000 acres of wet meadows remain in the Sandhills (Rundquist 1983). An analysis of National Wetland Inventory digital data indicated that 369,606 acres of wetland were mapped in the Sandhills (LaGrange et al. 2004). The reason for the large discrepancy between the two surveys appears to be related to the techniques used. Rundquist (1983) used Landsat satellite generated imagery and mapped larger areas as wet meadow wetlands than did the National Wetland Inventory. The wetlands in the Sandhills range in size from less than one acre to 2,300 acres with greater than 80% of all wetlands estimated to be 10 acres or less in size (Wolfe 1984). Numerous wetlands are also associated with the streams and rivers within the Sandhills and along the Loup River and its tributaries after they flow out of the Sandhills.

Several unique wetland types are located within the Sandhills. The Nebraska Natural Heritage Program has identified fens within the Sandhills (Steinauer 1995), a rare wetland type both in the Sandhills and throughout the United States. Fens are characterized by slightly acidic water and peat (undecomposed plant parts) soils that form in areas fed with a nearly constant supply of groundwater. Fens harbor several rare plant species such as cotton grass *(Eriophorum polystachion)*, buckbean *(Menyanthes trifoliata)*, and marsh marigold *(Caltha palustris)*. The current range of these plants is mostly in colder regions north of Nebraska and the populations in the Sandhills are likely relics from a much cooler period in the Sandhills that have survived in these specialized habitats. In the western portion of the Sandhills there are numerous highly alkaline wetlands (Steinauer 1994) that harbor unusual plants and invertebrate life. These alkaline wetlands are very attractive to shorebirds because of the invertebrate life they produce.

Loss and Threats

Wetland loss in the Sandhills has occurred primarily through draining by surface ditches, beginning as early as 1900 (McMurtrey et al. 1972, U.S. Fish and Wildlife Service 1960). With the introduction of center-pivot irrigation systems to the Sandhills in the early 1970s, land leveling/shaping and local water-table declines have resulted in extensive wetland loss in some areas. While quantifiable data are not available for the Sandhills, estimates of wetland acres drained range from 15% (McMurtrey et al. 1972) to 46% (U.S. Fish and Wildlife Service 1986). Sandhills wetlands were given a priority 1 ranking (due to very extensive past losses) in the Nebraska Wetlands Priority Plan (Gersib 1991).

> The Sandhills contain more acres of wetlands than any other complex in Nebraska.

Sandhills wetland in Garden County.

Sandhills wetlands are most threatened by drainage to increase hay acreage. This drainage directly impacts the lake or marsh where the project occurs and also can lead to cumulative wetland loss both downstream and upstream as the channel becomes entrenched, lowering the water table and causing lateral drainages to occur that impact adjacent wetlands. Many smaller wetlands are also threatened by conversion from ranching to irrigated farming. Concentrated, large-scale irrigation development can result in long-term effects on wetland communities by lowering the groundwater table. Changing farm economics appear to have greatly slowed center-pivot irrigation development in the Sandhills, and the Conservation Reserve Program (CRP) allowed many pivots to be planted back to grass cover. However, this situation could change as CRP expires or economics change.

Groundwater pollution, largely from agricultural chemicals and concentrated livestock waste, is a threat to the historically excellent water quality in the Sandhills. Nitrate levels in groundwater exceed safe limits (10 mg/1) in some locations due to fertilizer application (NRC 1993, Engberg 1984).

A potentially disastrous future threat is the sale and removal of groundwater to areas away from the Sandhills. With its extensive groundwater resources (Bleed and Flowerday 1989), the Sandhills area is sometimes touted for major water sales. Such a loss of water would greatly impact the region's lakes, marshes, and meadows since they are connected to the groundwater (Winter et al. 2001).

Functions and Values

Sandhills wetlands are extremely valuable to the region's ranchers and the ranching economy. These wetlands, especially the wet meadows, provide abundant and nutritious forage that is used as winter cattle feed. Wetlands also offer grazing sites and a source of water to livestock.

More than 300 species of birds have been recorded in the Sandhills region. Of these, over 125 show an ecological affinity to wetland habitats including large numbers of waterfowl, shorebirds, and waterbirds. (Bleed et al. 1989). The North American Waterfowl Management Plan lists the Sandhills as a habitat area of major

concern in North America (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1986). The Sandhills are the most important waterfowl production area in Nebraska and are considered by Bellrose (1980) to be the best duck production area south of the Prairie Pothole Region. The Nebraska Game and Parks Commission counted an average of 218,414 ducks by aerial surveys in the Sandhills during the 1999-2002 nesting seasons (Vrtiska and Oldenburger 2002). These aerial counts are not corrected for visibility bias, which means the actual number of breeding ducks in the Sandhills could be 2-3 times the number actually counted. The most common species of nesting waterfowl include mallards, blue-winged teal, gadwalls, northern shovelers, northern pintails, redheads, and ruddy ducks. Production from the Sandhills Canada goose flock provides a fall flight that exceeds 10,000 birds (M. Vrtiska, pers. comm.). There are probably 50-60 pairs of nesting trumpeter swans and they are expanding their nesting range throughout the Sandhills (M. Vrtiska, pers. comm.).

Several state and federally listed threatened and endangered species use the Sandhills and associated wetlands. The migration corridor of the endangered whooping crane encompasses most of the Sandhills. Threatened bald eagles move through the area during migration and winter along Sandhills rivers, and several nests have been built by bald eagles along Sandhills rivers and in wood lots adjacent to more permanent wetlands. Wet meadows provide habitat for the western prairie fringed orchid, which is a threatened species.

Sandhills wetlands are valuable to the region's ranchers and the ranching economy.

Most of the lakes in the Sandhills are too shallow or alkaline to support game fish populations. However, some freshwater lakes, and their associated wetlands, have adequate water depth to over-winter fish and support an exceptional warm-water fishery. Although more than 75 fish species (including many non-native species) occur within the Sandhills, the most common sport fishing species are northern pike, yellow perch, largemouth bass, bluegill, and crappie. Sandhills streams and their associated wetlands also provide habitat for 3 state threatened fish species in Nebraska: the northern redbelly dace, finescale dace, and blacknose shiner.

Wetlands in the Sandhills function both as groundwater discharge and recharge sites, though recharge usually occurs only during heavy precipitation events in the spring (Bleed and Flowerday 1989). Although precipitation is low and evaporation rates are high, the large underground reservoir, known as the Ogallala Aquifer, provides a water table at or near the surface for discharge into a vast array of wetlands, even during drought. Agricultural, residential and municipal water supplies within the region, and a sizeable portion of the rest of Nebraska, are dependent upon the Ogallala Aquifer as their sole source of water.

The Sandhills region in general represents one of Nebraska's most popular tourist areas. Visitation data from Valentine and Crescent Lake National Wildlife Refuges as well as the presence of many State Wildlife Management and Recreation Areas within the Sandhills reflect well on the recreation values these wetlands provide. Camping, canoeing, boating, fishing, hunting, trapping, birdwatching, and wildlife photography are common recreational activities within this area.

Select Public Use Areas

- Cottonwood-Steverson Lake WMA, 28 miles N. of Hyannis, Cherry Co.
- Crescent Lake National Wildlife Refuge, 23 miles, N. of Oshkosh, Garden Co.
- Ballard's Marsh WMA, 18 miles S. of Valentine, Cherry Co.
- Valentine National Wildlife Refuge, 22 miles S. of Valentine, Cherry Co.

- American Game Marsh WMA, 19 miles S. of Johnson, Brown Co.
- South Pine WMA, 11 miles S. of Long Pine, Brown Co.
- Twin Lakes-Rock County WMA, 18 miles S, 3 miles E of Bassett, Rock Co.
- Goose Lake WMA, 6 miles S, 10 miles E. of Chambers, Holt Co.

Conservation Programs and Contacts

Sandhills Task Force- The Task Force is composed of ranchers, Nebraska Cattleman members, conservation organizations, and government agencies. The Task Force was formed to address issues of common concern relating to the ecology of the Sandhills, including wetlands, and sustaining the ranching community. Contact the Sandhills Coordinator, U.S. Fish and Wildlife Service, P.O. Box 1686, Kearney, NE 68848, (308) 236-5015.

Other contacts include the Nebraska Game and Parks Commission District Office in Bassett (402) 684-2921.

Loup/Platte River Sandhills

Profile

The Loup/Platte River Sandhills wetland complex is in a narrow band of wind-deposited sand extending from the confluence of the Platte and Loup Rivers at Columbus, west to near the town of Ravenna. Wetlands are most numerous in a 70-square-mile area south of Genoa. This complex was called the Platte-Nance-Merrick county Sandhills complex by Gersib (1991). Within these Sandhills are numerous freshwater wetlands. These wetlands are mostly small (<5 acres) and range from temporarily to semipermanently-flooded. Some information suggests that the groundwater that recharges these wetlands is related to levels in the Platte and Loup rivers, but little quantitative information is available.

Yellow-headed blackbird.

Loss and Threats

Some drainage and cropping of these wetlands has occurred, however, losses within this complex appear to be less than in many other complexes in the state. Threats to these wetlands are primarily related to the potential of local groundwater pumping drawing down water tables and causing the wetlands to lose their water source. This complex may also be impacted by alterations of flows in the Platte and Loup rivers, but this connection is currently not well understood. In the early 1970's, there was a proposal to drain a large number of wetlands within this complex to facilitate conversion to agriculture (Farrar 1974), and this threat remains.

Functions and Values

Unfortunately, little is known about how this wetland complex functions. The wetlands are known to provide good habitat for nesting waterfowl and likely provide habitat for other water birds. Locally, the area provides recreation for waterfowl hunters. These wetlands provide water and forage production for area livestock. The role that these wetlands play in the water quality and groundwater dynamics of the region needs further investigation.

Select Public Use Areas

- Sunny Hollow WMA, 4 miles S. and 1 mile W. of Genoa, Merrick Co.

Conservation Programs and Contacts

Contact the Nebraska Game and Parks Commission District Office in Kearney (308) 865-5310 or Norfolk (308) 370-3374.

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SALINE/ALKALINE WETLANDS

These wetlands have saline (salty) or alkaline water. They receive their salts from either groundwater or through concentration by evaporation. The complexes in Nebraska include the Eastern Saline and the Western Alkaline. There are also some highly alkaline wetlands in the western Sandhills that are covered in the Sandhills Complex section. Additionally, moderately saline/alkaline wetlands are found in scattered pockets along much of the Platte River.

Eastern Saline

Profile

Eastern Saline wetlands are of historical significance as their presence spawned a short-lived salt mining industry in the 1860's that led to the establishment of the city of Lincoln (Cunningham 1985). Eastern saline wetlands occur in swales and depressions within the floodplains of Salt Creek and its tributaries in Lancaster and southern Saunders counties. The wetlands receive their salinity from groundwater inflow that passes through an underground rock formation containing salts deposited by an ancient sea that once covered Nebraska. Eastern saline wetlands are characterized by saline soils and salt-tolerant vegetation. Soil salinity varies greatly between, and even within, wetlands. Highly saline wetlands usually have a central area that is devoid of vegetation, and when dry, exhibit salt encrusted mudflats. Wetlands having lower soil salinities are fully vegetated with salt-tolerant plants.

Loss and Threats

Eastern saline wetlands are considered critically imperiled in Nebraska (Clausen et al. 1989) and the most limited and endangered vegetation community in the state (Kaul 1975). Although historic wetland acreages have not been quantified, past losses are considered to be significant (R. Gersib, pers. comm.).

Inventory and assessment work by Gersib and Steinauer (1990) and Gilbert and Stutheit (1994) noted extensive wetland losses from expansion of the city of Lincoln and agricultural activities. They further noted that all extant saline wetlands identified in their inventory have experienced recognizable degradation through drainage, diking, filling, farming and overgrazing. Eastern saline wetlands were given a priority 1 ranking (due to very extensive past losses) in the Nebraska Wetlands Priority Plan (Gersib 1991).

Because the entire Eastern saline wetland complex is located in and near the city of Lincoln, past losses have been severe, and future threats from development activities are imminent. Saline wetland assessment work by Gersib and Steinauer (1990) indicated that 168 of 188 uncultivated wetland sites were considered to have a high or moderate vulnerability to future wetland degradation or loss.

Categories of threat to Eastern saline wetlands include drainage or filling, stream-bed degradation, agricultural conversion or use, residential or commercial development, transportation, and water pollution. Of these, commercial or residential development and road construction are considered to be the greatest threats to Eastern saline wetlands. Commercial and residential development usually result in total wetland destruction and the loss of all related functions. One of the most serious long-term threats is the degradation (deepening) of stream channels that results in erosive lateral headcuts (gullies) that eventually drain wetlands, and would likely lead to lower area water tables.

Functions and Values

Eastern Nebraska saline wetlands provide habitat for a variety of wildlife species, and are particularly important as migrational habitat for shorebirds. The exposed saline mudflats provide abundant invertebrate foods. During the last century, more than 230 species of birds have been reported for the salt basins of Lancaster County (Farrar and Gersib 1991). Twenty-two species of shorebirds were documented using the saline wetlands during the 1997 spring migration. (Poague et al. 1998) and they estimated that more than 20,000 shorebirds may use these highly vulnerable wetlands during spring migration. The federally endangered least tern and threatened piping plover have been reported using Eastern saline wetlands.

Mudflats of the Eastern Saline wetlands form a salty crust that supports a variety of unique plants and animals and are used by shorebirds such as this Lesser Yellowlegs.

The Salt Creek tiger beetle *(Cicindela nevadica var. lincolniana)*, a very rare and restricted subspecies, is found only on the open salt flat areas of Eastern saline wetlands. The Salt Creek tiger beetle is a state listed endangered species and is a candidate for the federal endangered species list.

Eastern saline wetlands are home to many saline plants that are found nowhere else in Nebraska. Three plant species found growing in Eastern saline wetlands are considered rare in Nebraska (Clausen et al. 1989) including saltmarsh aster *(Aster subulatus var. ligulatus)*, saltwort (*Salicornia rubra)*, and Texas dropseed *(Sporobolus texanus)*. Saltwort is a state listed endangered species.

Silty clay soils reduce downward water movement resulting in low to moderate groundwater recharge functions. The location of wetlands within the Salt and Rock Creek floodplains and their alluvial soils provide strong indications that flood control functions are being provided by these wetlands.

Because of their location in and around the city of Lincoln and their proximity to Omaha, Eastern saline wetlands are ideally located to provide recreational opportunities. Bird watching, nature study, and waterfowl and pheasant hunting are the most common outdoor recreation activities.

> Saline wetlands contain the most limited and the most endangered vegetation community in the State.

Few wetland areas in Nebraska provide the educational opportunities afforded by the close proximity of these unique wetlands to so many students.

Select Public Use Areas

- Arbor Lake, ½ mile N. of Arbor Road on N. 27th, Lincoln, Lancaster Co.
- Shoemaker Marsh, 1 mile N. of Arbor Road on N. 27th, Lincoln, Lancaster Co.
- Jack Sinn WMA, 1 mile S. of Ceresco, Lancaster/Saunders co.
- Little Salt Fork Marsh, 3 miles E. of Raymond, Lancaster Co. This is a Nature Conservancy area and is open to limited public use.
- Lincoln Saline Wetland Nature Center NRD Area, east shore of Capitol Beach Lake in Lincoln, Lancaster Co.
- Whitehead Saline Wetlands NRD Area, 27th Street and I-80, Lincoln, Lancaster Co.
- Phizer Saline Wetland, 1st and Cornhusker, Lincoln, Lancaster Co. Owned by Phizer Co. but open to public use.

Conservation Programs and Contacts

Saline Wetland Conservation Partnership- This is a partnership between the City of Lincoln, Lancaster County, Lower Platte Natural Resources District, The Nature Conservancy, the Nebraska

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Game and Parks Commission, and others to protect and conserve Eastern Saline Wetlands (LaGrange et al. 2003). Contact the Saline Wetland Coordinator, 3125 Portia, Box 83581, 68501 (402) 476-2729.

Other contacts include the Nebraska Game and Parks Commission District Office in Lincoln (402) 471-5561.

Western Alkaline

Profile

Western Alkaline wetlands occur on the floodplain of the North Platte River upstream from Lewellen, and along the upper reaches of Pumpkin Creek. These wetlands receive their water from a combination of overland runoff, flood overflows, and springs. The hydrology of these wetlands is complex and influenced by local irrigation runoff. The alkalinity is principally caused by the salts of sodium carbonate and calcium carbonate becoming concentrated in the soils as a result of high rates of evaporation in this semi-arid region. These wetlands frequently dry up and a white crust of alkaline salts forms on the exposed soil surface.

Loss and Threats

Wetlands in this complex appear to have experienced fewer losses and to be less threatened than many of the other complexes in Nebraska. Much of this is due to the lack of development in the vicinity of these wetlands and because the soils are poorly suited to crop production. However, some wet meadows on less alkaline sites have been drained and converted to cropland or planted to non-native wheatgrasses. Irrigation projects have affected some sites and the long-term effect of reduced flows in the North Platte River is unknown. In recent years flows have greatly declined on Pumpkin Creek, likely as a result of groundwater depletions, and this could impact the alkaline wetlands located there.

Functions and Values

Western Alkaline wetlands provide nesting and migration habitat for a variety of waterfowl, shorebirds, and other waterbirds. This complex is especially attractive to nesting American avocets, Wilson's phalaropes, cinnamon and blue-winged teal, mallards, and Canada geese. Much of the shorebird habitat is provided by the open alkaline flats. These wetlands provide important waterfowl hunting and wildlife viewing opportunities in this region of the state. Several plants rare to Nebraska occur in the alkaline wetlands including the Nevada bulrush *(Scirpus nevadensis)*, slender plantain *(Plantago elongata)*, silverweed *(Potentilla anserina)*, eastern cleomella *(Cleomella angustifolia)*, thelypody *(Thelypodium integrifolium)*, seaside heliotrope *(Heliotropum curassavicum)* and sea milkwort *(Glaux maritima)*.

The location of these wetlands near springs and along the Oregon Trail lends to their historical significance.

Chimney Rock is reflected in a western alkaline wetland at sunset.

American avocet on nest located in saltgrass and alkali salts.

Select Public Use Areas

- Kiowa WMA, 2 miles S. of Morrill, Scotts Bluff Co.
- Chet and Jane Fliesbach WMA (Facus Springs), 2 miles S., 3 miles E. of Bayard, Morrill Co.

Conservation Programs and Contacts

Platte River Basin Environments, Inc. is a group interested in the protection and restoration of wetland habitat in the Panhandle and especially along the North Platte River. Contact Platte River Basin Environments at 190498 County Road G, Scottsbluff, NE 69361, (308) 632-3440.

The Playa Lakes Joint Venture is a multi-state partnership for wetland and bird conservation that covers portions of western Nebraska. Contact the Playa Lakes Joint Venture Coordinator, 103 East Simpson Street, LaFayette, CO 80026, (303) 926-0777.

Other contacts include the Nebraska Game and Parks Commission District Office in Alliance (308) 763-2940.

RIVERINE WETLANDS

Wetlands are closely associated with the riparian zones and floodplains of all of Nebraska's rivers and streams. These riparian areas are complex systems with numerous inter-related components (e.g., wetlands, organic matter, sandbars, tree falls, side channels, etc.). Wetlands are an important component of this system by producing invertebrates and other organic matter that provide energy and food to the streams and rivers. Additionally, these wetlands provide spawning and nursery areas for many different types of fish, amphibians, and reptiles, and a home for numerous wildlife species. Although wetlands occur along all of Nebraska's rivers, this guide focuses on the wetlands associated with the Platte, Missouri, Niobrara, and Elkhorn rivers. These complexes appear to contain the greatest river-associated wetland acreage remaining in the state. The Platte River contains important wetlands throughout its reach; however, in this guide, three segments are singled out for special consideration.

Missouri River chute restored at Hamburg Bend WMA ,Otoe Co. as part of the U.S. Army Corps of Engineers mitigation project.

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Central Platte River

Profile

The Central Platte River (also called the Big Bend Reach) extends approximately 90 miles from Lexington to Chapman. Historically, the Platte River was a broad open prairie river with a braided channel and numerous saturated wet meadows adjacent to the river. However, the diversion of approximately 70% of the historic annual flows has changed the Central Platte River into a narrower river with a dense band of mature deciduous woodland encroaching on the wet meadows. Numerous islands, which at one time were open sandbars, have since been overgrown with woody vegetation due to a reduction in high-water scouring flows.

Loss and Threats

The Platte River valley epitomizes the struggle between agricultural and development interests, and wildlife, fish, recreation, and other values associated with wetlands. American Rivers, a national river conservation organization, has listed the Platte River as one of the most endangered waterways in the United States.

Diminished flows, increased sediment storage in upstream reservoirs, and agricultural conversion have greatly altered the Platte River valley. Since 1860, the Central Platte River has lost up to 73% of active channel areas (Sidle et al. 1989). Upstream from the Central Platte, active channel losses on the river have reached 85 percent. In many areas, channel width has been reduced to 10-20% of its historic size (U.S. Fish and Wildlife Service 1981). From 1988 through 1994, open-channel areas declined by 4 to 41% due to relatively low summer flows and reduced scouring flows, allowing the establishment of undesirable woody vegetation (Currier 1995). Since settlement, wet meadow acreage in the Central Platte has declined 73% (Currier et al. 1985). Wet meadow acreage declined up to 45% between 1938 and 1982 (Sidle et al. 1989). An increase in shrub and forested wetland types has occurred at the expense of riverine, emergent wetlands and wet meadows as a response to decreased scouring flows. The increase in the shrub and forested wetlands has been detrimental to fish and wildlife resources that historically used the river valley (Currier et al. 1985; U.S. Fish and Wildlife Service 1981). Wetlands along the Central Platte were given a priority 1 ranking (due to very extensive past losses) in the Nebraska Wetlands Priority Plan (Gersib 1991).

Braided channels of the Platte River with associated sandbars and wet meadows.

Agriculture (drainage and conversion to grain crops) and sand and gravel mining operations pose the biggest immediate threats to wet meadows adjacent to the Platte River. Loss of instream flows, groundwater depletions, and degradation of the riverbed continue to pose a long-term threat to the source of water for the remaining wet meadows . Once this source of water is lost, the meadows become drier, allowing tree invasion or agricultural, commercial, and residential development. Impoundment and diversion of river water and water-borne sediment are the main factors that have and continue to cause shifts from a wide, shallow, open channel to a narrow, deep channel surrounded by upland or wetland with woody vegetation. Failure to address these stream flow issues within the Platte River will continue to threaten the river and the fish and wildlife that depend on it.

The spread of purple loosestrife is an additional threat. Purple loosestrife is an introduced plant of little value to wildlife that out-competes desirable native plants. Purple loosestrife was only reported west of Kearney in the late 1980's (Gersib 1991) but has since become established throughout the Central Platte.

Functions and Values

The Central Platte provides habitat for several federally threatened and endangered species. The endangered whooping crane uses the river during spring and fall migration, and the portion of the Central Platte from Lexington to Shelton has been designated as critical habitat necessary for the survival and recovery of this species. Up to 300 threatened bald eagles winter along the Central Platte area annually. Several nests have been built by bald eagles along the Central Platte. The endangered interior least tern and threatened piping plover nest on the few remaining unvegetated sandbars in the river and at some sand and gravel pits adjacent to the river. A portion of the Central Platte has been designated as critical habitat necessary for the survival and recovery of the piping plover. Terns and plovers have been forced to nest on the sand spoil piles at gravel pits because of the encroachment of woody vegetation on most river sandbars, however both species still depend on the river for foraging habitat. Wet meadows near the river provide habitat for at least one population of the western prairie fringed orchid, which is listed as a threatened species.

Waterfowl hunting is a common recreational activity in many wetlands, including these along the Platte River

During the spring, nearly one-half million sandhill cranes comprising 80 percent of the North American population, converge on the river valley to rest and accumulate fat reserves for later migration and nesting (U.S. Fish and Wildlife Service 1981). Seven to ten million ducks and geese, including snow, Ross', white-fronted and Canada geese, mallards, and northern pintails, stage along the Platte River and in nearby Rainwater Basin wetlands. Average midwinter waterfowl counts, 1998-02, were 26,000 mallards and 28,000 Canada geese in the stretch of river from Gothenburg to Central City (Nebraska Game and Parks Commission, unpubl. data). This reach also hosts large concentrations of migrant wading birds and shorebirds and several nesting colonies of great blue herons. More than 300 bird species have been observed along the Central Platte River, and 141 species have nested in the area. Over half of the 300 species are neotropical migrants

> The Central Platte River and its associated wet meadows are host to over half a million sandhill cranes each spring.

that winter largely south of the Tropic of Cancer but nest north of the tropics (Lingle 1994). A report issued by the National Audubon Society focused on the importance of the Central Platte as wildlife habitat, especially for migratory birds, and the complexities of managing this severely threatened system (Safina et al. 1989).

During high flows, the Platte River recharges the underlying aquifer, which provides irrigation water for thousands of acres of cropland (Burns 1981) and municipal water for 35 percent of the population of Nebraska. In portions where the channels are not constricted by structures (e.g., bridges and bank protection) or encroached upon by vegetation, the Platte River has an enormous capacity to carry floodwaters within its own banks (Safina et al. 1989).

The Platte River provides a variety of recreational opportunities. From fall 1986 to fall 1987, Nebraskans spent an estimated $51.3 million on nature-associated recreation in the Platte River Valley (Bureau of Sociological Research 1988). Activities from highest to lowest participation rates included picnicking, nature hikes, observing wildlife, swimming, fishing, camping, boating, and hunting. A separate study indicated that up to 80,000 crane watchers flock to the Platte River each spring and benefit the local economy with more than 40 million dollars (Lingle 1992).

Select Public Use Areas

- Fort Kearny State Recreation Area/Bassway Strip WMA, 9 miles N., 2 miles W. of Minden, Kearney Co.
- The Nature Conservancy, National Audubon Society, Platte River Whooping Crane Maintenance Trust, and Crane Meadows Nature Center have areas along the Platte River that are available for public use and tours or crane observation blinds by appointment. Contact: The Nature Conservancy, P.O. Box 438, Aurora, NE 68818, (402) 694-4191; National Audubon Society, Lillian Annette Rowe Sanctuary, 44450 Elm Island Road, Gibbon NE 28840, (308) 468-5282; Platte River Whooping Crane Maintenance Trust, 6611 W. Whooping Crane Dr., Wood River, NE 68883, (308) 384-4633; or Crane Meadows Nature Center, 9325 S. Alda Rd., Wood River, NE 68883 (308) 382-1820.

Conservation Programs and Contacts

A wide variety of organizations and agencies have programs that address wetland conservation issues along the Central Platte. In addition to the organizations listed above, further information can be obtained by contacting the Nebraska Game and Parks Commission, P.O. Box 30370, Lincoln, NE 68503 (402) 471-5422, or the U.S. Fish and Wildlife Service, 203 W. 2nd Street, Federal Bldg., Grand Island NE 68801, (308) 382-6468.

Other contacts include the Nebraska Game and Parks Commission District Office in Kearney (308) 865-5310, and the Platte River Partnership in Wood River (308) 583-2294.

Lower North Platte River

Profile

The lower reach of the North Platte River extends approximately 20 river miles, from Sutherland to North Platte. This wetland complex consists of riverine and marsh-like wetlands lying within the historically active floodplain and channel of the river. Temporarily and seasonally flooded wetlands comprise an estimated 80% of all wetlands in the lower reach of the North Platte River. There are also extensive wetlands all along the North Platte River upstream of Sutherland. Many of these wetlands are included within the Western Alkaline Wetland complex.

Loss and Threats

Sidle et al. (1989) reported that the active river channel width between North Platte and Lake McConaughy has declined 85 percent since 1860. Since 1938, the active channel width between North Platte and Sutherland has declined by 65 percent (U.S. Fish and Wildlife Service, unpubl. data). Wet meadow acreage losses along the North Platte River were estimated to be 23-33% since 1938, though many of the farmable meadows already were converted and under gravity irrigation prior to 1938 (Sidle et al. 1989).

Additionally, an increase of scrub-shrub and forested wetland types has occurred at the expense of riverine and emergent wetlands as a response to decreased instream flows and increased sediment storage in upstream reservoirs. Lower North Platte River wetlands were given a priority 2 ranking (due to extensive past losses) in the Nebraska Wetlands Priority Plan (Gersib 1991).

Agricultural conversion, groundwater depletions, and sand and gravel mining operations pose the greatest short-term threats to wet meadows adjacent to the North Platte River. Residential and commercial developments commonly encroach on wet meadows after drainage, filling, or the mining of sand and gravel. Groundwater depletions and degradation of the riverbed will continue to impact the remaining wet meadows in the long-term. Impoundments and the diversion of river water and sediment are the main factors that have caused and will continue to cause the shift from a wide, shallow, open channel to a narrow, deep channel bordered by uplands or scrub-shrub/forested wetlands.

Functions and Values

During the spring, about 150,000 migrating sandhill cranes spend up to six weeks feeding and resting on the Lower North Platte River and adjacent wet meadows. Sandhill cranes roost in the river and wet meadows at night and forage in wet meadows, grassland, and cropland during the day. Threatened bald eagles winter along the river and also use it during migration. Endangered whooping cranes occasionally use this stretch of river during both spring and fall migrations. Migrating and wintering waterfowl use the river and associated wet meadows. The entire North Platte river is the most important area in the state for wintering Canada geese and is one of the most important for wintering mallards (M. Vrtiska, Nebraska Game and Parks, pers. comm.).

The Lower North Platte River and its associated aquifer provide municipal and irrigation water supplies (Missouri River Basin Commission 1976). During high-flow periods, the river recharges the underlying aquifer. Because the Platte River system, including the Lower North Platte River, is highly regulated by a series of upstream

Sandhill cranes stop and rest on Nebraska wetlands before continuing their northward journey. Some will fly all the way to Alaska and even Siberia to nest.

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reservoirs and diversions for irrigation and power district canals, the groundwater discharge and recharge functions of the river and associated wetlands have been significantly altered from natural conditions (Missouri River Basin Commission 1976). Although upstream reservoirs on the North Platte River provide considerable flood protection, the continued loss of wetlands and channel capacity increases the future chances of flood damage.

Waterfowl hunting and fishing occur on the Lower North Platte River (Anderson et al. 1989). A survey by the University of Nebraska indicated that Nebraskans as a whole have a keen interest in a variety of recreational activities available on the Lower North Platte River and support further efforts to provide these recreational opportunities (Bureau of Sociological Research 1988).

Select Public Use Areas

- North River WMA, 3 miles N. of Hershey, Lincoln Co.
- Muskrat Run WMA, 6 miles E., 1 mile N. of Hershey, Lincoln Co.
- Buffalo Bill Ranch State Historical Park, North Platte, Lincoln Co.

Bird watching is just one example of the many forms of outdoor recreation that wetlands provide.

Conservation Programs and Contacts

A wide variety of organizations and agencies have programs that address wetland conservation issues on the Platte River. Contact the Nebraska Game and Parks Commission, P.O. Box 30370, Lincoln, NE 68503 (402) 471-5422, or the U.S. Fish and Wildlife Service, 203 W. 2nd Street, Federal Bldg., Grand Island NE 68801, (308) 382-6468.

Platte River Basin Environments is a group interested in the protection and restoration of wetland habitat in the Panhandle and especially along the North Platte River. Contact Platte River Basin Environments at 190498 County Road G, Scottsbluff, NE 69361, (308) 632-3440.

Other contacts include the Nebraska Game and Parks Commission District Office in North Platte (308) 535-8025.

Lower Platte River

Profile

The Lower Platte River extends approximately 100 miles from where the Loup River joins the Platte near Columbus to the Platte-Missouri River confluence south of Omaha. The river in this reach begins to flow in a more defined channel, but islands and sandbars are still numerous. The Lower Platte has fewer acres of wetlands and wet meadows than the Central Platte. The wetlands along the Lower Platte are mostly fresh to slightly saline, saturated wet meadows and seasonally and semipermanently-flooded channel remnants and oxbows. These wetlands were likely more forested historically than wetlands further upstream.

Loss and Threats

The wetlands and channel habitat along the Lower Platte have suffered cumulative losses similar to those in the Central Platte. Diversion of stream-flows and levee construction leading to floodplain development have probably had the greatest impacts. Numerous wetlands have also

Bald Eagle.

been altered by drainage and conversion to cropland, sand and gravel mining, and housing and commercial developments. Additional diversion of water poses threats to the wetlands in the future. Levees built along the river eliminate or narrow the river's floodplain and disconnect wetlands from over-bank flows. Wetlands along the Lower Platte will face continued threats of stream-bank stabilization, and urban expansion and associated disturbances, especially considering their proximity to Omaha, Fremont, and Columbus.

Functions and Values

The wetlands and associated habitats along the Lower Platte River provide important migrational habitat for a variety of waterfowl and nesting habitat for wood ducks. Up to 60 threatened bald eagles have wintered along the Lower Platte in recent years, and several productive nests have been confirmed. The endangered least tern and threatened piping plover nest on sandbars and sand pits along the river. The Lower Platte has been designated as critical habitat necessary for the survival and recovery of the piping plover. Shorebird surveys conducted on the Lower Platte from 2000-2002 have documented 21 species using this river section. Several great-blue heron rookeries are also located along the Lower Platte. The endangered pallid sturgeon, the state-endangered sturgeon chub and state-threatened lake sturgeon are also found near the mouth of the Platte River.

Wetlands along the river help to attenuate flood flows and also filter the water, removing some pollutants. Additionally, numerous towns, including the cities of Omaha and Lincoln, pump municipal water from wells that receive recharge from this stretch of river.

The Lower Platte receives very intensive recreational use since it is within 50 miles of more than 60% of the state's population. Waterfowl and deer hunting, fishing, and boating occur on this reach (Anderson et al. 1989). State parks and recreation areas along the Lower Platte receive a total of 3-4 million visits annually.

Select Public Use Areas

- Louisville State Recreation Area, 1 mile W. of Louisville, Cass Co.
- Platte River State Park, 1 mile S. and 2 miles W. of Louisville, Cass Co.
- Schramm State Recreation Area, 8 miles S. of Gretna, Sarpy Co.
- Mahoney State Park, 1 mile S. and 2 miles E. of Ashland, Cass Co.
- Two Rivers State Recreation Area, 4 miles S. and 3 miles E. of Waterloo, Douglas Co.
- Fremont Lakes State Recreation Area, 1 mile W. of Fremont, Dodge Co.

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- Bramble WMA, 2 miles E. and 2.5 miles N. of Cedar Bluff, Saunders Co.
- Whitetail WMA, 1 mile W. and 2 miles S. of Schuyler, Colfax Co.

Conservation Programs and Contacts

A wide variety of organizations and agencies have programs that address wetland conservation issues on the Platte River. Contact the Nebraska Game and Parks Commission, P.O. Box 30370, Lincoln, NE 68503 (402) 471-5422, or the U.S. Fish and Wildlife Service, 203 W. 2nd Street, Federal Bldg., Grand Island NE 68801, (308) 382-6468.

Other contacts include the Nebraska Game and Parks Commission District Office in Lincoln (402) 471-5561 or Norfolk (402) 370-3374.

Missouri River

Profile

In Nebraska, the Missouri River floodplain harbors a collection of riverine and marsh-like wetlands that follow the state line from eastern Boyd County downstream to the southeast corner of the state in Richardson County. Prior to the 1930s, the Missouri was a wild, natural river that supported a tremendous number and diversity of fish and wildlife. The river was described as occupying a sandy channel that flowed between easily erodible banks 1,500 feet to over one mile apart with braided, sinuous channels twisting among sheltered backwaters, sloughs, chutes, oxbows, gravel bars, sandbars, mudflats, snags, alluvial islands, deep pools, marshland, and shallow water areas (U.S. Fish and Wildlife Service 1980). The character of the Missouri was drastically altered between 1930 and 1970 as channelization and mainstem dams caused the river channel to narrow and deepen and associated floodplain wetlands to wither and disappear. Upstream from Ponca, the river has remained mostly unchannelized and numerous islands and wetlands remain, although diminished from pre-dam conditions. Within the downstream channelized reach, the riverbed is degrading from near Sioux City to where the Platte River joins the Missouri near the town of Plattsmouth. The bed is stable or aggrading downstream from Plattsmouth.

Loss and Threats

About 100,300 acres of aquatic habitats and 65,300 acres of islands and sandbars have been converted to dry-land or navigation channel between Sioux City, Iowa, and the river's confluence with the Mississippi River (U.S. Fish and Wildlife Service 1980). Within Nebraska, losses were estimated at 18,200 acres of aquatic habitat and 18,700 acres of islands and sandbars. Channelization, along with the flood protection provided by mainstem and tributary reservoirs, has fostered agricultural, urban, and industrial encroachment on 95% of the floodplain (Hesse et al. 1989). The six, huge mainstem dams in the Dakotas and Montana have had measurable influences on water quality, quantity, and timing along the Missouri River. The release of relatively silt-free waters from Gavins Point, the lowermost dam in the system, is contributing to riverbed degradation taking place from below the dam to about Plattsmouth (U.S. Fish and Wildlife Service 1980). Riverbed degradation causes adjacent wetlands to become abnormally dry and isolates backwater areas from the main channel. In addition, control of the release of water from the dams has reduced the flood pulse that helps to maintain floodplain wetlands. Missouri River wetlands were given a priority 1 ranking (due to very extensive past losses) in the Nebraska Wetlands Priority Plan (Gersib 1991).

The Missouri River is a wetland complex where most of the destruction and degradation has already occurred. Categories of greatest threat along the Missouri River appear to be riverbed degradation, residential, agricultural and commercial development, transportation, navigation maintenance projects, water pollution, water development projects, streambank stabilization, agricultural conversion, and drainage and filling. These factors have had a cumulative effect on river functions by isolating the floodplain from the river and reducing the natural dynamics.

Purple loosestrife has become well established in the upper reaches of the Missouri River near Niobrara, Nebraska. Purple loosestrife's rapid expansion into the backwater areas of Lewis and Clark Lake is a threat to native plants all along the river.

The unchannelized portion of the Missouri River in northern Nebraska contains numerous wetlands.

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Wetlands associated with rivers and lakes improve fishing.

Functions and Values

The Missouri River, like many natural systems, is a whole that is greater than the sum of its parts. The interactions between the different parts (e.g., wetlands, organic matter, sandbars, tree falls, side channels, etc.) form a complex interrelated system. Wetlands are an important component of this system because they produce invertebrates and other organic matter that provide energy and food to other parts of the river. Additionally, these wetlands provide spawning and nursery areas for many different types of fish, and a home for numerous wildlife species.

Several state and federally listed threatened and endangered species regularly use the Missouri River in Nebraska. The threatened bald eagle uses the river as migrational and wintering habitat, with wintering populations averaging 438 since 1990. Additionally, many bald eagle nests have been discovered along the Missouri with 5 nests on the NE side of the river being productive. Peregrine falcons nest in Omaha and rely on the Missouri River corridor for food. The endangered interior least tern and threatened piping plover nest on unvegetated sandbars in the unchannelized reach of the river, a habitat type which has been eliminated downstream from Sioux City. The recovery plans for both the piping plover (U.S. Fish and Wildlife Service 1988) and the interior least tern (U.S. Fish and Wildlife Service 1990) include Missouri River nesting habitat as being essential to the recovery of these species. The unchannelized portion of the Missouri has been designated as critical habitat necessary for the survival and recovery of the piping plover. Several fish species in the river are in severe decline including the federally endangered pallid sturgeon, state endangered sturgeon chub, state threatened lake sturgeon, and the sicklefin chub which is a candidate endangered/threatened species.

Before channelization changed the character of the Missouri River, the area was very important migration habitat for ducks, geese, swans, pelicans, and shorebirds (U.S. Fish and Wildlife Service 1980; U.S. Army Corps of Engineers 1978). Large populations of wood ducks once nested in the river corridor along with smaller numbers of blue-winged teal, gadwalls, and mallards. Wood ducks still nest along the river where adequate habitat remains. Although of diminished quality, the Missouri River still provides migration habitat for waterfowl and shorebirds, especially in the unchannelized reach. DeSoto National Wildlife Refuge in Nebraska and Iowa focuses on providing migrational habitat for waterfowl and often holds a peak fall snow goose population of 500,000 birds. Over 300 species of birds and numerous mammals use the Missouri River and associated habitats. One hundred and sixty-one species of birds likely breed in the region (Mollhoff, 2001). Nearly 8,000 raptors of eighteen species were observed migrating past Hitchcock Nature Center near Omaha during the fall of 2001. Loss of wetland habitats has caused decreases of wetland mammals such as beaver, muskrat, and the river otter, a state threatened species.

A significant spawning area for paddlefish and sauger still exists in the Missouri River along the South Dakota-Nebraska state line. Backwaters along the Platte and Missouri rivers also provide important nursery areas for sport and forage fish; however channelization of the Missouri River and the reduction of sandbars and slack-water habitats have adversely affected the fishery in Nebraska (Funk and Robinson 1974; Schainost 1976).

Channelization, loss of wetlands, and extensive development of the floodplain have reduced the natural flood-carrying capacity of the Missouri River system. As a result, flood stages in receiving waters (e.g., the Mississippi River) have increased as was evidenced by the severe 1993 floods (Galloway 1994).

The Missouri River in Boyd and Knox counties has been included in the National Park Service's Nationwide Rivers Inventory, in part due to outstanding fish and wildlife values (National Park Service 1982). The Missouri River from the Fort Randall Dam in South Dakota to just downstream from Niobrara, Nebraska, and from Gavins Point Dam near Yankton, South Dakota to Ponca State Park near Ponca, Nebraska is a Wild and Scenic River identified as the Missouri National Recreational River. Commercial fishing currently exists on the Missouri River for rough fish (primarily carp and buffalo). Outdoor recreation, from boating and fishing to camping and hunting, is important along the entire Missouri River in Nebraska. However, recreational use likely is much lower than its potential due to the reduction in fish and wildlife habitats in the channelized reach (U.S. Fish and Wildlife Service 1980). In spite of this, a 1992 survey by the Nebraska Game and Parks Commission indicated that the Missouri provided total annual public recreation use estimated to be 28,750,226 person-hours, and total annual private use was estimated to be 50,328,300 person-hours (Hesse et al. 1993). The total recreation related expenditure was estimated at $364 million. Several state parks and recreation areas along the Missouri River, including Indian Cave State Park, Lewis and Clark State Recreation Area, Ponca State Park, and Niobrara State Park, each receive well over 100,000 visitors per year.

Select Public Use Areas

- Indian Cave State Park, 13 miles N. of Falls City, Richardson Co.
- Hamburg Bend WMA, 3 miles S. and 5 miles E. of Nebraska City, Otoe Co.
- William Gilmour Memorial WMA, 1 mile S. and 1 mile E. of Plattsmouth, Cass Co.
- Randall W. Shilling WMA, Northeast edge of Plattsmouth. Cass Co.
- Gifford Point/Fontenelle Forest, Bellevue, Sarpy Co.
- Boyer Chute National Wildlife Refuge, 3 miles E. of Ft. Calhoun, Washington Co.
- DeSoto National Wildlife Refuge, 3 miles E. of Blair, Washington Co.
- Blackbird/Tieville/Decatur Bend WMAs, ½ mile E. of Decatur, Burt Co.
- Ponca State Park, 2 miles N. of Ponca, Dixon Co.
- Niobrara State Park/Bazile Creek WMA, adjacent to Niobrara, Knox Co.

Conservation Programs and Contacts

A wide variety of programs are in place that attempt to restore flows and habitat to the Missouri River. Contact the Nebraska Game and Parks Commission, P.O. Box 30370, Lincoln, NE 68503 (402) 471-5561 or the Norfolk office at (402) 370-3374.

Missouri National Recreational River- The National Park Service manages the National Recreation River which is a component of the Wild and Scenic River System. The designated areas include the Missouri River from the Fort Randall Dam in South Dakota to just downstream from Niobrara, Nebraska, and from Gavins Point Dam near Yankton, South Dakota to Ponca State Park near Ponca, Nebraska, the lower 20 miles of the Niobrara River and lower 8 miles of Verdigre Creek. Contact: National Park Service, P.O. Box 591, O'Neill, NE 68763, (402) 336-3970.

Blue-winged teal winter in Central and South America and nest around Nebraska's wetlands.

Elkhorn River

Profile

The Elkhorn River arises out of the eastern Sandhills and joins with the Platte River just west of Omaha. The Elkhorn contains numerous sandbars and side channels, similar in some ways to the Platte River. Numerous wetlands are associated with the floodplain of the Elkhorn River. Most of these wetlands are oxbows, occurring in former channels of the river that were left isolated as the river changed its course. These wetlands range from permanent lakes to temporarily-flooded meadow areas.

Loss and Threats

The wetlands along the Elkhorn River appear to have been less impacted by drainage and diversion than those along the Platte River and many other Nebraska rivers. However, some drainage and filling have occurred, and the remaining wetlands are threatened by continued conversion, sand and gravel mining, potential diversions of river water, sedimentation from surrounding cropland, bank stabilization, and channel straightening.

Functions and Values

The Elkhorn River and its associated wetlands provide habitat for endangered least terns and threatened piping plovers, especially in the vicinity of sand pit sites that provide nesting substrate. The threatened bald eagle uses the Elkhorn for wintering, migration, and nesting. Several nests have been built and two of these have been productive. Numerous wading birds, shorebirds, and waterfowl, especially wood ducks, also use the Elkhorn and its associated wetlands.

Being associated with the river's floodplain, the wetlands of this complex play a valuable role in maintaining the natural functions and dynamics of the river system. These functions include filtering the water, attenuating flood peaks, and providing water to the river during periods of low flows.

The Elkhorn River provides significant recreation because of its proximity to the towns of O'Neill, Norfolk, Fremont, and Omaha.

Select Public Use Areas

- Powder Horn WMA/Dead Timber SRA, 1 mile W. and 3 miles N. of Scribner, Dodge Co.
- Black Island WMA, 2 miles E. of Pilger, Cuming Co.
- Wood Duck WMA, 2 miles S and 4 miles W. of Stanton, Stanton Co.
- Hackberry Creek WMA, 2 miles E. and ½ mile N. of Clearwater, Antelope Co.
- Dry Creek WMA, 2 miles SE of O'Neill, Holt Co.

Conservation Programs and Contacts

Contact the Nebraska Game and Parks Commission District Office in Norfolk (402) 370-3374.

Niobrara River

Profile

The Niobrara River flows across northern Nebraska from Sioux County to Knox County. A variety of floodplain wetlands are associated with the Niobrara River, and receive water from the river and the numerous springs located along the canyon walls of the river valley. The Niobrara River is a scenic treasure in the State of Nebraska and provides a unique mix of northern, western, and eastern plant communities. A portion of the river downstream from Valentine has been designated as a National Scenic River and the lower 20 miles a National Recreation River under the Wild and Scenic Rivers Act.

Loss and Threats

The wetlands located along the Niobrara have not been greatly altered by human activities. Some small dams have been put in place, but most of the river flows naturally. The river was threatened by a large diversion dam being considered in the vicinity of the town of Norden. That particular project was dropped and future projects are precluded by Scenic River designation. Purple loosetrife has spread along the Niobrara and constitutes a threat because it is

Kayakers enjoy the Niobrara River.

of little value to wildlife and it out-competes desirable native wetland plants.

Functions and Values

The Niobrara River and its associated wetlands provide important habitat for more than 250 bird species. Threatened bald eagles use the Niobrara during migration, and wintering concentrations of eagles have ranged from 35 to 150. Two productive bald eagle nest sites have been located but it is felt that there are as many as 10 nesting sites along the lower 120 miles of river. Endangered whooping cranes stop along the Niobrara River during migration. Endangered least terns and threatened piping plovers nest on unvegetated sandbars on the Niobrara. The river from its mouth, upstream to near the Norden bridge has been designated as critical habitat for the piping plover. The region also hosts concentrations of migrating and wintering waterfowl and nesting colonies of wading birds such as great blue herons and double-crested cormorants

Being associated with the river's floodplain, the wetlands of this complex play a valuable role in maintaining the natural functions and dynamics of the river system. These functions include filtering the water, attenuating flood peaks, and sustaining the river during periods of low flows.

In recent years, tourism related to the river has greatly increased. On the Ft. Niobrara National Wildlife Refuge alone, nearly 25,000 people per year launch canoes, kayaks or inner-tubes to float the Niobrara.

Select Public Use Areas

- Niobrara State Park, 1 mile W. of Niobrara, Knox Co.
- Fred Thomas WMA, 10 miles N. of Bassett, Rock Co.
- Smith Falls State Park, 18 miles E. of Valentine, Cherry Co.
- Ft. Niobrara National Wildlife Refuge, 3 miles E. of Valentine, Cherry Co.
- Borman Bridge WMA, 2 miles SE of Valentine, Cherry Co.
- Agate Fossil Bed National Monument, 22 miles S. of Harrison, Sioux Co.

Conservation Programs and Contacts

Niobrara National Scenic River - The National Park Service manages a total of 76 miles of the Niobrara as a National Scenic River. Contact: the National Park Service, P.O. Box 591, O'Neill, NE 68763, (402) 336-3970, or the Niobrara Council, 111 E. 3rd St., Valentine, NE 69201, (402) 376-2793. Other contacts include Ft. Niobrara National Wildlife Refuge, U.S. Fish and Wildlife Service, Box 67, Valentine, NE 69201, (402) 376-3789, and the Niobrara Valley Preserve, The Nature Conservancy, Box 348, Johnstown, NE 69214, (402) 722-4440.

Other contacts include the Nebraska Game and Parks Commission District Office in Bassett (402) 684-2921.

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GLOSSARY

PLANTS AND ANIMALS

Listed below are select plants and animals that occur in and around Nebraska wetlands, including common, unique, and endangered species. Italic species are on the State of Nebraska endangered/threatened list. Bold Italic species are also on the federal endangered/threatened list. Numbers indicate year followed by month of a related NEBRASKAland Magazine article. Related articles in the Nebraska Game and Parks Commission's Trail Tales Magazine, distributed quarterly to 4th graders throughout Nebraska, are also noted.

Plants

Marsh Marigold.

Saline

Saltwort 1991.07, 1999.12, Trail Tales- Fall 2000
Saltgrass 1991.07, 1994.05

Wet Meadow and Edge Species

Cottongrass
Marsh Marigold
Prairie White-fringed Orchid 1993.07
Swamp Rose Mallow
Spotted Touch-me-not
Swamp Milkweed 1984.03
Smartweed
Beggar's Tick
Barnyard Grass
Marsh Skullcap
Marsh Fern
Sedges
Water Cress

Emergent

Cattail
Arrowhead 1973.08
Sweet Flag
Bulrush
Water Hemlock
Wild Rice 1995.07
Common Reed

Submergent and Floating Leafed

Bladderwort
Pondweed 1987.01
Water Lilly
Algae 1987.01

Woody

Willow 1993.01
Buttonbush
Dogwood
Elderberry
Silver Maple
Cottonwood 1986.08, 1993.01
Sycamore

Introduced and Invasive

Purple Loosestrife 1989.07, 1996.05, 1997.7
Reed Canary Grass

Purple Loosestrife.

Crawfish.

Non-Insect Invertebrates

Daphnia
Scud (Amphipod)
Leech
Pond Snail 1971.05
Clam 1990.08, 1994.04, 1997.5, Trail Tales- Fall 1995
Crayfish

Salt Creek tiger beetle.

Insects

Water Scorpion
Damselfly
Dragonfly 1991.08, 1975.07, Trail Tales- Summer 1998
Water Strider 1999.06
Water Boatman
Common Backswimmer
Predaceous Diving Beetle
Whirligig Beetle
Salt Creek Tiger Beetle 1990.07, 1999.12, 2003.03 Trail Tales- Fall 2000
Midge Fly
Mosquito Trail Tales- Summer 1998
Viceroy Butterfly
Western Tiger Swallowtail Butterfly 1985.09, 1992.08
Great Gray Copper Butterfly

Bluegill.

Fish

Pallid Sturgeon 1987.01, 1989.08, 1990.04, 1993.10, 1998.03
Paddlefish 1987.01
Gar 1987.01
Northern Pike 1973.02, 1986.12, 1987.01, 1988.04, 1991.03
Grass Pickerel 1987.01
Largemouth Bass 1976.05, 1976.06, 1987.01
Bluegill 1979.08, 1987.01, 2000.07
Green Sunfish 1987.01, 1991.05
Mosquito Fish 1991.07
Fathead Minnow 1987.01
Plains Topminnow 1987.01, 1991.07
Sturgeon Chub
Northern Redbellied Dace 1987.01, 1990.04, 1994.03
Finescaled Dace 1987.01, 1990.04, 1994.03
Pearl Dace 1987.01, 1990.04, 1994.03
Blacknose Shiner 1987.01, 1990.04, 1992.03
Iowa Darter 1987.01
Plains Killifish 1987.01
Stickleback 1987.01
Small-mouth Buffalo 1987.01
Carp 1980.04, 1987.01, 1993.11
Perch 1983.07, 1998.07

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Leopard frog

Amphibians

Tiger Salamander
Chorus Frog
Bullfrog 1975.07, 1977.07, 1979,06, 1990.07
Central Plains Toad
Spadefoot Toad
American Toad 1977.11
Rocky Mountain Toad
Great Plains Toad 1991.04
Leopard Frog
Northern Cricket Frog
Common Tree Frog 1970.06, 1978.08

Blanding's turtle

Reptiles

Snapping Turtle Trail Tales- Summer 2001
Blanding's Turtle 2003.07, Trail Tales- Summer 2001
Box Turtle 1998.11, 2001.03, Trail Tales- Summer 1999, Trail Tales- Summer 2001
Northern Painted, Trail Tales- Summer 2001
Spiny Soft-shelled, Trail Tales- Summer 2001
Yellow Mud Turtle 2001.05
Plains Garter Snake 1978.06
Red-sided Garter Snake 1978.06, 1992.05
Massasauga 1995.07, 1999.12
Common Water Snake 1970.11, 1978.06
Graham's Water Snake 1978.06
Western Fox Snake 1978.06

White-fronted geese.

Birds

White Pelican 1990.10, 1993.04
Double-crested Cormorant 1993.04, 1997.5
Pied-billed Grebe 1991.05, 1998.07, Trail Tales- Spring 2002
Eared Grebe 1984.06, 1991.05, Trail Tales- Spring 2002
Trumpeter Swan 1970.03, 1979.11, 1984.03, 1985.01, 1990.10, 1995.12, 2002.04
Canada Goose 1972.05, 1976.11, 1981.04, 1983.10, 1987.06, 1987.11, 2004.07
Snow Goose 1975.02, 1976.11, 1990.10, 1998.01, 1999.01
White-fronted Goose 1976.11, 1977.08
Mallard 1976.11, 1985.11
Blue-winged Teal 1974.12, 1976.11, 1999.05
Wood Duck 1972.09, 1975.12, 1976.11, 1986.03, 1994.03
Redhead 1974.10, 1976.11
Great Blue Heron 1982.11, 1988.04, 1993.08, 1999.07
American Bittern 1991.05
Sandhill Crane 1975.03, 1980.02, 1984.03, 1985.01, 1989.03, 1992.03, 1993.01, 1996.03, 1998.01, 2000.05, Trail Tales- Spring 2000, Trail Tales- Spring 2001

Whooping Crane 1989.10, 1990.10, 1992.04, 1993.01, 1994.10
Bald Eagle 1976.02, 1980.10, 1991.08, 1993.12, 1997.12, Trail Tales- Winter 1997
Northern Harrier
Peregrine Falcon 1997.11
Ring-necked Pheasant 1985.12, 1989.11, 1993.11, 1998.08, 2000.12
Least Tern 1997.6, 2001.07, Trail Tales- Summer 2002
Black Tern 1991.05
Ring-billed Gull
Sora 1998.08
American Coot 1991.05, 2000.05, Trail Tales- Spring 2002
Piping Plover 1988.03, 1995.11, 2001.07
Avocet 1973.05, 1994.05
Black-necked Stilt, 2001.06
Pectoral Sandpiper
Wilson's Phalarope
Common Snipe 1974.08, 1982.10, 1986.04, 1998.08
Short-eared Owl
Belted Kingfisher 1985.01
Willow Flycatcher
Tree Swallow 1985.01
Yellow Warbler
Common Yellowthroat
Yellow-headed Blackbird 1991.05
Red-winged Blackbird 1991.05, 1991.07
Swamp Sparrow

Muskrat.

Mammals

Short-tailed Shrew 1993.08
Meadow Vole 1982.09, 1987.06
Southern Bog Lemming
Meadow Jumping Mouse
Muskrat 1992.06
Beaver 1971.12
Raccoon 1974.04
Mink
River Otter 1987.11, 1992.12
Long-tailed Weasel 1999.07
White-tailed Deer 1974.11, 1975.04, 1991.03, 1997.04, 1998.08
Big Brown Bat 1975.10, 1993.08, 1997.07, Trail Tales- Summer 2000, Trail Tales- Fall 2001
Opossum 1975.05

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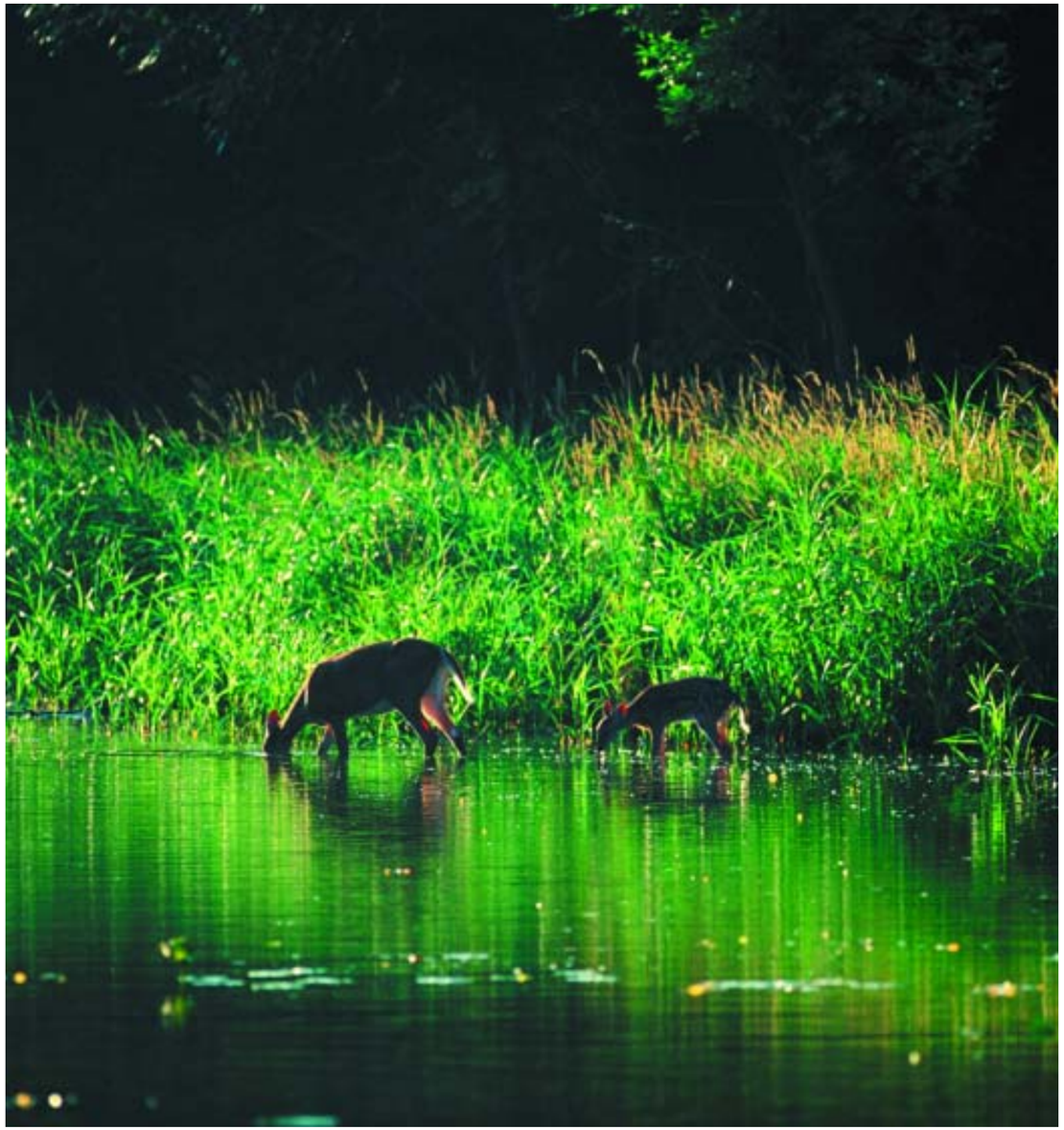

White-tailed deer.

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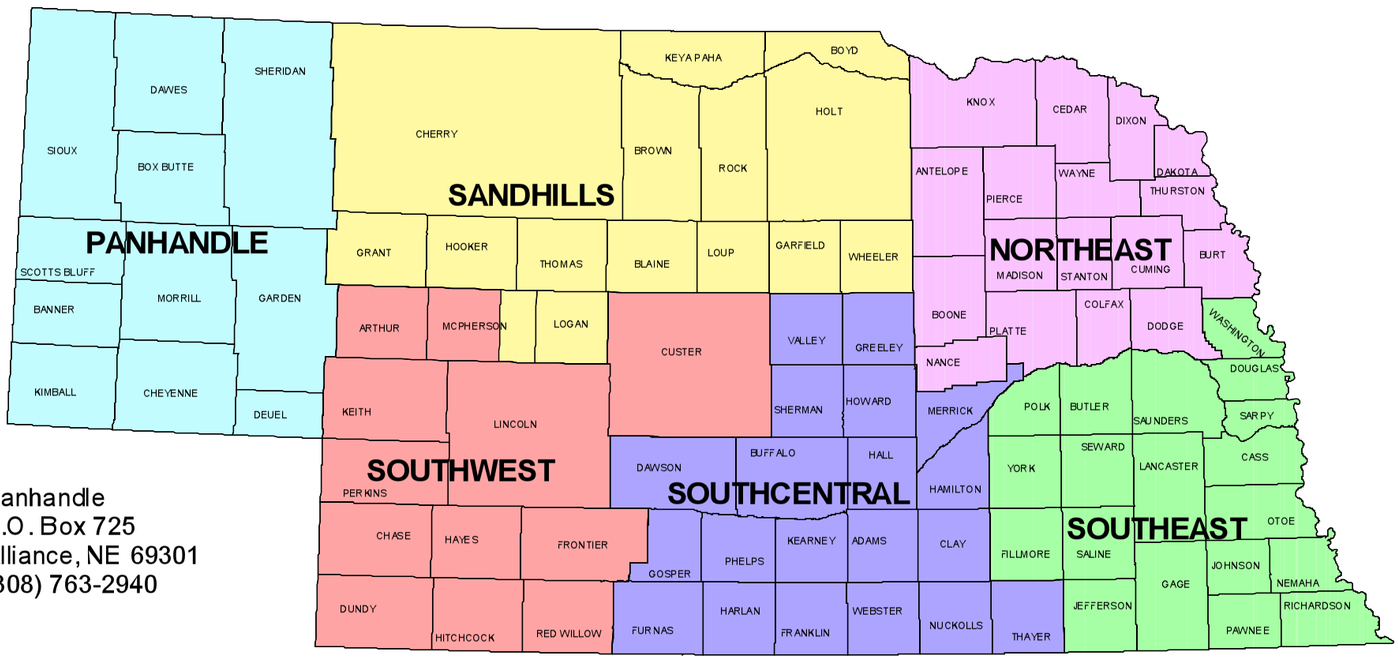

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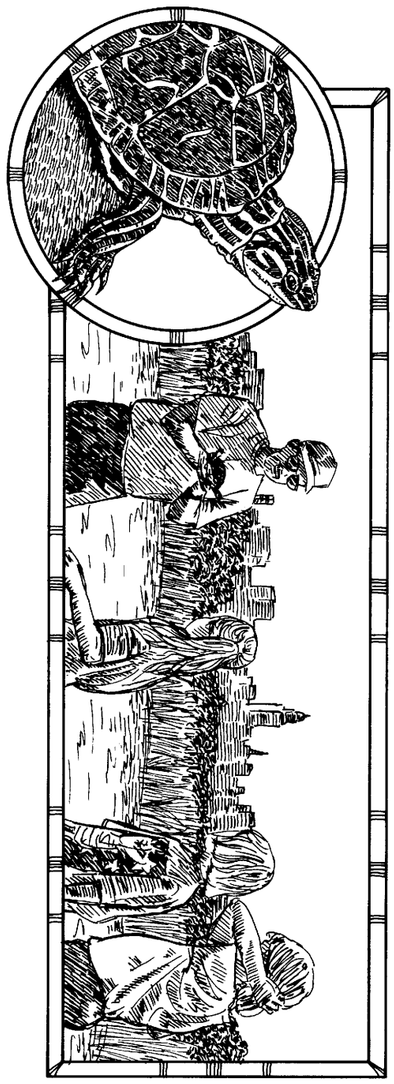

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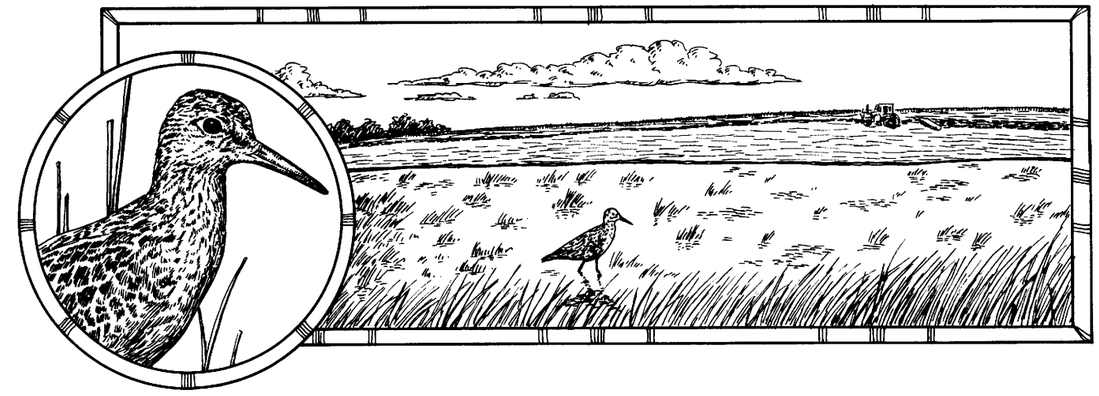

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This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement (CD98704601-0) to the Nebraska Game and Parks Commission. The contents do not necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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