

Fish, Wildlife & Ecosystem Health

Appendix B



Red River of the North Watershed
June 2017



US Army Corps
of Engineers[®]
St. Paul District



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FISH, WILDLIFE AND ECOSYSTEM HEALTH WORKING GROUP REPORT

EXECUTIVE SUMMARY

The Red River Basin has many rich resources that provide benefits to society. Finding a balance between land use for highly functioning natural systems and the use of the landscape for human needs is essential to ensure resources are sustainable for future generations while not impeding the current growth and development of the basin. The Red River Basin Comprehensive Watershed Management Plan (CWMP) will build off previous works, like the Red River Basin Commission (RRBC) Red River Basin Natural Resources Framework Plan (NRFP), to provide updated guidance for integrated watershed stewardship and management.

The Fish, Wildlife and Ecosystem Health working group is one of six groups tasked with providing input to the CWMP. The group consists of members representing various agencies and public interest groups with environmental concerns throughout the basin. Through meetings and discussions the group has produced a document that collectively identifies the problems and opportunities that exist in the basin, addresses goals and objectives to improve environment conditions and provides recommended actions to achieve them.

The vision statement for the Fish, Wildlife and Ecosystem Health working group is to “Maintain existing habitat and restore natural systems in the Red River Basin.”

Problem areas were broadly classified into three main categories; Habitat Loss, Habitat Degradation and Unfamiliarity with Ecosystem Functions and Values. Each of these categories was broken down further to provide additional detail:

Problems:

- 1. Habitat Loss**
 - Loss of prairies
 - Loss of wetlands
 - Loss of riparian habitat
 - Loss of wooded areas
- 2. Habitat Degradation**
 - Changes in connectivity
 - Climate change
 - Invasive species
 - Water quality
 - Water supply
 - Restoration and enhancement obstacles
- 3. Unfamiliarity with Ecosystem Functions and Values**
 - Lack of understanding basic ecological principles
 - Uninformed decision making

Goals and objectives were developed for each of the problem areas to improve the environmental conditions and to prevent further degradation of habitat in the basin. The goals, and more detailed objectives associated with each of them, are listed below:

Problem: Habitat Loss

Goal 1: Conserve remnant natural habitat, and protect fish and wildlife throughout the Red River Basin.

Objective 1.1 – Maintain or increase the acreage of each of the following cover types: woodlands, grasslands, wetlands, riparian corridors.

Objective 1.2 – Prevent the introduction and spread of invasive species in the Red River Basin.

Objective 1.3 – Provide support for the continued existence of state/province and federally listed species as well as unique habitats through conservation of critical habitat.

Problem: Habitat Degradation

Goal 2: Restore and enhance natural processes and degraded habitat that support fish and wildlife.

Objective 2.1 – Improve connectivity between habitats, where appropriate.

Objective 2.2 – Increase biodiversity of native species, and promote the distribution of these species across the Red River Basin.

Objective 2.3 – Decrease the contaminants, nutrients and turbidity of waterbodies in the basin, where appropriate.

Objective 2.4 – Restore hydrology to provide additional geomorphic stability.

Objective 2.5 – Promote the integration of features that provide environmental benefits in projects with other primary purposes.

Objective 2.6 – Reduce the time, process and bureaucracy involved in environmental projects.

Problem: Unfamiliarity with Ecosystem Functions and Values

Goal 3: Develop opportunities for education to aid in the understanding and appreciation of fish, wildlife and natural processes.

Objective 3.1 – Establish an economic appreciation for the Red River Basin’s natural resources.

Objective 3.2 – Increase stakeholder and public knowledge of fish, wildlife and natural processes through environmental education and outdoor activities.

Objective 3.3 – Improve cultural competencies amongst various social and cultural groups in the Red River Basin.

A number of strategies and actions were identified that would fulfil the environmental objectives for the basin. Ultimately the group screened out actions that were insufficient or unacceptable. The final array of recommendations is provided in Table B-1 below:

Table B-1: Actions Recommended By the Fish, Wildlife and Ecosystem Health Group

Recommended Actions	
Goals	Actions
Conservation	Diversify Incentive Programs
	Improve Calculation of Incentives
	Enforce Laws and Regulations
	Continue Interbasin Meetings
	Update Wetlands Inventory
	Identify Regulatory Gaps
Restoration & Enhancement	Continue Interbasin Meetings
	Deauthorization of Projects
	Utilize Existing Programs (Appendix B-B)
Education & Public Engagement	Update Education Curriculum
	Increase Outdoor Activity Programs
	Increase/Replace Kiosks
	Multi-Agency Phone App

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1 INTRODUCTION

The U.S. Army Corps of Engineers (Corps) St. Paul District, in partnership with the North Dakota Red River Joint Water Resource District (RRJWRD), the Minnesota Red River Watershed Management Board (RRWMB) and the Red River Basin Commission (RRBC) has developed a Comprehensive Watershed Management Plan (CWMP)—a deliverable under the Corps’ specifically-authorized Red River Basin Feasibility Study (Feasibility Study)—for the Red River of the North Basin (also known as Red River Basin and RRB). This Fish, Wildlife and Ecosystem working group report is an appendix to the overall CWMP



The Red River of the North Basin

1.1 Framework

The Red River Basin CWMP framework is based upon the vision, goals and objectives outlined in the RRBC’s Red River Basin Natural Resources Framework Plan (NRFP) and supporting inventory reports. These reports, completed in 2005,

were developed with extensive stakeholder input and regional participation and using the best available data in the watershed. The CWMP builds upon this effort with a focus on six major resource areas:

1. Flood Risk Management and Hydrology
2. Fish, Wildlife and Ecosystem Health
3. Water Quality
4. Water Supply
5. Recreation
6. Soil Health

This working group report summarizes the Fish, Wildlife and Ecosystem focus area.

1.2 Red River of the North Watershed

The Red River Basin is an international, multi-jurisdictional watershed of 45,000 square miles, with 80 percent of the basin lying in the United States and 20 percent in Manitoba, Canada (Figure B-1). Eighteen Minnesota counties, twenty-two North Dakota counties, two South Dakota and one Canadian province lie wholly or partially in the basin. The economic impact of the basin, from both urban-

generated activity and a vibrant agricultural economy, is significant. This basin is home to more than half a million people and serves as a jobs, education and medical hub, in addition to a world-renowned agricultural producer.

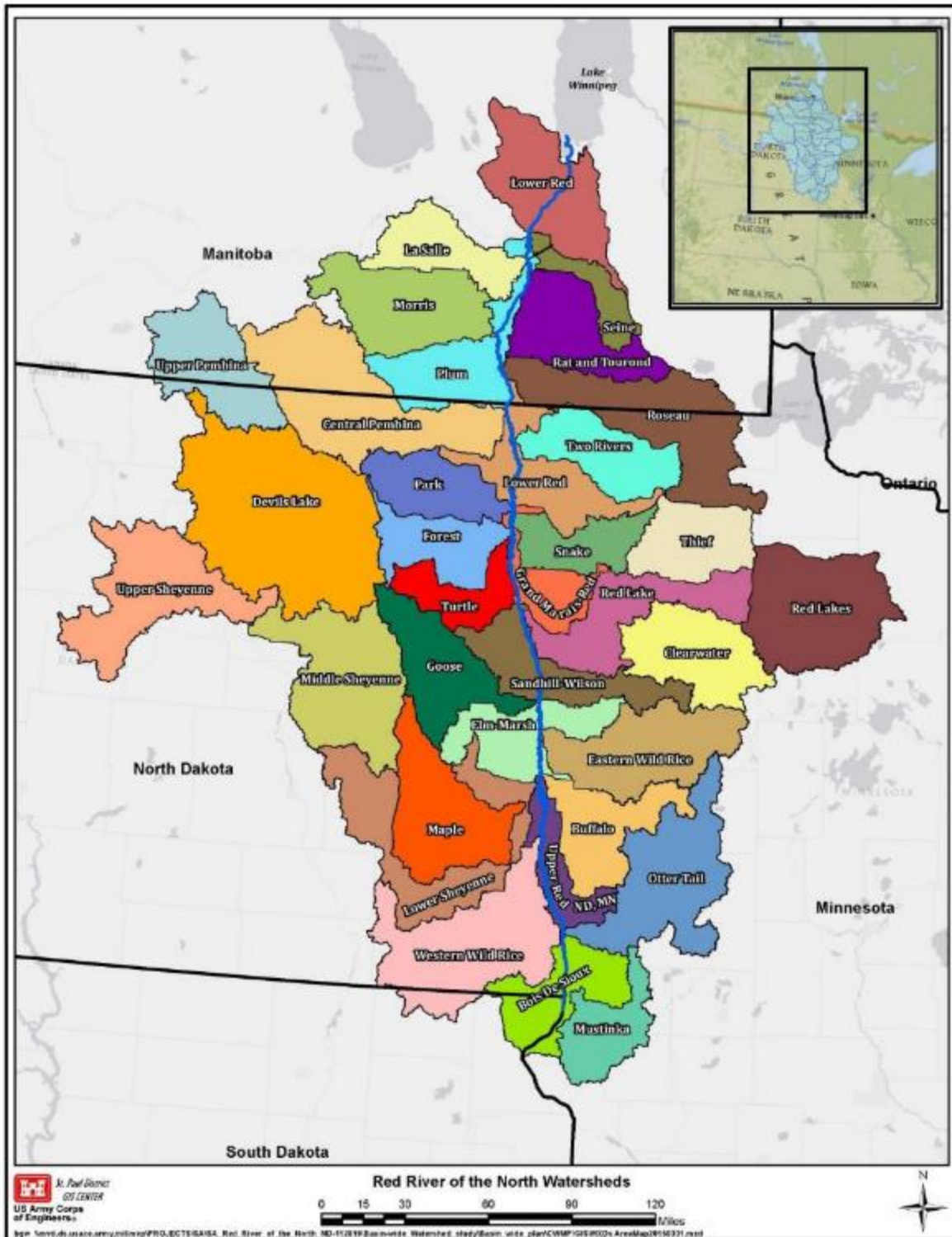


Figure B-1: Red River Basin

1.3 Working Group Process

Six working groups corresponding to each of the six CWMP resource areas were formed. The six CWMP groups worked closely with the existing RRBC's NRP working groups. A subject matter expert from the Corps was identified for each working group to serve as the secretary. The secretary role has the primary responsibility for writing the report. Each coordinating committee also included a facilitator or chair, in addition to subject matter experts from other agencies or stakeholder groups.

Each of the six resource areas collaborated with existing NRP working groups to perform iterations of the Corps' 6-step planning process and develop recommendations for each area. The collaboration and integration of the CWMP working groups and the RRBC's NRP working groups were done to economize efforts, leverage local resources, ensure collaborative stakeholder involvement, generate a broad set of solutions for multiple stakeholders and ultimately lead to comprehensive long-term recommendations and actionable solutions for the basin.

Over the course of two years, the working groups held various meetings to work through the 6-step planning process described in *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (1983) and the *Planning Guidance Notebook ER 1105-2-100* (April 2000). The six steps in the iterative plan formulation process are:

1. Specify the water and related land resources problems and opportunities of the study area;
2. Inventory and forecast existing conditions;
3. Formulate alternative plans;
4. Evaluate alternative plans;
5. Compare alternative plans; and
6. Select the recommended plan.

1.4 Fish, Wildlife and Ecosystem Working Group Composition

A variety of stakeholders, representing local, state and other federal agencies, as well as varied jurisdictional representation from North Dakota, Minnesota and Manitoba were included on each working group. A list of agencies involved with the Fish, Wildlife and Ecosystem Health working group is provided below.

- AAE Tech Services Inc.
- Emmons & Olivier Resources, Inc.
- International Institute for Sustainable Development
- Manitoba Department of Sustainable Development
- Minnesota Department of Natural Resources
- Minnesota Pollution Control Agency
- Natural Resources Conservation Service (U.S. Department of Agriculture)
- North Dakota Department of Health
- North Dakota Game and Fish Department
- North Dakota Parks and Recreation Department
- North Dakota State University
- Prairie Restorations, Inc.
- Red River Basin Commission
- Seine-Rat River Conservation District
- South Dakota Game, Fish and Parks

- The Nature Conservancy
- University of Manitoba
- University of Minnesota – Crookston
- University of Minnesota Extension and Northwest Regional Sustainable Development Partnership
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

2 BACKGROUND

2.1 Existing Information

Many studies, reports and planning documents have been produced regarding the basin's natural resources and environmental conditions. Key documents and resources include:

"A River Runs North: Managing an International River." Krenz, G. and J. Leitch, Red River Water Resources Council, 1998.

"A User's Guide to Natural Resource Efforts in the Red River Basin." Red River Flood Damage Reduction Working Group, 2001.

"Assessment of the Fish Assemblages and Habitat Quality in the Red River of the North, U.S. Mainstem Portion: Wahpeton to Pembina, ND." Prepared for U.S. Environmental Protection Agency, Region 8 Water Division, Denver, CO and the North Dakota Department of Health, Bismarck, ND by Midwest Biodiversity Institute, Columbus, OH, 2010.

"Development of Index of Biotic Integrity Expectations for the Lake Agassiz Plain Ecoregion." USEPA 905-R-96-005. Niemela, S., E. Pearson, T. Simon, R.M. Goldstein and P.A. Bailey, U.S. Environmental Protection Agency, Chicago, IL, 1998.

"Establishing a Foundation for Ecological Infrastructure Investments in the Red River Basin." Voora, V., Gislason R., Zubrycki K. and S. Perlmutter, International Institute for Sustainable Development, Winnipeg, MB, 2011.

"Inventory Team Report: Fish, Wildlife, and Outdoor Recreation." Red River Basin Board, Moorhead, MN, 2000.

"Minnesota Prairie Conservation Plan." Minnesota Prairie Plan Working Group, Minnesota Prairie Plan Working Group, Minneapolis, MN, 2011.

"Red River Basin Natural Resources Framework Plan." Red River Basin Commission, Moorhead, MN and Winnipeg, MB, 2005.

"Red River of the North Fisheries Management Plan." Minnesota Department of Natural Resources, North Dakota Game and Fish Department, Manitoba Water Stewardship, and South Dakota Department of Game, Fish and Parks, 2008.

"State of Lake Winnipeg, 1999-2007." Government of Canada, Manitoba Water Stewardship, 2011.

"Watershed Health Assessment Framework." Minnesota Department of Natural Resources, online at <http://www.dnr.state.mn.us/whaf/index.html>, 2015.

2.2 Environmental Setting

2.2.1 Climate

The climate of the Red River Basin can be categorized as a humid continental climate, with warm to hot summers and cold winters (Belda et al. 2014; Peel et al. 2007).

Temperatures have ranged from a maximum of 118 °F (48 °C) in August, to minimums of -55 °F (-48 °C) in January and February (Krenz and Leitch 1998). The annual mean

temperature ranges from 35 °F (2 °C) in the north near Lake Winnipeg (Government of Canada et al. 2011) to 43 °F (6 °C) in the southern end of the basin (High Plains Regional Climate Center 2015). High temperatures of 85 to 90 °F (29 to 32 °C) are common in summer while subzero temperatures are often experienced in the winter months. The number of growing degree days ranges from 1481 in the northern part of the basin to 2047 in the south (based on 41 °F/5 °C; New et al. 2000). Such weather extremes are typical of continental climate.

The climate of the Red River Basin can be categorized as a humid continental climate, with warm to hot summers and cold winters.

The average annual precipitation ranges from just under 17 inches (43 centimeters) per year in the western portion of the basin to over 26.5 inches (67.3 centimeters) per year in the east (PRISM Climate Group 2015). About three-fourths of the basin's precipitation occurs as rainfall during April through September, and almost two-thirds comes during May, June and July. November through February are the driest months, with precipitation averaging about one-half inch per month (Krenz and Leitch 1998).

The basin experiences nearly continuous wind. Air masses originating in northern Canada, the northern Pacific and in the tropical regions of the south all pass through the region regularly. The weather fronts associated with these air masses causes windy conditions and can result in large daily temperature fluctuations (Arguez et al. 2010).

2.2.2 Land Cover/Land Use

Land cover/land use data can be used to display and analyze the distribution of resources and land use in a given area. Complete coverage of land cover/land use data from a single source was only available at very coarse resolution (250 meters; Commission for Environmental Cooperation 2013) for the entire basin. This resolution would not have been adequate to determine the smaller-scale changes in habitat that typically occur in the basin. Higher resolution (30 meters) data from the U.S. Geological Survey (USGS) 2011 National Land Cover Database (NLCD) (Homer et al. 2015) and the Agriculture and Agri-Food Canada (AAFC) 2011 Crop Inventory were combined by generalizing land cover classes into similar categories (Figure B-2).

The Red River Basin is a highly agricultural region. Nearly 70 percent of the basin is used for agricultural purposes (row crops, pastures and haying lands) (Table B-2). Woodlands, wetlands, developed areas, grasslands and water make up the remaining area with 12, 7, 5, 4 and 4 percent coverage, respectively. The distribution of cover types between the United States and Canada is also similar, with agricultural land covering the majority of the basin and the occurrence of woodlands becoming more frequent in the extreme eastern portion of the basin.

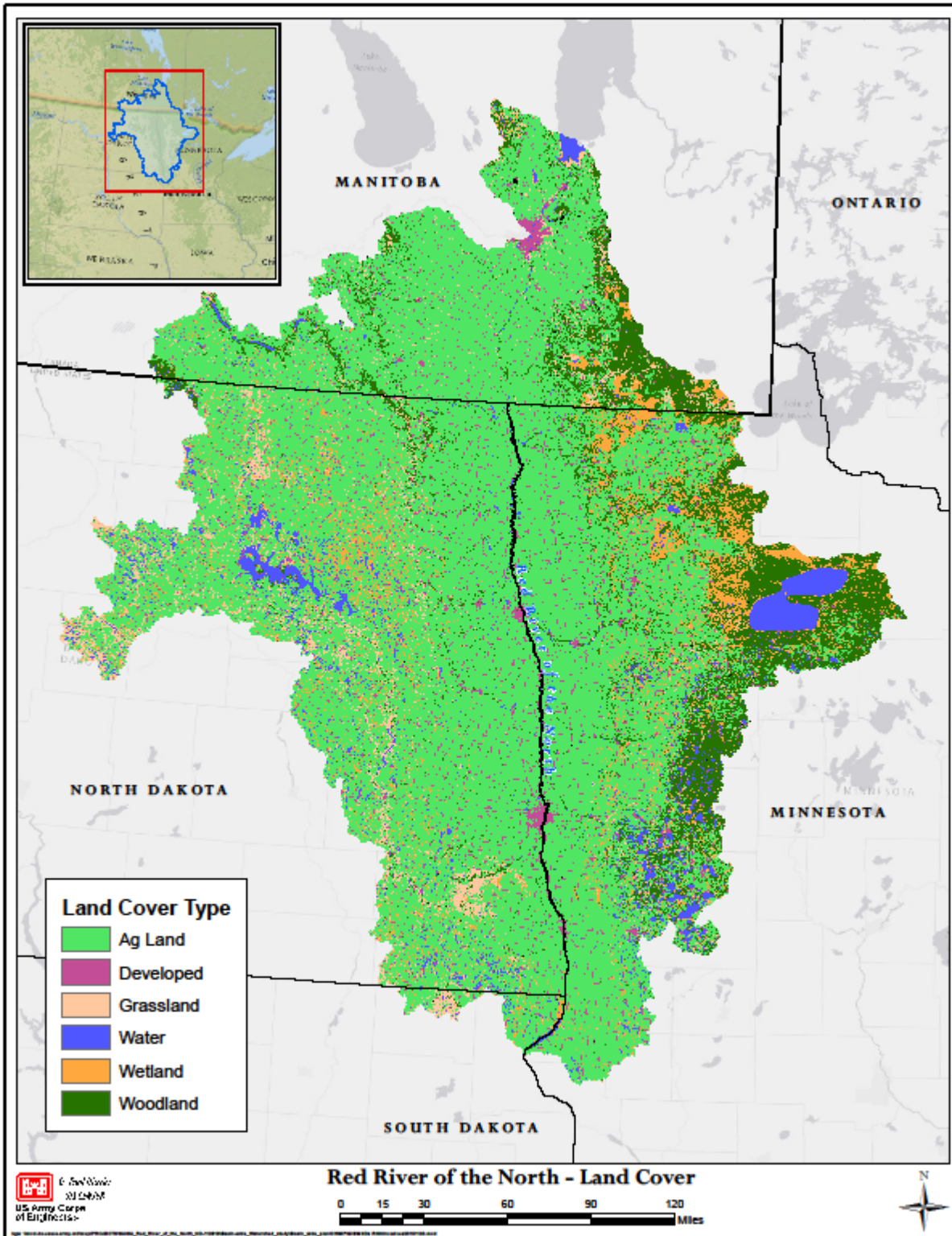


Figure B-2: Land Cover of the Red River Basin

Table B-2: Distribution of Land Cover/Land Use Across the Red River Basin (RRB)

Cover Type	RRB Acreage	RRB Coverage	U.S. Acreage	U.S. Coverage	Manitoba Acreage	Manitoba Coverage
Ag Land	21,555,349	69%	17,060,935	68%	4,494,414	71%
Woodland	3,661,563	12%	2,670,252	11%	991,311	16%
Wetland	2,067,808	7%	1,889,351	8%	178,457	3%
Developed	1,438,712	5%	1,164,408	5%	274,304	4%
Grasslands	1,362,385	4%	1,080,114	4%	282,271	4%
Water	1,294,070	4%	1,191,368	5%	102,702	2%
No Class/Barren	20,335	0%	6,783	0%	13,552	0%
Total Acres	31,400,223		25,063,211		6,337,012	

2.2.3 Habitat

2.2.3.1 Terrestrial Ecoregions

While land cover data is a good way to show the current distribution of land use, it does not necessarily reflect the natural habitat potential for the basin. A number of different classification systems have been developed to describe ecological patterns at the regional, national and international levels. These classes, often referred to as ecoregions, are defined by a variety of important ecological attributes that can include, but are not limited to, climate, vegetation, wildlife, biological complexity, geomorphology, hydrology and geology (Bailey 1995; Olson et al. 2001; Omernik 1987; Wilken et al. 2011).

For the purposes of this report, the ecoregions as described in *North American Terrestrial Ecoregions—Level III* will be used (Wilken et al. 2011). Descriptions of the Wilken et al. ecoregions have been slightly modified in this document to more accurately portray conditions in the Red River Basin.

A total of seven ecoregions encompass the Red River Basin (Figure B-3; Table B-3). Approximately 83 percent of the basin falls into ecoregions that would naturally support prairie flora and fauna: the Lake Manitoba and Lake Agassiz Plain, the Aspen Parkland/Northern Glaciated Plains and the Northwestern Glaciated Plains Ecoregions. The remaining 17 percent of the basin is made up of ecoregions that can be described as forested or mixed forest areas. These ecoregions include the Northern Minnesota Wetlands, North Central Hardwood Forests, Northern Lakes and Forests and Mid-Boreal Lowland and Interlake Plain Ecoregions. A detailed description of each ecoregion is provided on the following pages.

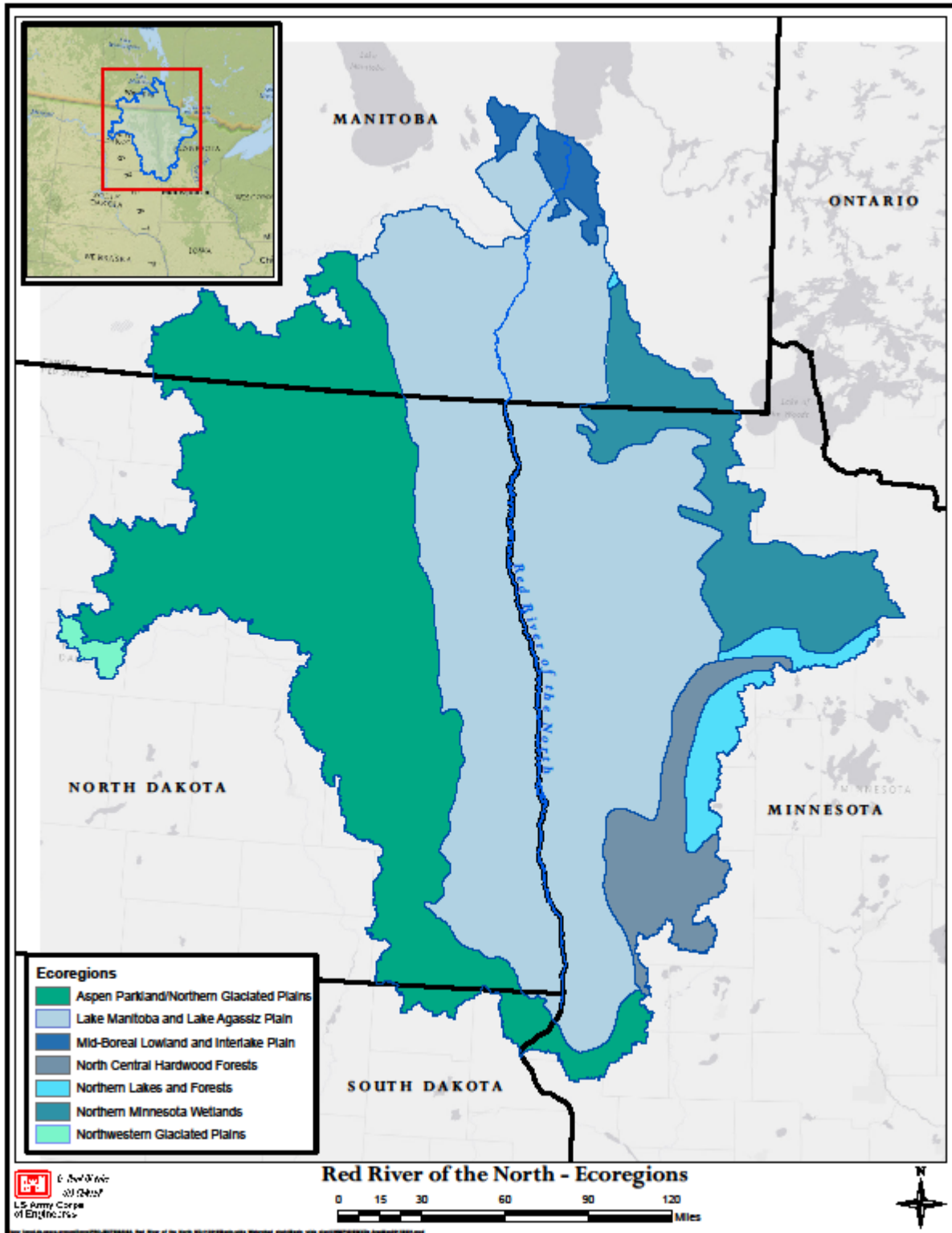


Figure B-3: Red River of the North – Ecoregions

Table B-3: Ecoregions of the Red River Basin

Ecoregion	General Habitat Description	Acres	Percentage of Basin
Lake Manitoba and Lake Agassiz Plain	Prairie	14,795,495	47.2%
Aspen Parkland/Northern Glaciated Plains	Prairie	10,963,161	35.0%
Northern Minnesota Wetlands	Forest/Wetland	2,682,254	8.6%
North Central Hardwood Forests	Forest	1,513,344	4.8%
Northern Lakes and Forests	Forest	764,419	2.4%
Mid-Boreal Lowland and Interlake Plain	Forest	455,425	1.5%
Northwestern Glaciated Plains	Prairie	151,228	0.5%

Lake Manitoba and Lake Agassiz Plain

This ecoregion makes up nearly half of the Red River Basin. It stretches down the center of the basin, encompassing the Red River Valley and following the river with a north/south orientation. The terrain is extremely flat with higher elevations in the south and lower elevations to the north. Moraine and lacustrine deposits cover the valley’s low relief. Glacial Lake Agassiz and a series of proglacial lakes that came before it, left a thick bed of lake sediment on top of glacial till.

The Canadian portion is a mosaic of trembling aspen/oak groves and rough fescue grasslands. In the United States, riparian areas have cottonwood, willow, bur oak, green ash and elm. The historic tallgrass prairie has been replaced by intensive row crop agriculture. Cropland is extensive, with potatoes, beans, sugar beets, wheat, spring wheat, barley, canola, sunflowers, corn and soybeans. Some hunting and water-oriented recreation are also significant land uses.

Low density, low gradient stream and river networks cross the area and are part of the Red River watershed; late winter flooding is common. In some areas, ditching and channelization has been completed, mostly for agricultural purposes.

Wildlife in the region includes significant waterfowl, as well as white-tailed deer, coyote, red fox, jackrabbit, cottontail rabbit, raccoon, muskrat, sharp-tailed grouse, ring-tail pheasant, geese, ducks, perch, walleye, channel catfish and ground squirrel.

Aspen Parkland/Northern Glaciated Plains

This ecoregion makes up the western third of the basin and the majority of the basin that lies in North Dakota. The region features flat to gently rolling plains composed of glacial moraine. There are areas of lacustrine and hummocky to ridged fluvioglacial deposits; the typical bedrock is composed of Tertiary and Cretaceous sandstones and shales.

In its native state the landscape was characterized by trembling aspen, oak groves, mixed tall shrubs and intermittent fescue grasslands. Bur oak and grassland communities occupied drier sites. Many areas had transitional grassland containing tallgrass and shortgrass prairie, including big and little bluestem, green needlegrass, blue grama, western wheatgrass and switchgrass. Soils are very fertile in this ecoregion and represent some of the most productive agricultural land in the basin. It produces a wide diversity of crops, including spring wheat, flax, rye, barley, oats, corn, soybeans and sunflowers, as well as forages and several specialty crops.

There is a low density of streams and rivers across the area. High concentrations of temporary and seasonal wetlands create favorable conditions for waterfowl nesting and migration. Many of these seasonal wetlands have been drained for agricultural use.

There are major habitats in this ecoregion for waterfowl. It provides a major breeding habitat for waterfowl and includes habitat for white-tailed deer, coyote, snowshoe hare, cottontail, red fox, northern pocket gopher, Franklin's ground squirrel and bird species like sharp-tailed grouse and black-billed magpie.

Northern Minnesota Wetlands

This ecoregion spans the international border on the east-northeastern edge of the basin. Flat and irregular plains scattered with vast and nearly level marshes characterize the region. This area was formerly occupied by broad glacial lakes and even today is mostly covered with standing water.



A tributary to the Red River of the North

The peat soils occurring on the former lakebed possesses a mix of conifer/bog forest and boreal forest vegetation. Common species are white spruce, black spruce and balsam fir. There are also areas of maples and white pine. Successional areas contain aspen, paper birch and jack pine.

Characteristic wildlife species include black bear, gray wolf, white-tailed deer, snowshoe hare, mink, river otter, bald eagle, osprey, common loon, walleye and northern pike.

This area has a relatively small human population. Principal land uses include forestry, recreation, hunting, fishing and some minor areas of mixed farming and grazing.

North Central Hardwood Forests

The North Central Hardwood Forests



The Red River of the North

occur in the southeastern portion of the basin. This ecoregion is transitional between the predominantly forested regions to the north and lands dominated by agriculture to the south and west. This area includes lacustrine basins and glacial lake outwash plains. The land use is a mosaic of forestland, cropland and pasture. Vegetation consists of oak savanna, oak-hickory forests, maple-basswood forests, northern hardwoods of maple, beech and birch are the dominant forest types.

The area possesses a high density of perennial streams, wetlands and lakes but less than that of areas to the north. Surface waters are generally more nutrient-rich than forested regions to the north but less eutrophic than regions to the south.

Bison, elk and wolf were once abundant in this ecoregion. White-tailed deer, coyote, gray fox, red fox, beaver, raccoon, fisher, otter, mink, gray squirrel, wild turkey, sandhill crane, turkey vulture, ruffed grouse, Canada goose, northern pike, walleye and sunfish are often found in this area.

Northern Lakes and Forests

A small patch of the Northern Lakes and Forest Ecoregion lies on the eastern edge of the Red River Basin. Moderate to low gradient perennial streams are typical. Wetlands are widespread. The numerous glacial lakes are clearer and less productive than those found in ecoregions to the south. Glaciated, irregular plains and morainal plains and hills are found in this area. Row crops, cattle farming, recreation, tourism and hunting and fishing are typical for this area.

Forest types are mostly coniferous and northern hardwood forests with sugar maple, red maple, paper birch, yellow birch, aspen, white spruce, balsam fir, hemlock, eastern white pine, jack pine and red pine. Cooler and wetter sites have black spruce, tamarack and northern white cedar. This area is rich in wildlife and includes pileated woodpecker and muskellunge in addition to many of the species listed in the North Central Hardwood Forests Ecoregion.

Mid-Boreal Lowland and Interlake Plain

A small portion of this ecoregion exists in the extreme northern end of the basin, between the city of Winnipeg and Lake Winnipeg. This area is comprised of flat lowlands that are mantled by glacial moraine and lacustrine deposits. The area is heavily farmed with main crops consisting of spring wheat, other cereal grains, oilseeds and hay.

Native vegetation consists of tall to low trembling aspen stands with some balsam poplar, an understory of tall shrubs and a ground cover of mixed herbs. White spruce and balsam fir are the climax species but are not well represented. Open stands of tall jack pine occur on dry, sandy sites. Depressions are water-filled or are covered with sedges, willow, some black spruce and tamarack.

The area provides habitat for white-tailed deer, black bear, moose, beaver, coyote, snowshoe hare and eastern cottontail, as well as for waterfowl and colonial water birds like cormorant, gull, tern, heron, American white pelican and grebe.



The Red River of the North

Northwestern Glaciated Plains

A very small portion of the basin (0.5 percent) lies within the Northwestern Glaciated Plains Ecoregion. This region, in central North Dakota, is the transitional area between more consistent moisture and agriculture to the east and a harsher, drier climate to the south and west. Streams in this area are mostly intermittent. High concentrations of semi-permanent and seasonal wetlands, known as prairie potholes, are also found in this area. The land surrounding many of these potholes is often farmed for cereal grains and oilseeds or used as rangeland for cattle.

Spear grass, blue grama grass and wheatgrass were once dominant native grasses that covered many parts of this landscape. A variety of shrubs and herbs were also common as well as some sagebrush. Scrubby aspen, willow, cottonwood and boxelder are also found on shaded slopes.

2.2.3.2 Aquatic Habitat

Historically, intermixed upland and aquatic habitats provided a dynamic mosaic that provided landscape and watershed functions. These habitats consisted of meandered streams and rivers making up pristine riparian areas with narrow gallery forests along the water's edge (Red River Basin Board 2000). Low depressions throughout the basin provide ponding areas that have formed numerous lakes and wetlands.

Riverine Habitat

The Red River (also known as Red River of the North) is the largest river in the Red River Basin, running longitudinally from south to north. It flows 540 miles (870 kilometers) from the United States into Canada, varies 233 feet (71 meters) in elevation and has a slope ranging from less than 1.3 feet/mile (44 millimeters/kilometer) at the headwaters of Minnesota to less than one-fourth feet/mile (40 millimeters/kilometer) at the International Boundary (Deschamps et. al 2002). The Red River contains high concentrations of suspended sediment, partly due to runoff from agricultural lands. The Red River contributes only 14 percent of the flow, but 65 percent of the nutrients into Lake Winnipeg (McCullough, personal communication). High concentrations of phosphorous lead to large algal blooms in clearer downstream waters, like Lake Winnipeg. Due to its high turbidity, there are few submerged macrophytes in the main-stem (TetrES Consultants Inc. 2006), while bulrushes and cattails are common in the backwater areas of the Red River watershed.

The Red River is the largest river in the Red River Basin. It flows 540 miles from the United States into Canada.

Many of the small to moderately sized rivers in the Red River Basin have been severely altered or eliminated (North/South Consultants Inc. 2010). These rivers are characterized as having mean annual discharges of 35 to over 700 feet³/second (1 to 20 meters³/second). Fine substrates of silt and clay make many of these waters highly productive and able to support a diversity of fish. The headwaters of streams in the basin include rapids, pool, runs, fall and riffle habitats along with cobbles and boulder substrate. They provide spawning, nursery, foraging and overwintering areas for large and small fish. The larger tributaries to the Red River include the Bois de Sioux, Wild Rice (in both Minnesota and North Dakota), Sheyenne, Elm, Turtle, Otter Tail, Buffalo and Red Lake Rivers in the United States, the La Salle and Seine Rivers in Canada, as well as the Pemina and Roseau Rivers, which flow across international borders.

Lakes

The Red River Valley Lake Plain contains thousands of lakes that are magnets for tourists participating in various forms of recreational activities such as boating, fishing, hunting and other outdoor activities. The

central corridor of the Red River Valley, however, is mostly void of lakes. The majority lakes are found outside the beach ridges, near the exterior reaches of the basin.

Larger lakes in the basin include the upper impounded area of Lake Traverse (southern basin along the Minnesota/South Dakota border), Devils Lake (western basin in central North Dakota), Upper and Lower Red Lakes (eastern basin in north-central Minnesota) and the lower end of Lake Winnipeg (northern basin in central Manitoba). A high density of lakes that attracts many vacationers to the eastern portion of the basin is known as the “Lakes Area.” The Lakes Area is largely composed of Ottertail and Becker Counties in Minnesota, which together encompass nearly 2,000 lakes.

Wetlands

Wetlands are often referred to as “environment’s kidneys.” Wetlands filter out toxic chemicals and nutrients from water systems, keeping lakes, streams and aquifers clean. They also slow erosion, reduce floodwaters and allow for groundwater recharge. Due to extensive draining and development, many of the basin’s wetlands have been lost. According to the Sierra Club, up to 98 percent of wetlands have been lost in the Red River Valley (1998). The majority of existing wetlands in the basin are not located in the valley, but outside of the beach ridge.

There are no comprehensive inventories of wetlands for the entire Red River Basin. In the United States, the National Wetlands Inventory (NWI) is the best available dataset (Figure B-4). In Canada, efforts to create a comprehensive wetland inventory have begun but are currently in development.

The original NWI was created through a U.S. Fish and Wildlife Service (USFWS) program based on aerial photographs from the 1970s and 1980s. Land use changes and development have significantly altered the landscape since that time and most consider the NWI to be out-of-date. The Minnesota Department of Natural Resources (DNR) has initiated efforts to update the NWI for the entire state. The portion of the state in the Red River Basin is slated for completion in 2019.

Despite these shortfalls, the NWI does help give an indication as to the distribution and intensity of wetlands across larger landscapes, and therefore, was used to inventory of the basin’s wetlands in this document. According to the NWI database, the United States portion of the Red River Basin has just short of three million acres of wetlands. The distribution of the wetland acreage in the Red River Basin is 69.5, 29.5, and 1 percent for Minnesota, North Dakota and South Dakota, respectively.

Ducks Unlimited Canada, Environment Canada, the Canadian Space Agency and the North American Wetland Conservation Council established the Canadian Wetland Inventory (CWI) in 2002 to fill the information gap on Canada’s wetlands. In the Red River Basin; however, only the very eastern portion has been mapped at this time.

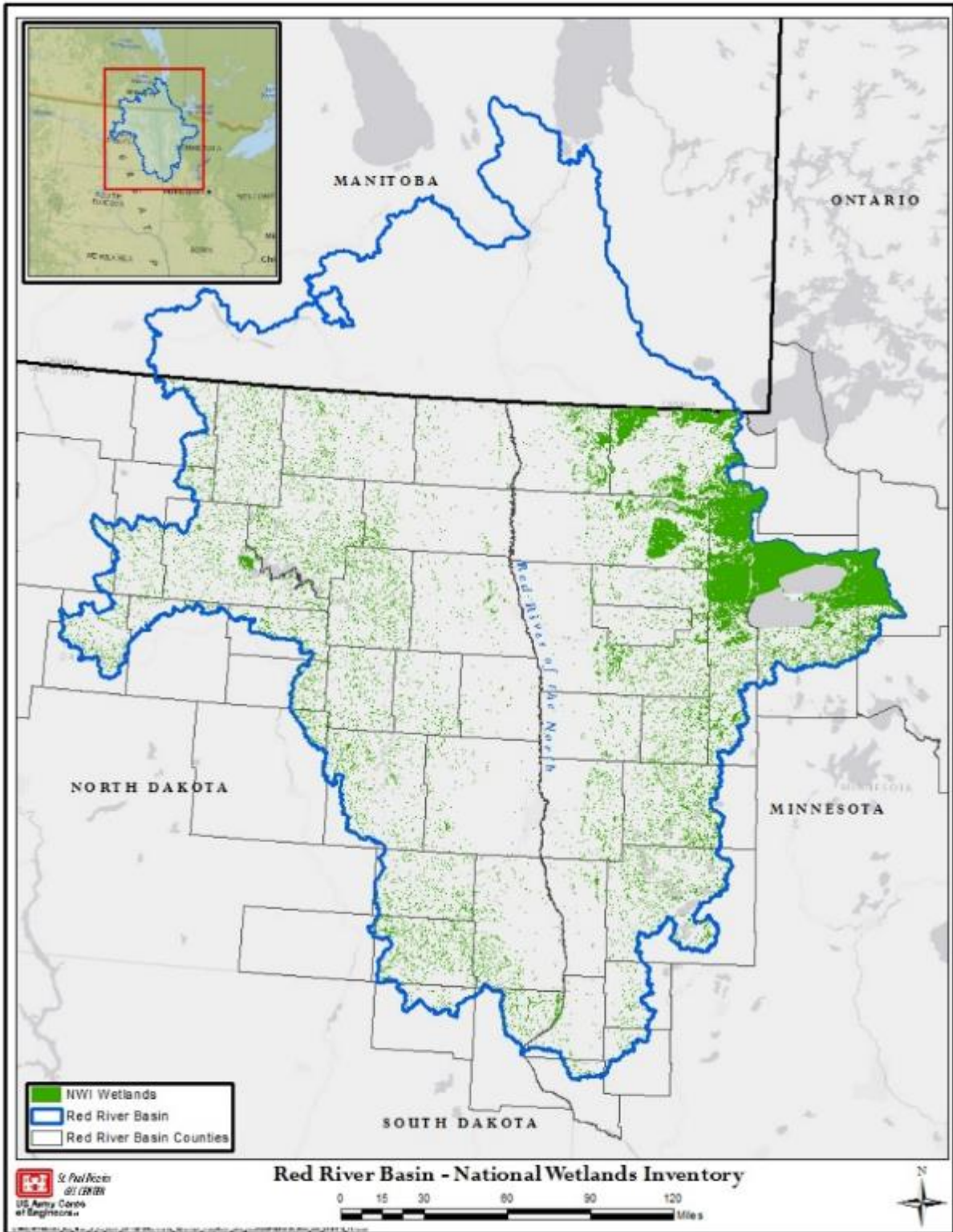


Figure B-4: National Wetlands Inventory Map of the Red River Basin

2.2.3.3 Unique and Important Habitats

2.2.3.3.1 Tallgrass Prairie and Prairie Pothole

Much of the basin was historically dominated by prairie. This expansive grassland habitat evolved in areas where trees generally could not survive due to frequent grazing, wildfires and drought. Tallgrass prairie was named from the dominant grasses like big bluestem, switchgrass and Indiangrass, which can grow from 3 to 7 feet tall. On the western edge of the Red River Basin, prairie habitat becomes a mix of tallgrass and shortgrass prairie (Figure B-5).

The entire prairie region of the basin can also be described as prairie pothole habitat (Figure B-6). Glaciers moving across the basin scoured out millions of depressions in the landscape. As the glaciers retreated the depressions filled with water. These “potholes” range in size from small ponds to large glacial lakes (USFWS 2013). Wetland complexes are a critical part of the landscape, providing ecological, social and economic value. The prairie pothole region is especially important to waterfowl. Though it makes up only 10 percent of the breeding habitat in North America in terms of acreage, it produces 50 percent of the continent's waterfowl (USFWS 2013).

2.2.3.3.2 Riparian Habitat

Riparian areas are the transition zone between surface waters and terrestrial habitat. They are made up of a variety of trees, shrubs, grasses and forbs. Riparian zones are an important source of food and cover, improve water quality and provide valuable habitat for a wide range of birds and other wildlife species. Deciduous trees are often found in the basin's riparian areas. Common tree species include American elm, green ash, box elder, bur oak, aspen and ironwood (Herman and Johnson 2008a). Most of the deciduous forests in the North Dakota portion of the basin occur within riparian zones.

2.2.3.3.3 Beach Ridge/Calcareous Fens

The ancient Glacial Lake Agassiz covered as much as 170,000 square miles (440,000 kilometers²; Fisher and Smith 1994) including much of the Red River Basin. Narrow ridges with sand and gravel deposits formed along the perimeter of the lake creating the unique formations now referred to as the “beach ridge.” The beach ridge is an important region in the basin. The prairie/wetland complexes and the rolling terrain provide important groundwater recharge and discharge zones. Calcareous fens, saline seeps and other unusual formations that occur along the beach ridge create habitats that are home to rare and unique species. The beach ridge's thin and rocky soils have also allowed some of the basin's native prairie to survive as they have been omitted from agricultural development. In addition, much of the highest quality spawning habitat for fish species requiring swifter currents and larger substrates, such as walleye and lake sturgeon, is found in Red River tributaries flowing through the beach ridge.

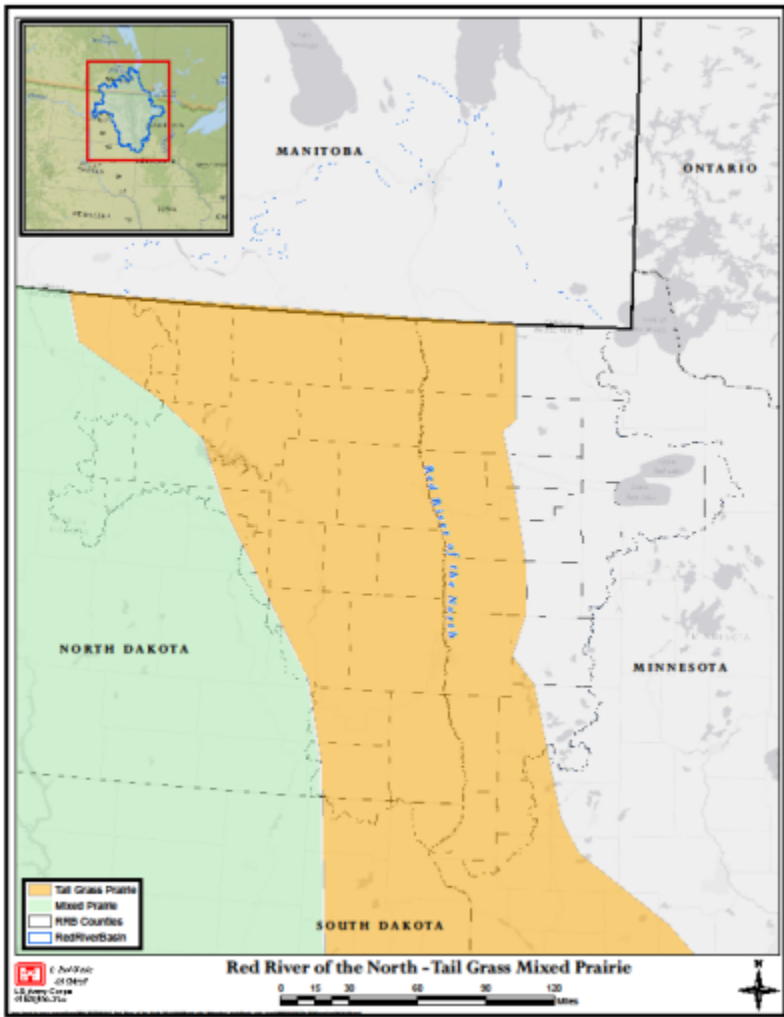


Figure B-5: Prairie Regions of the Red River Basin

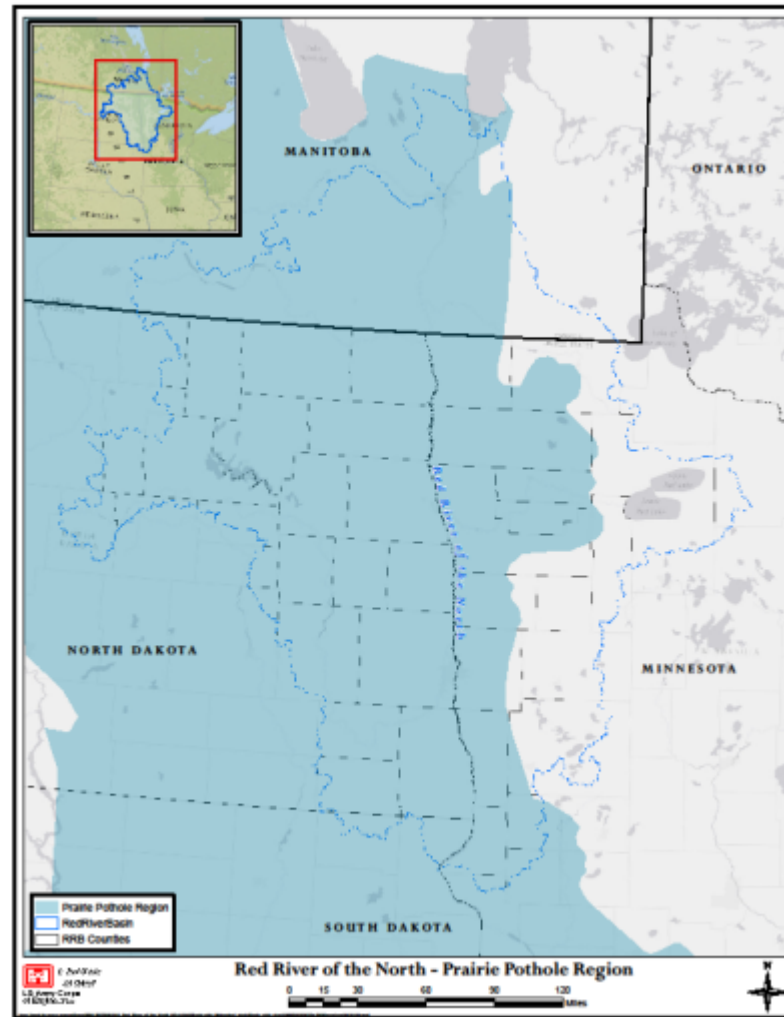


Figure B-6: The Prairie Pothole Region

2.2.4 Fish and Wildlife

2.2.4.1 Fish

The Red River Basin is home to 87 fish species. Major game species include channel catfish, walleye, sauger, smallmouth bass and northern pike. Other notable species include black bullhead, brown bullhead, lake sturgeon, freshwater drum, goldeye, mooneye and common carp.

The Red River is an important fishery locally but also receives visits from destination anglers traveling more than 500 miles (Brooks and Gangl 2012). The most frequently caught and harvested fish in the Red River is the channel catfish, followed by walleye, northern pike and sauger. The Red River is renowned for its channel catfish fishery (Minnesota DNR, 2014). Channel catfish in excess of 20 pounds are not uncommon, with some fish reaching over 30 pounds.



A survey crew fish sampling

The lake sturgeon is a fish species that has gained much attention in recent years due to its return to the basin. Once a common species in the Red River and some of its tributaries, the lake sturgeon was effectively extirpated from the watershed by the mid-1900s. Recent efforts by the Minnesota DNR have focused on restoring the lake sturgeon population in the Red River and its tributaries. Stocking of juvenile sturgeon began in 1997. Fry and fingerlings have been stocked annually since 2002. The reintroduction program has begun to see results of these effort with rare catches being reported by anglers. The program continues to move forward with a goal of establishing a self-sustaining population in the Red River Basin.

2.2.4.2 Wildlife

Wildlife species found in the basin are typically tolerant of human activities and are well adapted to agricultural landscapes. Common species include the white-tailed deer, ring-necked pheasant, wild turkey, jack rabbit, squirrel, raccoon, bald eagle and a number of waterfowl species.

Several species were extirpated or significantly reduced following the settlement of the basin. During this time much of the basin's grasslands were converted to agriculture. In addition, animals were overharvested for food and their value in the fur trade. Bison, antelope and other wildlife dependent on large blocks of open continuous grasslands vanished from the basin. Elk, wolves and bear were also extirpated or significantly reduced in numbers but have been able to rebound to varying degrees from reintroduction and conservation efforts.

2.2.4.3 Macroinvertebrates

Macroinvertebrates include a wide variety of creatures such as snails, worms, mussels, crayfish, beetles, aquatic insects (mayflies, stoneflies, caddisflies, midges, etc.), bees and butterflies, among others. They are extremely important ecologically as they drive the balance and flow of energy and nutrients. The benefits provided by macroinvertebrates are vital to many of the basin’s activities but go largely unnoticed. Macroinvertebrates provide food for larger organisms, increase the fertility of soils by processing dead or decaying matter, allow crops and plants to produce grains and fruit through pollination and can be used as indicators for stream health.

Macroinvertebrates are extremely important ecologically as they drive the balance and flow of energy and nutrients.

2.2.4.4 Listed Species

Both the United States and the Canadian governments have special laws and regulations protecting at-risk species. In the United States, the USFWS lists species for protection under the Endangered Species Act. In Canada, species are protected when determined to be nationally at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) which may trigger a listing under the Canadian Species at Risk Act (SARA).

2.2.4.4.1 U.S. Fish and Wildlife Service Listed Species

As of September, 2016, there were nine species in the Red River Basin labeled by the USFWS Endangered Species Program as proposed, candidate, threatened or endangered (Table B-4). Two species, the piping plover and the gray wolf, had multiple status designations (endangered and threatened) at different locations within the basin.

Table B-4: USFWS Federally Listed Species in the Red River Basin (RRB)

Group	Name	Federal Status	Critical Habitat in RRB
Bird	Piping Plover (<i>Charadrius melodus</i>)	Threatened	Yes
Bird	Red Knot (<i>Calidris canutus rufa</i>)	Threatened	No
Bird	Whooping Crane (<i>Grus americana</i>)	Endangered	No
Flowering Plant	Western Prairie Fringed Orchid (<i>Platanthera praeclara</i>)	Threatened	No
Insect	Dakota Skipper (<i>Hesperia dacotae</i>)	Threatened	Yes
Insect	Poweshiek Skipperling (<i>Oarisma poweshiek</i>)	Endangered	Yes
Mammal	Canada Lynx (<i>Lynx canadensis</i>)	Threatened	No
Mammal	Gray Wolf (<i>Canis lupus</i>)	Endangered & Threatened	Yes
Mammal	Northern Long-eared Bat (<i>Myotis septentrionalis</i>)	Threatened	No

Specific geographic areas that contain features essential for the conservation of a threatened or endangered species may be identified as critical habitat. The gray wolf, piping plover, Dakota skipper and Poweshiek skipperling all have areas designated as critical habitat in the Red River Basin.

Piping Plover

The piping plover is a small migratory shorebird. Historically, piping plovers could be found throughout the Atlantic Coast, Northern Great Plains and the Great Lakes. Drastically reduced, sparse populations presently occur throughout this historic range. In the basin, the piping plover is known to occur near Devils Lake in North Dakota. Piping plover's critical habitat is composed of vegetated shoreline beaches, peninsulas and islands with sand, gravel or shale, in addition to the adjacent shallow water areas. Critical habitat in the basin has been designated in several locations to the west of Devils Lake.

Rufa Red Knot

The rufa red knot is a small-medium shorebird that migrates long distances between summer and wintering grounds. Rufa red knots travel more than 9,300 miles each way between Tierra del Fuego in the winter and above the Arctic Circle for summer breeding. The long migration routes require regular stopover points, referred to as staging areas, for feeding. Rufa red knots return regularly every year to these staging areas, among which are the North Atlantic seaboard horseshoe crab breeding grounds—specifically on the Delaware Bay and the Cape May Peninsula—where the birds feed on the crab eggs. Commercial fisheries in these areas, however, have significantly reduced the production of horseshoe crab eggs, which has been a major factor in the decline of the species and has prevented the red rufa from being able to maintain viable population levels. Potential suitable staging areas occur throughout central North Dakota and include Devils Lake and the surrounding area within the basin. USFWS has not designated critical habitat for rufa red knot.

Whooping Crane

The whooping crane is the tallest bird in North America. Whooping cranes migrate between summer habitat in central Canada and its wintering grounds on the Texas coast. During its migration, this species is found throughout the Midwest and Rocky Mountains regions, including a wide band through North and South Dakota. They use shallow, seasonally and semi-permanently flooded Palustrine (marshy) wetlands for roosting and various cropland and emergent wetlands for feeding. During migration, whooping cranes are often recorded in riverine habitats. Currently there are three wild populations of whooping cranes in the United States, yielding a total population of about 383. Of these three populations, only one is self-sustaining. The USFWS has designated critical habitat for whooping crane but none in the Red River Basin.

Western Prairie Fringed Orchid

The western prairie fringed orchid is a perennial herb found in terrestrial areas throughout the Midwest in calcareous prairies and sedge meadows. The persistence of the orchid is dependent on periodic disturbance by fire, mowing or grazing. Known pollinators of the species is limited to few species of sphinx moths. The conversion of western prairie fringed orchid habitat to cropland has been listed as the greatest to the species. The orchid can be found near calcareous fens and sedge meadows in a number of counties adjacent to the Red River. No critical habitat has been designated for the western prairie fringed orchid.

Dakota Skipper

The Dakota skipper is a northern prairie butterfly species. Most of the native prairie habitat throughout the species' historical range has been lost and converted to agriculture. As a result, the Dakota skipper is

now a rare and localized species, dependent upon high-quality native prairie remnants in Minnesota and the Dakotas. There are a number of locations that could potentially provide Dakota skipper habitat in the basin. Critical habitat for the species has been designated in various areas, including the Lake Bronson and the Buffalo River State Parks in Minnesota.

Poweshiek Skipperling

The Poweshiek skipperling is a small, slender-bodied butterfly. Habitat for the butterfly consists of prairie fens, grassy lake and stream margins, moist meadows and wet-mesic to dry tallgrass prairie. Conversion of prairie to agriculture is likely the most influential factor in the decline of the species. Surveys at sites where these butterflies are known to occur have shown a dramatic decline in recent years, with many of the surveys failing to produce any sightings. The Poweshiek skipperling is considered to have limited mobility and is not likely to travel across habitat that does not resemble native prairie, restricting dispersal and making recolonization of isolated habitat unlikely. Poweshiek skipperlings are likely or known to occur in parcels of remnant prairie habitat in the southern and central areas of the basin. Almost all prairie remnants with Poweshiek skipperling populations are associated with gravelly glacial till soils, similar to what can be found long the Red River Basin's beach ridge. Critical habitat has been designated at a number of sites in the basin, including the Lake Bronson and the Buffalo River State Parks in Minnesota.

Canada Lynx

The lynx is a medium-sized furry cat with long legs and large paws, making it highly adapted for hunting in deep snow. It is closely associated moist boreal forests that have cold, snowy winters and a high-density of snowshoe hare prey base. Lynx are sensitive to human disturbance and have been adversely impacted by timber harvest, recreation and high traffic roads throughout their range. In the Red River Basin, lynx occur in heavily forested areas of northern Minnesota and southern Manitoba. There is no critical habitat for the Canada lynx in the Red River Basin.

Gray Wolf

The gray wolf is the largest wild canine species in North America. Gray wolves are most abundant throughout northern Canada, Alaska, and the forested areas of Northern Michigan, Minnesota and Wisconsin and have been re-introduced to Yellowstone National Park in Wyoming. Historically, its preferred habitat includes biomes such as boreal forest, temperate deciduous forest and temperate grasslands. Gray wolves live in packs of up to 21 members, although some individuals will roam alone. While predominantly forested portions of the basin in northern Minnesota and Canada do support stable populations of wolves, they are not common to the greater Red River Basin. They are listed as threatened in Minnesota and endangered throughout North and South Dakota. A small portion of the gray wolf's critical habitat lies in the extreme eastern tip of the basin, near Red Lake.

Northern Long-eared Bat

The northern long-eared bat is a medium-sized bat that hibernates in caves and mines in the winter and in the summer roosts singly or in colonies under the bark or in cracks and crevices of trees. The northern long-eared bat is relatively widespread. It is listed as a threatened species, however, because populations of the species in the eastern and central United States are being sharply reduced by a fungal pathogen that causes white-nose syndrome. The pathogen causes the bat to come out of hibernation prematurely and use energy critical for maintaining a body temperature that allows them to survive through the winter. In the eastern United States, northern long-eared bat populations have been reduced by more than 90 percent. The northern long-eared bat range encompasses the entire Red River Basin. White-nose syndrome has not yet been detected in the basin despite the fungal pathogens

westerly progression into Minnesota. No critical habitat has been published for the northern long-eared bat.

2.2.4.4.2 State Listed Species

In addition to federally listed species, each state within the basin also has a list of species that fall under special state designations. For a complete list of species with special state designations, see Appendix B-A.

2.2.4.4.3 Canadian Listed Species

The Canadian portion of the basin is also home to a number of species that have been listed by the Canadian government. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was established in 1977 to provide a single, scientifically sound classification of wildlife species at risk of extinction. In Manitoba, COSEWIC has identified several species. Of these species, 22 endangered species, 24 threatened species, and 26 species of concern are believed to occur in the basin. The Species at Risk Act (SARA) was proclaimed in 2003 to protect wildlife species at risk in Canada. The SARA list includes 16, 26 and 11 of the COSEWIC species have been listed under SARA as endangered, threatened or a species of special concern, respectively. For a complete list of COSEWIC and SARA species believed to occur in the basin see Appendix B-A.

2.2.4.5 Invasive Species

Invasive species are species that are non-native to an ecosystem and cause economic or environmental harm. Invasive species can displace native fish, wildlife and plants; decrease biodiversity and reduce agricultural productivity.

2.2.4.5.1 Aquatic Invasives

Available data was reviewed to identify aquatic invasive species (AIS) of primary concern within the basin. AIS of primary concern that occur in the basin include one fish species (common carp), one macroinvertebrate (spiny waterflea), three types of aquatic vegetation (curly leaf pondweed, Eurasian watermilfoil and flowing rush) and two mollusks (faucet snail and zebra mussel). Figure B-7 displays the locations of these AIS. Please note that the silver carp is listed on map for Strutsman and Dickey Counties in North Dakota. While silver carp have not been found in the Red River Basin itself, portions of these counties do lie within the basin.



2.2.4.5.2 Terrestrial Invasives

Invasive terrestrial species within the region include a more extensive list that is dominated by a number of invasive plants. In many cases the complete distribution of these species is not known and thus, specific presence or absence within the Red River Basin is difficult to track. The Minnesota DNR has noted approximately 300 invasive plants species in Minnesota, many of which are within or in close proximity to the basin. Some of the more prominent invasive terrestrial vegetation includes buckthorn, reed canarygrass, phragmites and purple loosestrife. Additional terrestrial species include a number of insects and earthworms, among others.

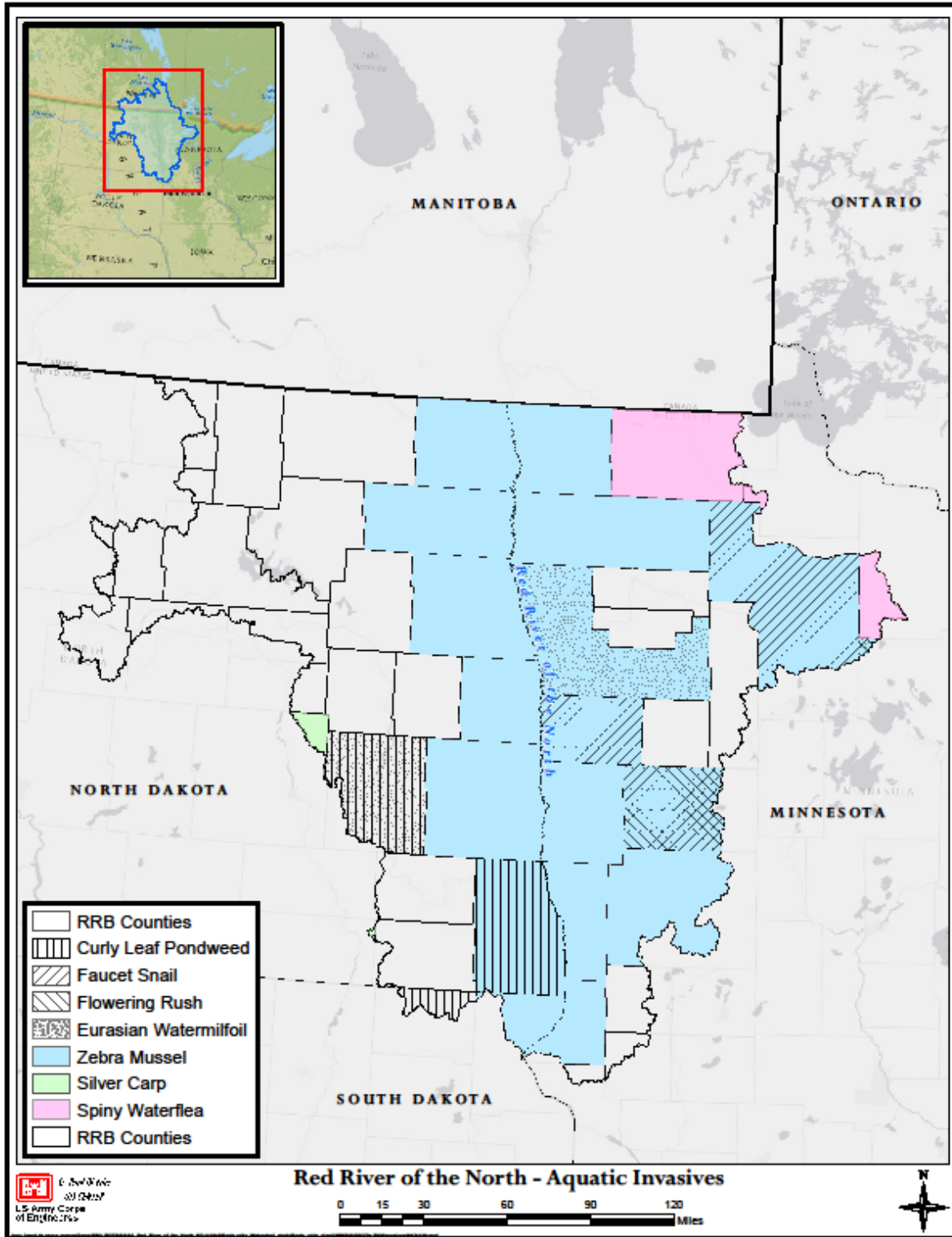


Figure B-7: Aquatic Invasives of Primary Concern in the Red River Basin

2.2.5 Ecosystem Goods and Services

Humans derive a number of benefits from naturally functioning ecosystems in the form of goods and services. Goods include tangible or material items such as food, fiber and other raw material, while services stem from ongoing processes like water purification, flood mitigation and waste decomposition. Ecosystem goods and services are vital to sustaining human well-being and to future economic and social development.

Ecosystem goods are the products of the processes and interactions of natural systems. In the basin, tradeable ecosystem goods like agricultural crops, livestock and timber are critical to the economy. Other goods like clean air and fresh water are not only valuable but essential.

Ecosystem services are the direct or indirect contributions, including economic, environmental and social effects, which ecosystems make to the environment and human populations. Ecosystem services that drive productivity and will ultimately determine the sustainability of land practices and development in the basin include the purification of air and water, flood mitigation, the decomposition of waste, soil formation, the pollination of crops and natural vegetation, dispersal of seed, maintenance of biodiversity and aesthetic beauty.

2.3 Problems

2.3.1 Habitat Loss

The majority of the Red River Basin's landscape was once dominated by grasslands with abundant shallow wetlands. Forested patches were also common along riparian corridors in the west, with increasing density in the northern and eastern portions of the basin.

In the mid to late 1800s much of the land in the region was settled by homesteaders who quickly cultivated the basin's fertile soils. The easily accessible and well drained lands were converted from prairies and wetlands to agricultural fields and pastures. Over time, technological advancements such as drain tile, irrigation, fertilizers, herbicides, pesticides and genetically engineered crops have increased yields across a variety of soil conditions, leading to crop production in areas that would otherwise be unsuitable or marginally productive.

The wildlife that relied upon the basin's prairies and wetlands have been forced to seek refuge in small remnant parcels of their native habitat, adapt to the agricultural-oriented landscape or simply vanish from the basin entirely.

2.3.1.1 Loss of Prairies

Prior to European settlement in the late 1800s, nearly the entire basin was covered by grasslands. Historically this habitat extended north and south along much of the Red River Valley floor. In the Red River Valley, over 95 percent of the prairie has disappeared (Herman and Johnson 2008b). Today less than 1 percent of the tallgrass prairie still exists nationally (USFWS 2013).

2.3.1.2 Loss of wetlands

In the 200-year period from 1780 to 1980 it is estimated that 49 percent and 42 percent of wetlands were lost in North Dakota and Minnesota, respectively (Dahl 1990). Today, total wetland acreage has generally been stable regionally, thanks in large part to the increased public awareness of wetland benefits and regulations requiring mitigation

Today, total wetland acreage has generally been stable regionally, thanks in large part to the increased public awareness of wetland benefits and regulations requiring mitigation for wetland impacts.

for wetland impacts. However, this has led to the loss of some sensitive wetland types that have been balanced by newly constructed pond-like wetlands, which typically have lower habitat value. In addition, many wetlands have been converted to cultivated wetlands. While farming wetlands is not classified as a loss of wetland quantity, it is a loss of quality (Minnesota DNR 2013).

2.3.1.3 Loss of Riparian Habitat

Much of the riparian habitat has been destroyed in the basin, mostly from human activity extending right up to the water's edge. While it's difficult to estimate the amount of riparian zone that has been lost in the basin, previous studies have estimated that 70 to 90 percent of the natural riparian ecosystems within the United States have been destroyed.

2.3.1.4 Loss of Wooded Areas

Woodlands provide benefits by filtering water runoff from adjacent agricultural lands, stabilizing riverbanks, protecting rural homes and roads from snow and wind, providing wildlife habitat and removing carbon dioxide from the atmosphere.

Forest loss in the basin typically occurs at small scales. New farming technology, larger equipment and declining tree health have provoked many land owners to remove windbreaks and riparian forests in recent years (North Dakota Forest Service [NDFS] 2015). In addition, larger scale loss of woodlands has occurred due to flood mortality, Dutch elm disease and clearing for new agricultural fields. In a 2013 aerial survey of the greater Red River Valley, several hundred acres of predominantly aspen forest decline were reported in the Pembina Gorge as well as 1,300 acres of forest lost to flood mortality (NDFS 2015). Large scale clearing of pine forest have also been reported in the extreme eastern portion of the basin for potatoes farming and production of other row crops.

2.3.2 Habitat Degradation

The majority of the basin's native habitat has been lost to the conversion of other land uses. Much of what remains has been degraded, primarily from human disturbances and the introduction of invasive species. The degree of degradation varies by location and is dependent on the cause of degradation, habitat type, and the sensitivity of the plants and animals that live there.

2.3.2.1 Connectivity



Bank failure along a Red River Basin stream

Some species require large expanses or a variety of habitat types to fulfill their needs for food, shelter and reproduction. In greatly altered landscapes such as those found in the Red River Basin, habitats may be highly fragmented. Connection of the fragmented habitat can be very important, especially if access to a number of fragmented areas is required to meet all the life stage requirements for a species to survive and reproduce.

Connectivity between terrestrial habitats types may take place in many forms. In the Red River Basin connectivity between terrestrial habitats is often achieved through riparian corridors, fence lines, windrows, waterways and road

ditches. These areas are frequently removed or altered to maximize farmland though they often produce lower yields than surrounding areas. The same areas can serve as critical travel corridors, providing cover for animals to move from one area to another.

Aquatic connectivity has also been severely restricted throughout the basin. Aadland et al. (2005) reported that over 500 dams have been built on the Red River since the 1800s. The dams were built for domestic water use, irrigation and electricity but failed to account for the passage of aquatic organisms. Thousands of miles of river have been cut off from seasonal fish migrations, preventing access to areas that provide prime spawning and rearing habitat. The distribution of native mussels and other macroinvertebrates populations have also been shown to be negatively affected by these barriers, as more species are often found downstream of the barriers than upstream of the structures.

Fish passage projects have become a priority for natural resource agencies of the basin over the past couple decades. Seven of the nine low-head dams on the Red River main stem have been altered to increase fish passage, leaving only the dams at Drayton, ND and Lockport, Manitoba as biotic barriers on the main stem of the river. In the basin approximately 31 fish passage alterations have been made to barriers in Minnesota as well as a handful of others in North Dakota and Manitoba.

2.3.2.2 Climate Change

There is still much uncertainty on how climate change will be felt in the coming decades and centuries. However, many studies are predicting rising temperatures and an increase in the frequency and intensity of precipitation. Many habitats and the plants and animals that reside within them require specific conditions to remain vigorous and sustain healthy populations. Even slight changes persisting over a long period of time could potentially disrupt the ecosystem, causing a shift in species composition and habitat.

2.3.2.3 Invasive Species

Invasive species may negatively impact native plants and animals, especially those that have adapted to fill specific niches. Invasives often lack predators in their new environments, which can further increase their competitive edge over native species. Once they have become established, invasive species can substantially transform an ecosystem, further compounding their effects on indigenous species.

Some examples of invasive species that have considerably impacted the Basin's habitat include the common carp, zebra mussels, reed canarygrass and hybrid cattails.

Many invasive species have become naturalized at low densities and have had very little impact on native species or habitats. However, there are a few that have had considerable adverse impacts including the common carp, zebra mussels, reed canarygrass and hybrid cattails. Common carp are very abundant, especially in the southern portions of the basin. They are known to reduce water quality by uprooting vegetation and increasing suspended sediments. Zebra mussels are a relatively new invasive to the basin but have spread quickly over the last few years. Zebra mussels are efficient filter feeders that are able to remove plankton, large bacteria and detritus from water, which disrupts food webs and can change water quality characteristics. Reed canarygrass and hybrid cattails are two vigorous plant species that have displaced native vegetation in many wetland and riparian areas throughout the basin. These species often create largely homogeneous stands of vegetation that offer little diversity or value for wildlife.

2.3.2.4 Water Quality

Water quality characteristics can be used to describe the chemical, physical and biological conditions of water. Poor water quality can be toxic to organisms, particularly those living in aquatic environments. Common water quality impairments found in the basin include high levels of nutrients, turbidity,

bacteria and low dissolved oxygen. For additional information see the Water Quality working group report.

2.3.2.5 Water Supply

The water supply can be limited in areas throughout the basin, particularly during drought conditions. Many communities in the Red River Valley rely on the drought-prone Red River as their sole source of water. Residential and commercial uses share this limited supply with plants and animals that depend on aquatic and semi-aquatic conditions. The withdrawal of water for human uses can cause changes in hydroperiods and ultimately the habitats these areas provide.

2.3.2.6 Restoration and Enhancement Obstacles

Habitat restoration and enhancement projects can be costly endeavors. They often require extensive planning, interagency coordination and monitoring to ensure that they provide the benefits intended. In addition, these projects frequently require permits to carry out the construction or alteration needed for restoration. The permits required for the construction of ecosystem restoration projects are often meant to protect against the degradation of habitats that these projects are intended to provide. The information provided in these permits frequently requires lengthy and redundant review.

Projects that have been federally-authorized require maintenance and inspection in addition to special restrictions that limit modifications to the project. Some of these projects were constructed over 50 years ago with little to no environmental consideration and if required maintenance is performed may contribute to processes adversely impacting aquatic habitat. Several federal projects have outlived their usefulness and are no longer needed for the purpose for which they were originally intended. Maintenance requirements and modification restrictions that still apply to these projects have unnecessary financial burdens and may limit alterations that could ultimately have benefits to the environment. Examples of these projects include Section 208 of the Flood Control Act of 1954 clearing and snagging efforts intended to increase flood conveyance. These projects were administered by the Corps in concert with local sponsors throughout the basin.

2.3.3 Unfamiliarity with Ecosystem Functions and Values



Painted turtle

Environmental processes and functions can be complex and are often difficult to comprehend without some background knowledge in basic ecological fundamentals and relationships. The majority of the general public and even many decision makers have not been exposed to or do not understand basic ecological principles. This can lead to ill-informed decision making with unintentional adverse environmental and economic consequences. Repair and mitigation for such actions can be extremely costly and is often irreversible.

2.4 Opportunities and Constraints

2.4.1 Opportunities

- There is an opportunity to conserve and enhance ecosystem health in concert with ongoing basin-wide flood risk management projects (e.g., Fargo-Moorhead).
- There is a goal for 20 percent flow reduction in the basin. Distributed storage basins have been identified as an option to obtain this goal. Environmental design considerations have the potential to create habitat.
- Improve opportunities for outdoor recreation where compatible with overall ecosystem health conservation and enhancement objectives.

2.4.2 Jurisdictional Constraints

- Conservation and restoration efforts within the basin are often restricted to established jurisdictional areas, whether it be at the watershed, county, state or international level. Each of the natural resource agencies representing these jurisdictional areas have varying goals and authorities that influence decisions and govern their actions.
- Data collection and studies are often carried out to better inform these agencies on the status and trends within their jurisdictional areas. These efforts are frequently performed using differing methods and varying resolutions, making them difficult or nearly impossible to compare across borders. Data covering the whole basin is rarely collected and in instances where basin-wide data is collected, it is often at very coarse resolutions, limiting its usefulness to analysis at the national or continental scale.

2.5 Future Conditions

2.5.1 Habitat

Efforts to conserve and enhance important natural areas in the basin will continue to improve habitat in targeted locations throughout the region. However, until the majority of landowners begin to see value in conserving lands it is likely that the slow and gradual loss and degradation of habitat will outpace these efforts.

2.5.2 Connectivity

The removal and modification of aquatic barriers has been a priority for agencies within the basin and will likely continue to be in the future. In the basin it is estimated that over 100, 42 and 14 structures impeding fish passage are still in place in North Dakota (Steven Krentz, personal communication, December 9, 2015), Minnesota (Minnesota DNR, 2015) and Manitoba (Geoff Klein, personal communication, Feb. 18, 2016), respectively. Plans are currently underway to alter dams for fish passage at Kathryn and Valley City in North Dakota, the Sand Hill River near Fertile, MN, and the LaSalle River at La Barriere Park in Manitoba.

2.5.3 Water Quality

Future water quality conditions are expected to remain similar to their current conditions in North Dakota and Manitoba but will likely improve in Minnesota as the newly passed “Buffer Law” (Laws of Minnesota 2015, 1st Special Session, Chapter 4, Article 4) goes into effect. The law establishes new perennial vegetation buffers of up to 50 feet along rivers, streams and ditches that will help filter out phosphorus, nitrogen and sediment. Other laws requiring buffers in Minnesota were in place prior to

2015, including Minnesota Statutes 103E, 103F and 103G as well as Minnesota Rules, chapter 6120. However, the legislation passed in 2015 provides more comprehensive protection along waterbodies than past rules. Buffers on public waters shall be in place by November 1, 2017 on public waters and by November 1, 2018 along public drainage systems to be in compliance with the Buffer Law.

2.5.4 Water Supply

There is a potential for a water supply crisis to occur in communities along the Red River Valley in the event of a severe drought. Studies have indicated that water availability would be inadequate during events similar in magnitude to historic events from the 1930s. There are plans underway to bring water from the Missouri River Basin to the Red River Basin (Red River Valley Water Supply Project). The basin's growing population and commercial demands are expected to strain water availability even further. The interbasin transfer of water should be considered carefully as changes in flow patterns and water chemistry could have unforeseen impacts on the biota of the areas lakes and streams. Connecting the two waterbodies would make both basins more vulnerable to the spread of aquatic invasives.

2.5.5 Invasive Species

Invasive species are spreading into new areas across the basin and will most likely continue to do so. Zebra mussels continue to expand their range and were recently found at several locations in the Red River main stem. This species is spread primarily through downstream drift of veliger larvae and by recreational boat traffic during early life stages. New locations of establishment, especially popular recreational waterbodies, have the tendency to become distribution points, further accelerating the spread. In heavy recreational use areas within the basin, including the Red River main stem, the "Lakes Areas" in northwestern Minnesota and in Devils Lake area of North Dakota, and waterbodies in and around Lake Winnipeg, the spread of zebra mussels appears almost certain.

Zebra mussels continue to expand their range and were recently found at several locations in the Red River main stem. This species is spread primarily by recreational boat traffic during early life stages.

Similarly, other aquatic invasives found within the basin may spread through either their own volition (e.g., swimming), downstream drift or human transport. Moreover, several other aquatic invasives found near the basin, such as Asian carp and quagga mussels, have the potential to invade in the near future. The list of aquatic plants and animals found near the basin is extensive, and the rate of spread and the risks they present are species specific.

Invasive terrestrial organisms present similar challenges with the addition of overland movement. The list of invasive species found in the Midwest also continues to grow, and new species will almost certainly be observed in the near future. Some terrestrial invasives that have been located near the basin but are not yet presently found in the area include the emerald ash borer and the gypsy moth.

2.5.6 Changing Climate

Climate change is expected to cause warmer temperatures, longer dry periods, wetter winters and more intense storm events (Corps 2015; Shafer et al. 2014; Pryor et al. 2014). With these conditions the demand for water and energy is also expected to rise. Increases in pest outbreaks, the spread of invasive species, wildfires and plant flowering times would be anticipated. Longer dry periods could have profound impacts on the shallow lakes and wetlands that make up the prairie potholes. Waterfowl, fish and other plants and animals adapted for life in these aquatic areas may struggle to survive from increased stress associated with the changing conditions. The reduced health or loss of species would create opportunities for other species, particularly invasives species.

The Fargo-Moorhead Metropolitan Area Flood Risk Management Feasibility Study (FM Flood Study; Corps 2011) examined general historical hydrology patterns for the basin and speculated on future hydrology based on future climate conditions. Based on the USGS gauge at Fargo, the hydrologic record of the Red River of the North shows a trend of increasing magnitude and frequency of flooding in recent decades. Figure B-8 shows the natural annual maximum mean daily flow on the Red River at Fargo for the period of record. As a part of the FM Flood Study, a panel of outside experts in hydrology and climate change was convened to weigh in on this general observation. The panel concluded that the hydrologic record showed a “dry” period in the early decades (e.g., early 1900s) and a “wet” period in later years continuing to the present. The panel speculated that this general wet climate would likely continue over the next 25 years, with the trend generally fading over time.

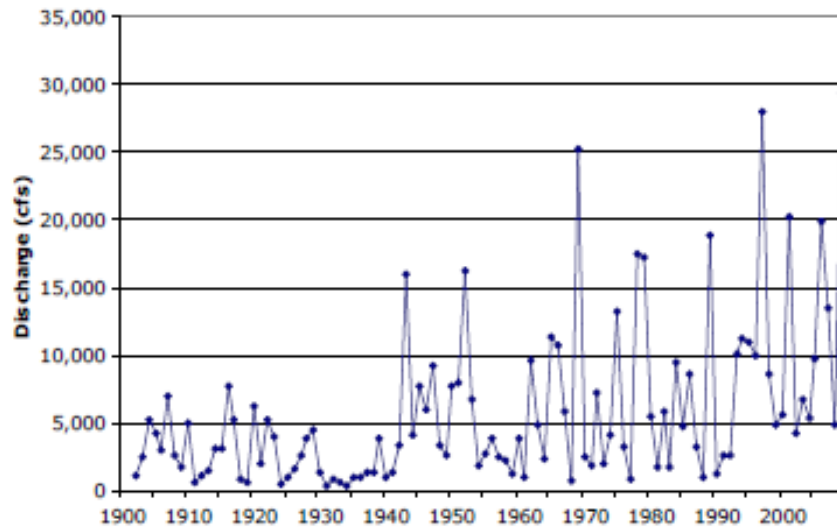


Figure B-8: Natural Annual Maximum Mean Daily Flow on the Red River at Fargo

2.5.7 Interagency Coordination

It is difficult for the agencies in the basin to take a multijurisdictional approach as each organization has varying budgets, availability of personnel and goals. Without regular meetings to discuss opportunities for projects, surveys and management, it is likely that coordination will remain similar to what it is today.

3 GOALS AND OBJECTIVES

Goals and objectives were developed collectively by various agencies with environmental interests throughout the Red River Basin. They were formulated to improve environmental conditions and to prevent further degradation from problems areas identified in the basin. The major problem areas included habitat loss, habitat degradation and public unfamiliarity of general ecosystem functions and values. Goals and objectives are listed below according to each of these problem areas. See Table B-6 after at the end of this section for a summary of all goals and objectives.

3.1 Problem 1: Habitat Loss

Goal 1: Conserve remnant natural habitat, and protect fish and wildlife throughout the Red River Basin.

Objective 1.1 – Maintain or increase the acreage of each of the following cover types: woodlands, grasslands, wetlands, riparian corridors.

It is unrealistic to completely stop the loss of all woodlands, grasslands, wetlands and riparian corridors without significantly hampering development and economic growth in the basin. However, it may be conceivable to create conditions in which the acreage lost is replaced by restored or created habitat. The acreage of each of these cover types in 2011 is presented in Table B-5 below.

Table B-5: Acreage of Habitat Types in the Red River Basin (RRB) (Based on 2011 USGS NLCD and AAFC 2011 Crop Inventory)

Cover Type	Acres	RRB Coverage
Woodland	3,661,563	12%
Wetland	2,067,808	7%
Grasslands	1,362,385	4%
Riparian Areas	NA	NA

Basin-wide land cover datasets were only available at very coarse resolutions (250 meter). Most land cover changes are taking place at smaller scales and would not be detected using this coarse data. Therefore, 30 meter resolution land cover data from the USGS 2011 National Land Cover Database and the AAFC 2011 Crop Inventory were generalized and combined to create higher resolution data. There were no readily available options for calculating riparian areas at this time.

Objective 1.2 – Prevent the introduction and spread of invasive species in the Red River Basin.

Hundreds of invasive species have been introduced to the basin and many more are poised to enter the region. Various agencies within the basin have boosted awareness on invasives through advertising, increased availability of cleaning stations and various forms of public outreach. There are far too many activities in the basin to monitor all actions that may lead to the spread of invasive species. Ultimately, public awareness and willingness to take extra steps to prevent the spread of invasives will dictate the degree of impact invasives have on the basin.

Objective 1.3 – Provide support for the continued existence of state/province and federally listed species as well as unique habitats through conservation of critical habitat.

Lists of rare and protected species continue to grow in the basin. The loss and degradation of habitat are leading causes for the decline of these species. Understanding the life cycles of rare plants and animals, their relationships with other processes and the identification of habitats critical for these species survival is crucial to ensure they have a future in the basin.

3.2 Problem 2: Habitat Degradation

Goal 2: Restore and enhance natural processes and degraded habitat that support fish and wildlife.

Objective 2.1 – Improve the connectivity between habitats, where appropriate.

Narrow strips of grass and trees are often times all that is left connecting patches of what was once continuous habitat. In addition, dams and other impediments restricting the movement of aquatic organisms exist throughout the basin. The lack of adequate travel corridors and aquatic barriers fragment the landscape and limit the movement of fish and wildlife. However, in some instances, such as barriers to prevent the movement of common carp to optimal spawning areas, the lack of connectivity is considered to be an effective management technique appropriate for improving a system's ecological health.

Objective 2.2 – Increase biodiversity of native species, and promote the distribution of these species across the Red River Basin.

The loss of natural habitat has led to the loss and decline of many native species and has also inhibited the resiliency of these species to compete with invasives. As a result, the dispersal and diversity of native species has also been inhibited.

Objective 2.3 – Decrease the contaminants, nutrients and turbidity of waterbodies in the basin, where appropriate.

The Red River has historically carried a high load of suspended sediments. Increases in agriculture and poor land use practices have led to increases in not only the sediment load but also contaminant and nutrient loads as well.

Objective 2.4 – Restore hydrology to provide additional geomorphic stability.

Anthropogenic changes to the landscape, loss of wetlands capable of providing water retention, the modification of streams and their floodplains and the increased personal and commercial demand for water have all contributed to altered hydrology in the basin. Drain tiling and ditching allow water to be purged from the landscape more quickly, while water used for commercial and personal consumption deplete the water supply. These factors have increased the fluctuation in water supply, creating flashier systems, which are more susceptible to mass bank failure and are less capable of providing the year-round aquatic habitats they have supported historically.

Objective 2.5 – Promote the integration of features that provide environmental benefits in projects with other primary purposes.

It can be difficult to develop and construct large ecosystem restoration and enhancement projects. Construction projects with other primary purposes (e.g., flood risk reduction, public infrastructure or even private development) may require some of the same permits, coordination and public support. Incorporating natural resource enhancement designs into these projects can improve habitat and can also serve as educational opportunities for the public.



Great egret

Objective 2.6 – Reduce the time, process and bureaucracy involved in environmental projects.

Undertaking environmental restoration and enhancement projects often requires permits and permissions from various government agencies. The information provided to these agencies and the review that is conducted can be time consuming and redundant.

3.3 Problem 3: Unfamiliarity with Ecosystem Functions and Values

Goal 3: Develop opportunities for education to aid in the understanding and appreciation of fish, wildlife and natural processes.

Objective 3.1 – Establish an economic appreciation for the Red River Basin’s natural resources.

The basin’s natural resources generate millions of dollars every year through activities such as hunting, fishing, boating, hiking, bird watching and other recreational activities. Natural processes that improve water quality and increase the natural well-being of residents also provide additional monetary benefits. While many individuals are vaguely aware of some of these natural assets, few people understand the comprehensive value they bring to the basin.

Objective 3.2 – Increase stakeholder and public knowledge of fish, wildlife and natural processes through environmental education and outdoor activities.

There is an abundance of environmental monitoring and research that occurs throughout the basin. The results of these studies may reveal impacts that particular actions have on the environment or may also suggest actions to improve resources. However, too often this knowledge is not effectively conveyed to the public and policy-makers, resulting in the failure of meaningful actions being taken.

Environmental impacts and processes can be complex and are often difficult to comprehend without some background knowledge of basic ecological fundamentals and relationships. The majority of the general public do not possess these basic fundamentals. Offering information and educational opportunities to residents in the basin can help increase understanding and aid the formulation of well informed decisions.

Objective 3.3 – Improve cultural competencies amongst various social and cultural groups in the Red River Basin.

In addition to Native Americans and other cultural groups that have been established in the Red River Basin for many years, the region has more recently become a destination for a number of refugees and immigrants. Many of these cultural groups, both well established and new, have very diverse views of how natural resources should be utilized and managed. Understanding these differences can help alleviate misconceptions between cultures that both manage and utilize these resources.

Table B-6: Goal and Objectives

Red River of the North Basin Vision: A Red River Basin where residents, organizations and governments work together to achieve basin-wide commitment to comprehensive integrated watershed stewardship and management.	
Fish, Wildlife and Ecosystem Health Vision Statement: Maintain existing habitat and restore natural systems in the Red River Basin	
Goals	Objectives
Conserve remnant natural habitat and protect fish and wildlife throughout the Red River Basin.	1.1 Maintain or increase the acreage of woodlands, grasslands, wetlands, and riparian corridors.
	1.2 Prevent and manage the spread of invasive species within the Red River Basin.
	1.3 Provide support for the continued existence of state and federally listed species and other unique habitats through conservation of critical habitat.
Restore and enhance degraded habitat and natural processes that support fish and wildlife.	2.1 Restore and enhance degraded habitat and natural processes that support fish and wildlife.
	2.2 Increase biodiversity of native species, and promote the distribution of these species across the Red River Basin.
	2.3 Decrease the contaminants, nutrients and turbidity of the Red River and its major tributaries.
	2.4 Restore hydrology to provide additional geomorphic stability.
	2.5 Promote the integration of features that provide environmental benefits in projects with other primary purposes.
	2.6 Reduce the time, process and bureaucracy involved in environmental projects.
Develop opportunities for education to aid in the understanding and appreciation of fish, wildlife and natural processes.	3.1 Develop opportunities for education to aid in the understanding and appreciation of fish, wildlife and natural processes.
	3.2 Increase stakeholder and public knowledge of fish, wildlife and natural processes through environmental education and outdoor activities.
	3.3 Improve cultural competencies amongst various social and cultural groups in the Red River Basin.

4 STRATEGIES AND ACTIONS

A strategy can be defined as a plan of action or policy designed to achieve a major or overall aim. In the following section, strategies and detailed actions for each of the three goal areas are discussed. These strategies are summarized in Table B-7. Evaluations and a recommended combination of actions will be presented in sections 5 and 6, respectively.

4.1 Conservation Strategies and Actions

The vast majority of land in the Red River Basin is privately owned. Landowners typically make investments in these lands to generate income, often looking to maximize profits. This may lead to the clear-cutting of wooded groves, the removal of habitat corridors and the cultivation of marginally productive lands. Solutions to avoid the loss of habitat associated with these areas include regulation, incentives, subsidies, land acquisition and conservation easements.

4.1.1 Regulation Strategy

Environmental laws and regulations have been put in place to protect and preserve the integrity of the environment and to reduce potentially harmful effects to human health that may result from environmental degradation. There are a number of laws and regulations protecting natural resources in the basin. These regulations do not comprehensively protect against all types of habitat degradation, are not always strictly enforced and may only protect portions of the basin due to jurisdictional boundaries.

4.1.1.1 Consistent Enforcement of Current Regulations

Federal, state and local agencies have developed regulations to protect the environment, but in some instances the enforcement agencies fail to enforce them adequately and/or lack consistently over their jurisdictional area. There are many reasons for this, which may include limited resources, personnel and varying interpretation.

4.1.1.2 Identify Gaps in Current Regulation

Lawmakers may deem it necessary to create new regulations as environmental relationships become more clearly understood. Developing new regulations is often an unpopular concept as opponents argue that it adversely effects economic growth and creates a disproportionately large burden on small business. However, when developed and carried out appropriately, environmental regulation can improve human health, avoid disasters and even save large sums of money.

To effectively develop environmental laws and regulations it is important to inventory those currently in place, identify stressors contributing to the degradation of the environment, and formulate new regulations that consider the direct and indirect effects associated with them.

4.1.1.3 Increase Penalties for Breaking Regulations

Certain regulations protecting the environment do not impose penalties harsh enough to deter people from breaking the law. In such cases, increased penalties could encourage compliance. However, if penalties become too severe, enforcement can become lax as regulators struggle to cite individuals for infractions that may seem disproportionately small compared to the consequences that violators face.

4.1.1.4 Runoff-Based Fees

Efforts are underway to assess drainage fees, providing an opportunity include environmental considerations. There is currently little accountability for land managers to reduce runoff and responsibly apply nutrients for crop production. Poor land practices can degrade the water quality of the drainage system and have detrimental impacts on aquatic environments. The damages caused by negligent practices are experienced downstream and little, if any, consequences are felt by those responsible for the degradation. Fees influenced by environmental impacts could provide accountability for those failing to use good land use practices.

4.1.2 Incentives Strategy

There are a number of programs that offer incentives such as tax breaks and financial compensation for conservation practices within the basin. Funding from these programs is available on a competitive basis and often varies from year-to-year. The programs listed in Appendix B-B include the larger-scale programs providing incentives in the basin. This list is not meant to serve as a comprehensive list of opportunities as many other programs are available at smaller scales, such as the conservation and watershed district levels.

4.1.2.1 Diversify Incentive Programs

There are a limited number of programs in the basin that provide the majority of incentives for the conservation of habitats and natural areas that support processes beneficial to society. In general, these programs have strict criteria that evaluates sites and ranks them with other locations competing for funds. While these criteria have been developed to choose the best sites for conservation, they cannot account for the diversity of habitats, goods, and services that ecosystems generate. As a result, some unique and high quality habitats are ranked low or fail to qualify for incentives. The creation of additional conservation programs, with varying evaluation criteria, could help reduce the likelihood that these areas are passed over.

4.1.2.2 Improve Incentive Calculation

Environmental research has increased the understanding of how certain environmental processes are interconnected, the goods and services they provide, and the economic benefit associated with them. Improved water quality, increased water supply, flood storage, carbon sequestration and erosion control are some examples of beneficial goods and services that can result from environmental processes. Due to the complexity of calculating these benefits, they are often left out, or given only a small consideration in calculating and ranking incentives. Consequently, incentives for some areas are undervalued or may not be eligible at all.

4.1.3 Targeted Property Acquisition and Conservation Easements

Property acquisition and conservation easements for the protection of natural resources and habitat do occur in the basin but are limited due to the high cost of purchasing and managing lands. Therefore, it is important to have current and reliable information that is comparable when targeting lands throughout the basin.

4.1.3.1 Continue Interbasin Coordination Meetings

Meetings held in preparation of this document brought together natural resource agencies and environmental professionals from across the region. Continued discussion between these groups could lead to collaboration on projects and data acquisition. In addition, frequent exchange of ideas between agencies could result in the mutual understanding of priorities and conservation in the basin.

4.1.3.2 Update Wetlands Inventory

Wetlands are a very important resource in the basin. Protecting wetlands through conservation and planning could provide numerous benefits. However, there are no recent and comprehensive inventories of wetlands for the entire Red River Basin, making it difficult for evaluation and planning at the basin level. The NWI has identified wetlands for the United States, but is considered out-of-date. In Canada, efforts have begun for mapping wetlands but only in a small portion of the basin.

The Minnesota DNR has initiated efforts to update the NWI and is expected to provide new wetland maps for the Minnesota portion of the basin in 2019. This would be a great opportunity for other jurisdictional areas to update and complete similar wetland mapping exercises.

The Fish, Wildlife and Ecosystem Health working group considered mapping wetlands for the entire basin to fill this data gap and use the information to make recommendations in this report. However, the time required to complete such an effort would have exceeded this report's deadlines.

4.1.4 Create More Decontamination Stations on Infested Waters

Decontamination stations are typically comprised of high-temperature power washers that can remove or kill aquatic invasives. Some stations have already been placed at public access points in the basin to help prevent the spread of invasive species. Additional strategically placed stations could help prevent the spread of invasives from infested waters.

4.2 Restoration and Enhancement Strategies

4.2.1 Deauthorization of Projects

Corps projects that have outlived their usefulness and are no longer needed for the purpose for which they were originally constructed were identified as part of this effort. Letters were sent out to the projects sponsors of several clearing and snagging projects in the basin to solicit interest in deauthorization of these projects to ease maintenance responsibilities and restrictions for project modification. Letters of interest for deauthorization were received back from project sponsors at two locations, the Lower Branch of the Rush River (Cass County, ND) and the Lower Wild Rice River (Norman County, MN).

4.2.2 Continue Interbasin Coordination Meetings

Meetings held in preparation of this document brought together natural resource agencies and environmental professionals from across the region. The group found value in discussions about the basin and supported the idea of reoccurring meetings at the conclusion of this effort. Continued discussion between these groups could lead to collaboration on projects that span multiple jurisdictional areas. Cooperative efforts have a greater potential for cost savings and could result in products that are more comparable across borders.

4.2.3 Utilize Existing Programs

There are numerous programs in the basin that support the restoration and enhancement of the environment. Restoration programs are typically limited in the type of work and locations in which they are permitted to carry out projects. With the goals and objectives of the basin in mind, coordinating the efforts of these various programs could lead to more efficient use of funding and a higher likelihood for attainment of the basin's goals and objectives. A list of the basin's major restoration and enhancement programs, along with descriptions and examples, are included in Appendix B-B.

A document summarizing potential restoration projects in the basin would aid in the utilization of habitat restoration programs and promote collaboration between agencies. The document could also prioritize projects, making it easier to initiate the planning and design of restoration when funding becomes available. Such an effort would need to have input from agencies throughout the basin to ensure all interests and agency priorities are accounted for. The Fish, Wildlife and Ecosystem Health working group would have the knowledge, expertise and diversity of representation to produce this product.

4.3 Educational and Public Engagement Opportunities

To make well informed decisions the basin’s residents need to have a well-rounded understanding of how actions effect the environment and ultimately impact the quality of resources they depend on for physical, mental and social well-being. Gaining knowledge on environmental processes and services can be accomplished through both education and communication strategies, as described below.

4.3.1 Education Strategy



4.3.1.1 Promote the Use of Environmental Education Lesson Plans in Primary and Secondary Schools

Exposing the basin’s youth to basic environmental concepts could be influential in helping them assess tradeoffs, make informed decisions and take responsible actions in the future. Many agencies at the state and federal level have prepared lesson plans that can aid educators in teaching environmental education.

4.3.1.2 Update Education Curriculum to Include Environmental Education

Schools are required to comply with federal and state education standards. Lesson plans are typically constructed to meet these standards and often allow for little time to explore areas outside of the mandatory curriculum. While special courses or after-school programs may be available in some areas, the majority of students are not exposed to environmental education. Including environmental education in the curriculum could ensure that the basin’s youth receive basic environmental principles.

4.3.2 Communication Strategy

4.3.2.1 Create Groups that Encourage Public Participation in Outdoor Activities.

Various groups that encourage outdoor activities can be found throughout the basin. However, sometimes these groups meet at locations that are inconvenient or can be intimidating to the public. Creating additional groups at the local level could alleviate these problems and encourage involvement.

4.3.2.2 Kiosks at Restoration Projects and Natural Areas

There are currently a number of educational kiosks throughout the basin. Interpretive signs could be placed at additional locations that demonstrate particular environmental conditions or processes well. The frequent rotation and updating of fading or aging signs would also bring more attention to the information. Incorporating interactive technologies, such as quick response (QR) codes linking kiosks to related web pages, would allow users to access additional information through a cell phone or tablet. Integration of such technologies may appeal to the growing demand for digital media.



QR code

4.3.2.3 Create New or Utilize Existing Phone Apps

When people show interest in the basin’s environment it is important to provide them with tools to keep them informed and engaged in the basin’s activities. In today’s computer age, digital media has become the new norm as smartphones, tablets and other devices are primary sources of news and information. Mobile applications, commonly referred to as apps, are software programs that users can download on their mobile device and access the latest news and information.

Many of the agencies in the basin currently utilize apps, but they are often limited to areas within designated state and international boundaries. This has resulted in numerous apps that provide incomplete information across the basin and have limited utility for those traveling across borders. An app that delivers information from across the basin may be able to provide more complete information and be more appealing to users.

There are also a number of environmental apps that could be useful if the appropriate information were submitted for the region. One example is the Early Detection & Distribution Mapping System (EDDMapS; University of Georgia 2015). This app documents and maps invasive species in real time as species are reported from volunteer submissions. Submissions are reviewed by state verifiers to ensure accuracy. EDDMapS is supported by the Corps, USFWS, the U.S. Forest Service, as well as many other state and federal agencies

Table B-7: Strategies and Actions

			Objectives: 1.1 Maintain or increase the acreage of woodlands, grasslands, wetlands and riparian corridors.; 1.2 Prevent and manage the spread of invasive species; 1.3 Provide support for the continued existence of state and federally listed species and other unique habitats through conservation of critical habitat; 2.1 Restore and enhance degraded habitat and natural processes that support fish and wildlife; 2.2 Increase biodiversity of native species and promote their distribution; 2.3 Decrease the contaminants, nutrients, and turbidity of the Red River and its major tributaries; 2.4 Restore hydrology to provide additional geomorphic stability; 2.5 Promote the integration of features that provide environmental benefit in projects with other primary purposes; 2.6 Reduce the time, process, and bureaucracy involved in environmental projects; 3.1 Develop opportunities for education to aid in the understanding and appreciation of fish, wildlife and natural processes; 3.2 Increase stakeholder and public knowledge of fish, wildlife and natural processes through environmental education and outdoor activities; 3.3 Improve cultural competencies amongst various social and cultural groups											
Strategy	Action	Description	1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3
Regulation	Enforcement	Enforce current laws and regulations	√	√	√			√	√					
	Identify Gaps in Regulations	Look at problems and develop regulations to alleviate them	√	√	√	√	√	√	√	√	√	√	√	
	Increase Penalties	Increase penalties for violating laws and regulations	√	√	√	√		√	√					
	Runoff-Based Fees	Include fees for runoff detrimental to the env. to drainage fees	√		√	√		√						
Incentives	Diversify Incentives Available	Create addition programs to provide incentives for different env. Benefits	√	√	√	√	√	√	√	√		√	√	
	Improve Calculation	Develop new methods for calculating value of habitat to more accurately reimburse for lands providing more value or services.	√		√	√	√	√	√					

Targeted Property Acquisition & Easements	Interbasin Coordination Meetings	Continue to hold interbasin meetings to increase coordination, knowledge, and collaboration between agencies		√	√	√				√	√			
	Update Wetlands Inventory	Update and create wetland inventories for the entire RRB.	√		√	√	√	√	√	√				
Decontamination Stations		Provide additional decontamination stations to waters with invasive species		√										
Deauthorize Projects		Deauthorize existing U.S. Army Corps of Engineers projects that have outlived their usefulness				√	√		√		√			
Interbasin Coordination Meetings		Continue to hold interbasin meetings to increase coordination, knowledge, and collaboration between agencies		√	√	√				√	√			
Existing Programs for Restoration		Utilize the existing agency authorities to seek out restoration and enhancement opportunities	√		√	√	√	√	√	√				
Education	Existing Env. Education Lesson Plans	Promote the use of existing environmental									√	√	√	√

		lesson plans in primary and secondary education												
	Update Education Standards	Update education curriculum to ensure youth exposure to basic environmental education									√	√	√	√
Communications	Outdoor Activity Programs	Increase the availability of programs that encourage the public to participate in outdoor activities									√	√	√	√
	Kiosks	Create kiosks explaining natural processes at sites likely to get exposure									√	√	√	√
	Create Multi-Agency App	Create a phone app focused on the basin’s environmental issues that is updated by agencies across the basin									√	√	√	√
	Utilize Existing Apps	Make concerted effort to inform existing apps on basin conditions (EDDMapS)									√	√	√	

5 EVALUATE AND COMPARE ACTIONS

Evaluation and screening was a process used to aid in the formulation and selection of recommended actions. The evaluation criteria used for screening were adapted from the *Economic and Environmental Principles & Guidelines for Water and Related Land Resources Implementation Studies* (U.S. Water Resources Council 1983). In the evaluation each of the potential actions were assessed as meeting the criteria listed below at a low (L), medium (M) or high (H) level in relation to the corresponding goal (Table B-8).

Screening criteria used to evaluate actions:

- **Completeness** – Completeness is the extent to which the given action provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects.
- **Effectiveness** – Effectiveness is the extent to which an action alleviates the specified problems and achieves the specified objectives.
- **Efficiency** – Efficiency refers to cost-effectiveness and the most efficient allocation of other resources. Efficiency is the extent to which an action is the most cost-effective means of alleviating the specified problems and achieving the specified objectives.
- **Acceptable** – Acceptability refers to the workability and viability of the action with respect to acceptance by Federal and non-Federal entities and the public and compatibility with existing laws, regulations and public policies.

Table B-8: Comparison and Evaluation of Actions

Goals	Strategies	Actions	Evaluation Criteria				Comments
			Complete	Effective	Efficient	Acceptable	
Conservation	Regulation	Enforce Existing Regulations	M	M	M	M	<ul style="list-style-type: none"> • Increased investment for governing body
		Identify Regulatory Gaps	M	H	M	M	<ul style="list-style-type: none"> • Often met with public resistance
		Increase Penalties	M	M	H	M	<ul style="list-style-type: none"> • Enforcement required
		Runoff-Based Fees	M	M	M	L	<ul style="list-style-type: none"> • Likely met with public resistance • Difficult to quantify • Expensive to implement
	Targeted Property Acquisition & Easements	Improve Incentive Calculation	M	M	H	H	<ul style="list-style-type: none"> • Target and increase payment for land that provides more services to public • complexity may be confusing
		Interbasin Coordination Meetings	H	H	H	H	<ul style="list-style-type: none"> • Increase likelihood of mutual understanding between agencies

							<ul style="list-style-type: none"> • Increase interagency partnering
		Update Wetland Inventory	M	M	M	H	<ul style="list-style-type: none"> • Update/create wetland inventory • Multijurisdictional effort
	Decontamination Stations		L	L	M	H	<ul style="list-style-type: none"> • Densities vary across basin
Restoration & Enhancement	Deauthorize Projects		H	H	H	M	<ul style="list-style-type: none"> • Would ease alteration of projects • Laws may limit implementability
	Interbasin Coordination Meetings		H	H	H	H	<ul style="list-style-type: none"> • Increase interagency partnering • Spread regional awareness
	Existing Programs for Restoration		M	M	M	M	<ul style="list-style-type: none"> • Increased effort to identify projects with existing programs • Create comprehensive list of potential projects
Education & Public Engagement	Education	Existing Env. Education Lesson Plans	H	M	H	M	<ul style="list-style-type: none"> • Empower youth with fundamentals to make well informed decisions
		Update Education Curriculum	H	H	H	M	<ul style="list-style-type: none"> • Empower youth with fundamentals to make well informed decisions • Difficult to change education standards
	Communications	Outdoor Activity Programs	H	M	H	H	<ul style="list-style-type: none"> • Encourage public-agency interaction
		Kiosks	H	L	H	H	<ul style="list-style-type: none"> • Passively educate public
		Create Multi-Agency App	H	H	H	M	<ul style="list-style-type: none"> • One-stop-shop for updates and info on Red River Basin natural resources • Likely require multi-agency involvement to be successful • Difficult to coordinate between agencies
		Utilize Existing Apps	M	M	H	M	<ul style="list-style-type: none"> • Require agency participation • public submissions aid in tracking spread of invasives

6 RECOMMENDATIONS

The Fish, Wildlife and Ecosystem Health working group collectively agreed upon a combination of realistic actions that would meet the goals and objectives established for the basin. The evaluation criteria presented in Section 5 and internal group discussions were used to screen out actions and ultimately come up with set of recommended actions for the basin (Table B-9). Specific actions that could be executed or pursued immediately were listed for implementation while actions requiring further analysis were listed for study.

Table B-9: Recommended Actions

Recommended Actions		Path Forward		
Goal	Actions	Implement	Study	Suggested Entity
Conservation	Diversify Incentive Programs	√		Public Agencies
	Improve Calculation of Incentives		√	Natural Resources Conservation Service (NRCS)
	Enforce Laws and Regulations	√		All Regulatory Agencies
	Continue Interbasin Meetings	√		RRBC Lead
	Update Wetlands Inventory	√		All Agencies
	Identify Regulatory Gaps		√	Fish, Wildlife and Ecosystem Health Working Group
Restoration & Enhancement	Continue Interbasin Meetings	√		RRBC Lead
	Deauthorization of Projects		√	Corps
	Utilize Existing Programs (Appendix B-B)	√		All Agencies
Education & Public Engagement	Update Education Curriculum	√		All Agencies
	Increase Outdoor Activity Programs	√		All Agencies
	Increase/Replace Kiosks		√	Fish, Wildlife and Ecosystem Health Working Group
	Multi-Agency Phone App		√	RRBC

7 CONCLUSION

Land use changes, hydrologic alterations, changing climate and the introduction of invasive species have inhibited the basin’s ability to support healthy populations of native plants and animals. In addition, these conditions also threaten the functionality of many natural processes that enhance resources that the basin’s residents depend on for physical, mental and social well-being. The Fish, Wildlife and Ecosystem Health working group has come up with the recommendations outlined in this document to improve the health of the basin’s natural resources so that they, along with the services they provide, may be enjoyed for years to come.

8 REFERENCES

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Appendix B-A: State Listed or Species of Conservation Priority Found in
the Red River Basin

Minnesota State Listed Species Found in the Red River Basin

From the Minnesota Natural Heritage Information System

Minnesota State Listed Species in the Red River Basin

Group	Name	State Status	Federal Status
Bird	American White Pelican (<i>Pelecanus erythrorhynchos</i>)	Special Concern	None
Bird	Baird's Sparrow (<i>Ammodramus bairdii</i>)	Endangered	None
Bird	Bald Eagle (<i>Haliaeetus leucocephalus</i>)	Special Concern	None
Bird	Burrowing Owl (<i>Athene cunicularia</i>)	Endangered	None
Bird	Cerulean Warbler (<i>Setophaga cerulea</i>)	Special Concern	None
Bird	Chestnut-collared Longspur (<i>Calcarius ornatus</i>)	Endangered	None
Bird	Common Gallinule (<i>Gallinula galeata</i>)	Special Concern	None
Bird	Common Tern (<i>Sterna hirundo</i>)	Threatened	None
Bird	Forster's Tern (<i>Sterna forsteri</i>)	Special Concern	None
Bird	Franklin's Gull (<i>Leucophaeus pipixcan</i>)	Special Concern	None
Bird	Greater Prairie-chicken (<i>Tympanuchus cupido</i>)	Special Concern	None
Bird	Henslow's Sparrow (<i>Ammodramus henslowii</i>)	Endangered	None
Bird	Horned Grebe (<i>Podiceps auritus</i>)	Threatened	None
Bird	Loggerhead Shrike (<i>Lanius ludovicianus</i>)	Threatened	None
Bird	Marbled Godwit (<i>Limosa fedoa</i>)	Special Concern	None
Bird	Nelson's Sparrow (<i>Ammodramus nelsoni</i>)	Special Concern	None
Bird	Northern Goshawk (<i>Accipiter gentilis</i>)	Special Concern	None
Bird	Piping Plover (<i>Charadrius melodus</i>)	Endangered	Threatened
Bird	Red-shouldered Hawk (<i>Buteo lineatus</i>)	Special Concern	None
Bird	Short-eared Owl (<i>Asio flammeus</i>)	Special Concern	None
Bird	Sprague's Pipit (<i>Anthus spragueii</i>)	Endangered	Candidate
Bird	Trumpeter Swan (<i>Cygnus buccinator</i>)	Threatened	None
Bird	Wilson's Phalarope (<i>Phalaropus tricolor</i>)	Threatened	None
Bird	Yellow Rail (<i>Coturnicops noveboracensis</i>)	Special Concern	None
Fish	Lake Sturgeon (<i>Acipenser fulvescens</i>)	Special Concern	None
Fish	Least Darter (<i>Etheostoma microperca</i>)	Special Concern	None
Fish	Pugnose Shiner (<i>Notropis anogenus</i>)	Special Concern	None
Insect	A Caddisfly (<i>Oxyethira ecornuta</i>)	Special Concern	None
Insect	A Caddisfly (<i>Oxyethira itascae</i>)	Special Concern	None
Insect	A Caddisfly (<i>Hydroptila novicola</i>)	Special Concern	None
Insect	Assiniboia Skipper (<i>Hesperia assiniboia</i>)	Endangered	None
Insect	Crimson Saltflat Tiger Beetle, westbournei subspecies (<i>Cicindela fulgida westbournei</i>)	Threatened	None
Insect	Dakota Skipper (<i>Hesperia dacotae</i>)	Threatened	Candidate
Insect	Garita Skipper (<i>Oarisma garita</i>)	Threatened	None
Insect	Ghost Tiger Beetle (<i>Cicindela lepida</i>)	Threatened	None
Insect	Iowa Skipper (<i>Atrytone arogos iowa</i>)	Special Concern	None
Insect	Leonard's Skipper (<i>Hesperia leonardus</i>)	Special Concern	None
Insect	Poweshiek Skipper (<i>Oarisma poweshiek</i>)	Special Concern	Candidate
Insect	Red-Tailed Prairie Leafhopper (<i>Aflexia rubranura</i>)	Special Concern	None

Minnesota State Listed Species in the Red River Basin

Insect	Regal Fritillary (<i>Speyeria idalia</i>)	Special Concern	None
Insect	Sandy Tiger Beetle (<i>Cicindela limbata nympha</i>)	Endangered	None
Insect	Uhler's Arctic (<i>Oeneis uhleri varuna</i>)	Endangered	None
Lichen	A Species of Lichen (<i>Buellia nigra</i>)	Endangered	None
Mammal	Eastern Spotted Skunk (<i>Spilogale putorius</i>)	Threatened	None
Mammal	Least Weasel (<i>Mustela nivalis</i>)	Special Concern	None
Mammal	Northern Bog Lemming (<i>Synaptomys borealis</i>)	Special Concern	None
Mammal	Northern Pocket Gopher (<i>Thomomys talpoides</i>)	Special Concern	None
Mammal	Plains Pocket Mouse (<i>Perognathus flavescens</i>)	Special Concern	None
Mammal	Prairie Vole (<i>Microtus ochrogaster</i>)	Special Concern	None
Moss	Curved-leaved golden moss (<i>Tomenthypnum falcifolium</i>)	Special Concern	None
Mussel	Black Sandshell (<i>Ligumia recta</i>)	Special Concern	None
Mussel	Creek Heelsplitter (<i>Lasmigona compressa</i>)	Special Concern	None
Mussel	Fluted-shell (<i>Lasmigona costata</i>)	Special Concern	None
Mussel	Mucket (<i>Actinonaias ligamentina</i>)	Threatened	None
Reptile	Common Five-lined Skink (<i>Plestiodon fasciatus</i>)	Special Concern	None
Reptile	Gophersnake (<i>Pituophis catenifer</i>)	Special Concern	None
Reptile	Plains Hog-nosed Snake (<i>Heterodon nasicus</i>)	Special Concern	None
Spider	A Jumping Spider (<i>Marpissa grata</i>)	Special Concern	None
Spider	A Jumping Spider (<i>Pelegrina arizonensis</i>)	Special Concern	None
Vascular plant	American Ginseng (<i>Panax quinquefolius</i>)	Special Concern	None
Vascular plant	Annual Skeletonweed (<i>Shinersoseris rostrata</i>)	Threatened	None
Vascular plant	Beach-heather (<i>Hudsonia tomentosa</i>)	Special Concern	None
Vascular plant	Beaked Spike-rush (<i>Eleocharis rostellata</i>)	Threatened	None
Vascular plant	Blanket-flower (<i>Gaillardia aristata</i>)	Special Concern	None
Vascular plant	Blunt Sedge (<i>Carex obtusata</i>)	Special Concern	None
Vascular plant	Bog Adder's-mouth (<i>Malaxis paludosa</i>)	Endangered	None
Vascular plant	Clinton's Bulrush (<i>Trichophorum clintonii</i>)	Special Concern	None
Vascular plant	Club-spur Orchid (<i>Platanthera clavellata</i>)	Special Concern	None
Vascular plant	Clustered Broomrape (<i>Orobanche fasciculata</i>)	Special Concern	None
Vascular plant	Clustered Bur-reed (<i>Sparganium glomeratum</i>)	Special Concern	None

Minnesota State Listed Species in the Red River Basin

Vascular plant	Coastal Sedge (<i>Carex exilis</i>)	Special Concern	None
Vascular plant	Creeping Juniper (<i>Juniperus horizontalis</i>)	Special Concern	None
Vascular plant	Cutleaf Ironplant (<i>Xanthisma spinulosum</i> var. <i>spinulosum</i>)	Special Concern	None
Vascular plant	Drummond's Campion (<i>Silene drummondii</i> ssp. <i>drummondii</i>)	Special Concern	None
Vascular plant	Dry Sedge (<i>Carex xerantica</i>)	Special Concern	None
Vascular plant	Dwarf Spike-rush (<i>Eleocharis coloradoensis</i>)	Special Concern	None
Vascular plant	English Sundew (<i>Drosera anglica</i>)	Special Concern	None
Vascular plant	Felwort (<i>Gentianella amarella</i>)	Special Concern	None
Vascular plant	Few-flowered Spike-rush (<i>Eleocharis quinqueflora</i>)	Special Concern	None
Vascular plant	Frenchman's Bluff Moonwort (<i>Botrychium gallicomontanum</i>)	Endangered	None
Vascular plant	Garber's Sedge (<i>Carex garberi</i>)	Threatened	None
Vascular plant	Goblin Fern (<i>Botrychium mormo</i>)	Special Concern	None
Vascular plant	Gray Ragwort (<i>Packera cana</i>)	Endangered	None
Vascular plant	Hair-like Beak-rush (<i>Rhynchospora capillacea</i>)	Threatened	None
Vascular plant	Hairy Fimbristylis (<i>Fimbristylis puberula</i> var. <i>interior</i>)	Endangered	None
Vascular plant	Hall's Sedge (<i>Carex hallii</i>)	Special Concern	None
Vascular plant	Handsome Sedge (<i>Carex formosa</i>)	Endangered	None
Vascular plant	Hill's Thistle (<i>Cirsium pumilum</i> var. <i>hillii</i>)	Special Concern	None
Vascular plant	Holboell's Rock-cress (<i>Boechera retrofracta</i>)	Threatened	None
Vascular plant	Indian Ricegrass (<i>Achnatherum hymenoides</i>)	Endangered	None
Vascular plant	Lapland Buttercup (<i>Ranunculus lapponicus</i>)	Special Concern	None
Vascular plant	Least Moonwort (<i>Botrychium simplex</i>)	Special Concern	None
Vascular plant	Linear-leaved Sundew (<i>Drosera linearis</i>)	Special Concern	None

Minnesota State Listed Species in the Red River Basin

Vascular plant	Long-stalked Chickweed (<i>Stellaria longipes</i> ssp. <i>longipes</i>)	Special Concern	None
Vascular plant	Louisiana Broomrape (<i>Orobanche ludoviciana</i> var. <i>ludoviciana</i>)	Special Concern	None
Vascular plant	McCalla's Willow (<i>Salix maccalliana</i>)	Special Concern	None
Vascular plant	Mingan Moonwort (<i>Botrychium minganense</i>)	Special Concern	None
Vascular plant	Missouri Milk-vetch (<i>Astragalus missouriensis</i> var. <i>missouriensis</i>)	Special Concern	None
Vascular plant	Missouri Spurge (<i>Chamaesyce missurica</i>)	Special Concern	None
Vascular plant	Mudwort (<i>Limosella aquatica</i>)	Special Concern	None
Vascular plant	Northern Androsace (<i>Androsace septentrionalis</i>)	Special Concern	None
Vascular plant	Northern Gentian (<i>Gentiana affinis</i>)	Special Concern	None
Vascular plant	Northern Singlespike Sedge (<i>Carex scirpoidea</i>)	Special Concern	None
Vascular plant	Nuttall's Sunflower (<i>Helianthus nuttallii</i> ssp. <i>rydbergii</i>)	Special Concern	None
Vascular plant	Oat-grass (<i>Avenula hookeri</i>)	Special Concern	None
Vascular plant	Pale Moonwort (<i>Botrychium pallidum</i>)	Endangered	None
Vascular plant	Plains Reedgrass (<i>Calamagrostis montanensis</i>)	Special Concern	None
Vascular plant	Prairie Mimosa (<i>Desmanthus illinoensis</i>)	Special Concern	None
Vascular plant	Prairie Moonwort (<i>Botrychium campestre</i>)	Special Concern	None
Vascular plant	Purple Sand-grass (<i>Triplasis purpurea</i> var. <i>purpurea</i>)	Special Concern	None
Vascular plant	Ram's-head Lady's-slipper (<i>Cypripedium arietinum</i>)	Threatened	None
Vascular plant	Red Saltwort (<i>Salicornia rubra</i>)	Threatened	None
Vascular plant	Red Three-awn (<i>Aristida purpurea</i> var. <i>longiseta</i>)	Special Concern	None
Vascular plant	Rock Sandwort (<i>Minuartia dawsonensis</i>)	Special Concern	None
Vascular plant	Sea Milkwort (<i>Lysimachia maritima</i>)	Endangered	None
Vascular plant	Sea Naiad (<i>Najas marina</i>)	Special Concern	None

Minnesota State Listed Species in the Red River Basin

Vascular plant	Sheathed Pondweed (<i>Stuckenia vaginata</i>)	Special Concern	None
Vascular plant	Shortray Fleabane (<i>Erigeron lonchophyllus</i>)	Special Concern	None
Vascular plant	Siberian Yarrow (<i>Achillea alpina</i>)	Threatened	None
Vascular plant	Slender Milk-vetch (<i>Astragalus flexuosus</i> var. <i>flexuosus</i>)	Special Concern	None
Vascular plant	Small White Lady's-slipper (<i>Cypripedium candidum</i>)	Special Concern	None
Vascular plant	Small White Water-lily (<i>Nymphaea leibergii</i>)	Threatened	None
Vascular plant	Small-leaved Pussytoes (<i>Antennaria parvifolia</i>)	Special Concern	None
Vascular plant	Soft Goldenrod (<i>Solidago mollis</i>)	Special Concern	None
Vascular plant	Sooty-colored Beak-rush (<i>Rhynchospora fusca</i>)	Special Concern	None
Vascular plant	Sterile Sedge (<i>Carex sterilis</i>)	Threatened	None
Vascular plant	Sullivant's Milkweed (<i>Asclepias sullivantii</i>)	Threatened	None
Vascular plant	Thread-like Naiad (<i>Najas gracillima</i>)	Special Concern	None
Vascular plant	Twig-rush (<i>Cladium mariscoides</i>)	Special Concern	None
Vascular plant	Water-hyssop (<i>Bacopa rotundifolia</i>)	Special Concern	None
Vascular plant	Western Prairie Fringed Orchid (<i>Platanthera praeclara</i>)	Endangered	Threatened
Vascular plant	White Adder's-mouth (<i>Malaxis monophyllos</i> var. <i>brachypoda</i>)	Special Concern	None
Vascular plant	White Wild Indigo (<i>Baptisia lactea</i> var. <i>lactea</i>)	Special Concern	None
Vascular plant	Whorled Nut-rush (<i>Scleria verticillata</i>)	Threatened	None
Vascular plant	Widgeon-grass (<i>Ruppia cirrhosa</i>)	Special Concern	None
Vascular plant	Wild Parsley (<i>Cymopterus glomeratus</i>)	Special Concern	None
Vascular plant	Wolf's Spike-rush (<i>Eleocharis wolfii</i>)	Endangered	None
Vascular plant	Yellow Prairie Violet (<i>Viola nuttallii</i>)	Threatened	None

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Data from: North Dakota Natural Heritage Program (NDNHP). 2012. North Dakota Plant Species of Concern. [Unpublished list].

North Dakota Natural Heritage Program, Bismarck, ND. 7 pp.

ANIMALS

Scientific Name	Common Name	Heritage Global Rank State Rank	USFWS Federal Status	Breeding Habitat/ NDNHP Occurrence Distribution
VERTEBRATES:				
BIRDS:				
<i>Accipiter cooperii</i>	Cooper's hawk	G5 SU	-	Brushy, deciduous woodlands, adjoining wood margins along major streams, ravines and escarpments. Bill, Bott, Burk, Gfor, McHe
<i>Accipiter gentilis</i>	Northern goshawk	G5 S?	-	Coniferous dominated hardwoods.
<i>Ammodramus bairdii</i>	Baird's sparrow	G4 SU	-	Upland prairies of mixed grass prairie or tallgrass habitat types. Bowm, Burk, Divi, Gfor, Kidd, McHe, McLe, Moun, Oliv, Pier, Role, Stut, Will
<i>Ammodramus henslowii</i>	Henslow's sparrow	G4 S?	-	Uncultivated grasslands, wet meadows and overgrown fields.
<i>Ammodramus leconteii</i>	Le Conte's sparrow	G4 SU	-	Fens, lowland tracts of tallgrass prairie and wet meadows. Bott, Kidd, McHe, Stut
<i>Ammodramus nelsoni</i>	Nelson's sharp-tailed sparrow	G5 SU	-	Freshwater prairie marshes and meadows. Kidd, McLe, Pier
<i>Anas acuta</i>	Northern pintail	G5 S?	-	Freshwater lakes and ponds. Stock-watering ponds.
<i>Anas cyanoptera</i>	Cinnamon teal	G5 S3	-	Freshwater lakes and marshes in open country. Bott, Burk, Burl, Cava, Gold, Kidd, McHe, McLe, Renv, Stut, Trai, Ward, Well
<i>Anthus spragueii</i>	Sprague's pipit	G4 S3	-	Mixed grass prairie on uplands. Bens, Bill, Bowm, Burk, Divi, Gfor, Gold, Kidd, McHe, McKe, McLe, Mort, Moun, Oliv, Pier, Slop, Star, Stut

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<i>Aquila chrysaetos</i>	Golden eagle	G5 S3	-	Badland buttes and adjoining native prairie. Bill, Dunn, Gold, McKe, Slop, Will
<i>Asio otus</i>	Long-eared owl	G5 SU	-	Dense vegetation adjacent to grasslands or shrublands; also open forests. Burk, Mort, Stut
<i>Athene cunicularia</i> (<i>Am. Ornithol. Union 1991</i>)	Burrowing owl	G4 SU	-	Dry, open, shortgrass prairie, often associated with burrowing mammals. Bill, Bott, Dunn, McHe, McKe, Merc
<i>Bartramia longicauda</i>	Upland sandpiper	G5 S?	-	Grasslands, especially large blocks. Grnt, Mort, Star
<i>Bubulcus ibis</i>	Cattle egret	G5 S4	-	Along streams, ponds and marshes. Burl, McHe, Pier, Sarg
<i>Bucephala albeola</i>	Bufflehead	G5 S4	-	Freshwater, permanent ponds with no outlet or only seasonal flow and small lakes. Bott
<i>Bucephala clangula</i>	Common goldeneye	G5 S3	-	Wetlands, lakes and river bordered by forests mature enough to provide suitable tree cavities. Bens, Bott, Grig, McHe, Nels, Rams, Role, Wals
<i>Buteo regalis</i>	Ferruginous hawk	G4 SU	-	Flat and rolling prairie, grasslands, sagebrush county. Bill, Bowm, Burk, Burl, Kidd, Loga, McIn, McLe, Moun, Pier, Sher, Slop, Star, Stut, Wals, Ward
<i>Buteo swainsoni</i>	Swainson's hawk	G5 SU	-	Native prairie or cropland that include thickets of natural tree growth or brush margins of native forested tracts. Barn, Bens, Bill, Dick, Gfor, Grnt, Kidd, McHe, McIn, Mcke, Mort, Moun, Nels, Rams, Sarg, Star, Stut, Town, Wals, Ward
<i>Butorides virescens</i>	Green heron	G5 S3	-	In or near woodland borders of streams, oxbows, ponds and lakes. Barn, Bens, Bott, Gfor, McHe, Rams, Rich, Sarg, Stut
<i>Calcarius mccownii</i>	McCown's longspur	G5 S2	-	Shortgrass prairie and heavily grazed, dry mixed grass prairie or rangeland. Bowm, Gold

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<i>Calcarius ornatus</i>	Chestnut-collared longspur	G5 S?	-	Mixed-grass and shortgrass uplands. Open prairie and cropland.
<i>Caprimulgus vociferus</i>	Whip-poor-will	G5 SH	-	Woods, especially near fields. Cass, Gfor, Pemb, Wals
<i>Cardinalis</i>	Northern cardinal	G5 S4	-	Shrubs and small trees along wood margins or in forest openings. Cass
<i>Cathartes aura</i>	Turkey vulture	G5 S4	-	Habitat complexes that include brushy woodlands intermingled with or adjoining open expanses of prairie. Bens, Bott, Burl, Dunn, Kidd, Mort, Oliv, Role, Star, Stut, Will
<i>Catoptrophorus semipalmatus</i>	Willet	G5 SU	-	Semipermanent ponds and lakes, seasonal ponds and lakes, permanent ponds and lakes, alkali ponds and lakes, intermittent streams. McLe, Sarg
<i>Centrocercus urophasianus</i>	Greater sage-grouse	G3G4 SU	(PS:C)	Scrub prairie dominated by a semiopen growth of sage. Bill, Bowm, Slop
<i>Charadrius melodus</i>	Piping plover	G3 S1S2	(LE,LT)	Barren sand and gravel shores of rivers and lakes, sparsely vegetated shorelines. Bens, Burk, Burl, Divi, Dunn, Eddy, Emmo, Kidd, Loga, McHe, McIn, McKe, McLe, Merc, Mort, Moun, Nels, Oliv, Pier, Rams, Renv, Role, Sarg, Sher, Slop, Stut, Ward, Will
<i>Charadrius montanus</i>	Mountain plover	G3 SX	PT	Dry shortgrass prairie and sage brush. Bill, Rich
<i>Chlidonias niger</i>	Black tern	G4S?	-	Shallow freshwater marshes with emergent vegetation, including prairie slough, lake margins and occasionally river or island edges. Gfor
<i>Coccyzus americanus</i>	Yellow-billed cuckoo	G5 SU	(PS)	Second growth, thicketed streamsidess. Bowm, Burl, Cass, Dick, McKe, Mort, Rich Star, Stut
<i>Contopus cooperi</i>	Olive-sided flycatcher	G4 S?	-	Forest and woodlands, especially in burned-over areas with standing dead trees in mixed coniferous-deciduous forest.

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<i>Contopus sordidulus</i>	Western wood-pewee	G5 S4	-	Stands or groves of mature cottonwoods, usually with partially open canopy. Oliv, Rans, Slop
<i>Corvus corax</i>	Common raven	G5 SU	-	Along rivers and streams. Mort, Will
<i>Coturnicops noveboracensis</i>	Yellow rail	G4 S2	-	Sedge meadows and grassy marshes. Bens, Gfor, McHe, Moun, Sher, Stut
<i>Cygnus buccinator</i>	Trumpeter swan	G4 SX	-	Small ponds and lakes or bays with extensive beds of cattails, bulrush, sedges and/or horsetail. Kidd, Stee
<i>Dendroica cerulea</i>	Cerulean warbler	G4 S?	-	Mature deciduous forest, particularly in floodplains.
<i>Dendroica coronata auduboni</i>	Audubon's warbler	G5T5 S3	-	Coniferous forests-limited to ponderosa pines in North Dakota. Slop
<i>Dendroica pensylvanica</i>	Chestnut-sided warbler	G5 S3	-	Fairly dense upland thickets of young or second-growth deciduous forest composed of small trees and tall shrubs. Cava, Role
<i>Dryocopus pileatus</i>	Pileated woodpecker	G5 S3	-	Late successional stages of coniferous or deciduous forest, also younger forests that have scattered, large, dead trees. Cass, Cava, Gfor, Pemb, Rans, Rich, Wals
<i>Ectopistes migratorius</i>	Passenger pigeon	GX SX	-	Eastern deciduous forests.
<i>Empidonax alnorum</i>	Alder flycatcher	G5 SU	-	Low bushes in wet areas, swamps, around marshes, streamsides, near woods. Cava
<i>Falco columbarius</i>	Merlin	G5 S2	-	Natural groves of trees, including adjoining wood margins and nearby tracts of brushland, grassland and fields. Bill, Bowm, McKe, Slop

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<i>Falco mexicanus</i>	Prairie falcon	G5 S3	-	Expanses of native prairie and cropland that include badlands and high cliffs along stream valleys or scattered isolated buttes on the high plains. Bill, Dunn, Gold, McKe, Merc, Slop
<i>Falco peregrinus anatum</i>	American peregrine falcon	G4T3S1	-	Cliff ledges, mostly along rivers or lakes. Cass, Dunn
<i>Gavia immer</i>	Common loon	G5 S4	-	Freshwater lakes and rivers. Bens, Bott, Gfor, Nels, Rams, Rich, Role, Stut
<i>Grus americana</i>	Whooping crane	G1 SX	(LE,XN,PXN)	Extensive marshes with numerous shallow ponds dominated by bulrush, cattails, sedges and other aquatic plants. Burk, Burl, Dunn, Divi, Emmo, Kidd, McHe, McKe, McLe, Moun, Stut, Ward, Will
<i>Grus canadensis</i>	Sandhill crane	G5 SU	(PS)	Extensive, shallow wetlands. Bens, Burk, McHe, McLe, Merc, Mort, Moun, Nels, Pemb, Pier, Role, Stut, Town
<i>Haliaeetus leucocephalus</i>	Bald eagle	G4 S1	(PS:LT, PDL)	Lakes and rivers in forested areas. Bill, Bott, Burl, Dunn, Gfor, McLe, Merc, Mort, Oliv, Slop
<i>Hylocichla mustelina</i>	Wood thrush	G5 SU	-	Interior and edges of deciduous and mixed forests. Pemb, Rich
<i>Icteria virens</i>	Yellow-breasted chat	G5 SU	-	Fairly dense thickets of small trees and tall shrubs on north facing slopes. Bill, McKe, McLe, Merc, Oliv, Ward
<i>Lanius ludovicianus</i>	Loggerhead shrike	G5 SU	(PS)	Open country and dry upland prairie where shrubs and small trees occur. Bens, Bill, Burk, Dunn, McLe, Mort, Renv, Rich, Slop, Star, Stut, Wals, Ward
<i>Larus pipixcan</i>	Franklin's gull	G4G5 S?	-	Lakes, marshes, ponds, rivers.
<i>Limosa fedoa</i>	Marbled godwit	G5 SU	-	Wetlands include intermittent streams and various types of ponds and lakes. McLe, Sarg

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<i>Lophodytes cucullatus</i>	Hooded merganser	G5 S3	-	Wood bordered rivers and large creeks, and adjoining oxbows, with large populations of small fish. Bott, McHe, Role, Ward
<i>Melanerpes carolinus</i>	Red-bellied woodpecker	G5 SU	-	Woods, edges, farms, swamps. Dick, Mort, Stut
<i>Melanitta fusca</i>	White-winged scoter	G5 SX	-	Dense underbrush around ponds, lakes and oxbows and on islands. Bott, Burk, Nels, Role, Ward
<i>Melospiza georgiana</i>	Swamp sparrow	G5 S3	-	Fens, particularly those that contain stands of cattail or phragmites and scattered shrubs. Bens, Bott, Dick, Kidd, LaMo, Sarg
<i>Mergus merganser</i>	Common merganser	G5 SH	-	Freshwater lakes and flowing rivers. Bott, Grnt, Rams
<i>Mimus polyglottos</i>	Northern mockingbird	G5 SU	-	Parklands, cultivated lands and second growth habitats. Bowm, Burl, Cass, Dick, Grig, McLe, Rich, Star, Stut, Town, Ward
<i>Numenius americanus</i>	Long-billed curlew	G5 S2	-	Shortgrass prairie and heavily grazed, dry, mixed grass prairie or rangeland. Bill, Bowm, Gold, Siou, Slop, Star
<i>Oporornis philadelphia</i>	Mourning warbler	G5S4	-	Disturbed second growth, prefers clearings, mixed-woods forests and stands of aspen-birch. Bott, Cava, Gfor, Pemb, Role, Wals
<i>Pandion haliaetus</i>	Osprey	G5 SU	-	Habitat associated with lakes and large rivers. McLe, Wals
<i>Passerina caerulea</i>	Blue grosbeak	G5 SU	-	Deciduous woodlands, scattered shrubs in dry fields, thickets near water, farms, old fields, forest edge. Bowm, Burl, Cass, Emmo, McLe, Stut
<i>Perisoreus canadensis</i>	Gray jay	G5 SR	-	Coniferous and mixed coniferous-deciduous forest. Role
<i>Phalaenoptilus nuttallii</i>	Common poorwill	G5 S4	-	Slopes and gulches of the badlands that contain thickets of trees. Bill, Dunn, Gold, McKe, Slop
<i>Piranga ludoviciana</i>	Western tanager	G5 SU	-	Open pine and mixed forests and wooded edges. Bill, Dunn, Slop, Star, Ward

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<i>Piranga olivacea</i>	Scarlet tanager	G5 SU	-	Rich, mature deciduous forests that occur on slopes of prominent hills and valley bluffs and on well-drained floodplains of large streams. Burl, Fost, Gfor, Rans, Wals
<i>Plegadis chihi</i>	White-faced ibis	G5 SU	-	Shallow marshes with islands of emergent vegetation. Burl, Sarg
<i>Podiceps grisegena</i>	Red-necked grebe	G5 SU	-	Freshwater or slightly brackish, permanent ponds and lakes. Bens, Bott, Burk, Kidd, McHe, McIn, Rams, Role, Stut, Ward
<i>Scolopax minor</i>	American woodcock	G5 SU	-	Forest with openings. Young forest and abandoned farmland mixed with forest. Rans
<i>Seiurus noveboracensis</i>	Northern waterthrush	G5 S4	-	Brushy bogs, shrub swamps, second-growth swamp forests and wood borders of ponds, lakes and streams. Bens, Bott, Cava, Gfor, Pemb, Rams, Role
<i>Sialia sialis</i>	Eastern bluebird	G5 SU	-	Forest edge, open woodland interspersed with or adjacent to grazed or mowed grasslands. Margins of floodplain and upland deciduous forest. Barn, Bott, Cass, Dunn, Gfor, Grig, Grnt, Hett, Mort, Rans, Renv, Role, Stut, Ward
<i>Sitta canadensis</i>	Red-breasted nuthatch	G5 S4	-	Coniferous and deciduous forest. Gfor, Slop
<i>Spizella breweri</i>	Brewer's sparrow	G5 S3	-	Scrub and sage prairie. Bill, Bowm, Gold, McLe, Oliv, Slop
<i>Sterna antillarum</i>	Least tern	G4 S1	(PS:LE)	Sparsely vegetated sandbars of the Missouri and Yellowstone Rivers. Burl, Emmo, Kidd, McLe, Merc, Mort, Oliv
<i>Sterna forsteri</i>	Forster's tern	G5SU	-	Large marshes with extensive areas of emergent vegetation. Bott, Emmo, McHe, Rams, Sher, Ward
<i>Sterna hirundo</i>	Common tern	G5 SU	-	Isolated, sparsely vegetated islands in large lakes, reservoirs, shallow impoundments.

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				Burk, Burl, Kidd, McHe, McLe, Moun, Rams, Renv, Role, Stut
<i>Strix varia</i>	Barred owl	G5 SU	-	Fairly dense thickets or groves of small trees or in brushy margins of more extensive forests. McHe, Mort, Pemb
<i>Tympanuchus cupido pinnatus</i>	Greater prairie chicken	G4T4 S2	-	Mid and tallgrass prairie, often mixed with cropland. Rans, Rich, Sarg, Stut
<i>Vermivora celata</i>	Orange-crowned warbler	G5 S4	-	Open woodlands with heavy brush, especially on slopes or near water. Cava, Gfor
<i>Vermivora chrysoptera</i>	Golden-winged warbler	G4 S3	-	Patches of herbs, shrubs and scattered trees, forested edge, shrubby fields, marshes and bogs with forest edge. Bott, Cava
<i>Vireo bellii</i>	Bell's vireo	G5 S3	(PS)	Dense, low, shrubby vegetation generally early successional stages in riparian areas, brushy fields, young second-growth forest or woodland. Burl, McLe, Merc, Star
<i>Vireo philadelphicus</i>	Philadelphia vireo	G5 S3	-	Early- to mid-successional deciduous woods and woodland edges, aspen parklands, hardwoods and shrub thickets. Cava
<i>Vireo solitarius</i>	Solitary vireo	G5 S?	-	Coniferous and mixed open forests and edges.
<i>Wilsonia canadensis</i>	Canada warbler	G5 SU	-	Low trees, shrubs, underbrush. Cava
<i>Zonotrichia albicollis</i>	White-throated sparrow	G5 S3	-	Coniferous and mixed forests, with numerous openings with low, dense vegetation. Bott, Cava, Role

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MAMMALS:				
<i>Antilocapra americana</i>	Pronghorn	G5 SNR	(PS)	Open range, to include rough, arid rough sagebrush flats and valleys of the badlands. Adapted to agricultural lands.
<i>Bos bison</i>	American bison	G4 SX	(PS)	Prairie and open woodlands.
<i>Canis lupus</i>	Gray wolf	G4 SX	(LE, LT,XN)	Forest areas, scrub margins.
<i>Cervus canadensis</i>	Wapiti or Elk	G5 SU	(PS)	Forests, plains and valleys.
<i>Chaetodipus hispidus</i>	Hispid pocket mouse	G5S4	-	Sandy soils and open area, also reported in rocky and loamy soils. Upland habitats—tall and shortgrass prairies. Emmo, Grnt, Mort
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog	G3G4 SU	C	Semiarid prairie, overgrazed rangeland. Bowm
<i>Didelphis virginiana</i>	Virginia opossum	G5 SU	-	Wooded areas, especially along rivers and streams.
<i>Dipodomys ordii</i>	Ord's kangaroo rat	G5 S4	-	Sandy soils, sagebrush, yucca or bunchgrass, or in banks or cuts. Bowm, Gold, Slop
<i>Glaucomys volans</i>	Southern flying squirrel	G5 SR	-	Heavy deciduous forests.
<i>Gulo</i>	Wolverine	G4 SX	-	Boreal forests.
<i>Gulo luscus</i>	North American wolverine	G4T4 SX	-	Boreal forests.
<i>Lagurus curtatus</i>	Sagebrush vole	G5 S4	-	Temperate, arid, shrub-steppe. Bowm
<i>Lontra canadensis</i>	Northern river otter	G5 S1	-	Riparian habitats. Ward
<i>Lynx canadensis</i>	Lynx	G5 SX	(PS:LT)	Boreal forests. Stut

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<i>Lynx rufus</i>	Bobcat	G5 SU	-	Forests and broken terrain.
<i>Martes pennanti</i>	Fisher	G5 S2	-	Dense lowland forests. Pemb
<i>Mustela nigripes</i>	Black-footed ferret	G1 S1	(LE,XN)	Prairie dog towns. Adam, Bill, Bowm, Dunn, Gold, Hett, McKe, Merc, Mort, Moun, Siou, Slop, Star
<i>Myotis ciliolabrum</i>	Western small-footed myotis	G5 SU	-	Rocky habitats, dissected breaks and badlands, ridges, cliffs or major outcroppings.
<i>Myotis evotis</i>	Long-eared myotis	G5 SU	-	Wooded areas, principally coniferous or oak forests, near rocky bluffs or cliffs. Bill, Dunn, Nels
<i>Myotis volans</i>	Long-legged myotis	G5 SU	-	Open forested lands, badlands. Bill
<i>Ovis canadensis</i>	Bighorn sheep	G4T4 S2	-	Badlands. Bill, McKe
<i>Perognathus flavescens</i>	Plains pocket mouse	G5 SU	-	Sandy soils with grass and sagebrush cover. Dick, Rich, Stee
<i>Puma concolor</i>	Mountain lion	G5 S2	(PS)	Rugged terrain, trees, brushy vegetation. McKe
<i>Sorex hoyi</i>	Pygmy shrew	G5 SU	-	Little known of habitat selection—documented as occurring near wetland areas to forested tracts. Bott, Burk, Gfor, Moun, Ward
<i>Sorex palustris</i>	Water shrew	G5 SR	-	Grassy and shrubby areas along banks of streams, ponds, and lakes and around potholes in bogs or forests.
<i>Spilogale putorius</i>	Eastern spotted skunk	G5S1	-	Forest edge, riparian woodlands, fence rows and shelterbelts.
<i>Sylvilagus nuttallii</i>	Mountain cottontail	G5 SX	-	Sagebrush lands and adjacent woodlands. Bill, Grnt, Slop
<i>Urocyon cinereoargenteus</i>	Common gray fox	G5 SU	-	West-brushy vegetation associated with rugged, broken terrain. East-deciduous forests. Gfor
<i>Ursus americanus</i>	Black bear	G5 SX	(PS)	Forested and brushy areas.

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<i>Vulpes velox</i>	Swift fox	G3 S1	(PS:LE)	Shortgrass, mixed grass and sandhill prairies. Merc, Slop
REPTILES:				
<i>Apalone mutica</i>	Smooth softshell	G5 SU	-	Missouri River system. Emmo, Mort
<i>Eumeces septentrionalis</i>	Prairie skink	G5 S2S3	-	Sandy areas such as sand dunes and grasslands. Barn, Cass, Rans, Rich, Sarg
<i>Graptemys pseudogeographica</i>	False map turtle	G5 SU	-	Southern Missouri River System. Emmo
<i>Phrynosoma hernandesi</i>	Short-horned lizard	G5 S?	-	Badlands.
<i>Sceloporus graciosus</i>	Sagebrush lizard	G5 S4	-	Badlands, rocky areas near water and adjacent areas of sandy soil and sagebrush. McKe, Slop
AMPHIBIANS:				
<i>Hyla vericolor</i>	Gray treefrog	G5 S4	-	Aspen woodlands of northeastern North Dakota. Rans, Rich
<i>Necturus maculosus</i>	Mudpuppy	G5 S4	-	Red River.
<i>Rana pipiens</i>	Northern leopard frog	G5 S?	-	Usually permanent water. In summer, inhabits wet meadows and fields.
FISH:				
<i>Acipenser fulvescens</i>	Lake sturgeon	G3G4 SX	-	Benthic feeder in large, clear rivers and lakes with gravel bottoms.
<i>Ameiurus natalis</i>	Yellow bullhead	G5 SX	-	Lakes, ponds and slow moving streams with aquatic vegetation. Adam, Cass, Oliv
<i>Campostoma anomalum</i>	Central stoneroller	G5 S3	-	Small rivers and creeks with gravel or bedrock riffles. Gfor

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<i>Cycleptus elongatus</i>	Blue sucker	G3G4 S3	-	Deep pools and channels of large rivers. Burl, Dunn, Emmo, McKe, McLe, Merc, Mort, Moun, Oliv, Siou, Will
<i>Erimyzon sucetta</i>	Lake chubsucker	G5 S?	-	Ponds, lakes, oxbows, sloughs. Clear water.
<i>Hybognathus argyritis</i>	Western silvery minnow	G4S?	-	Larger prairie streams with not much current and sand bottoms.
<i>Macrhybopsis gelida</i>	Sturgeon chub	G3 S2	-	Large, turbid streams and rivers. Rock or gravel bottom. Bill, Bowm, Dunn, Gold, McKe, Moun, Slop, Star, Will
<i>Macrhybopsis meeki</i>	Sicklefin chub	G3 S2	-	Large, swift flowing rivers with sandy bottom. Dunn, McKe, Will
<i>Macrhybopsis storeriana</i>	Silver chub	G5 S?	-	Sand-,silt-, gravel-bottomed rivers, lakes.
<i>Ichthyomyzon castaneus</i>	Chestnut lamprey	G4 S?	-	Medium to large rivers, reservoirs.
<i>Ichthyomyzon unicuspis</i>	Silver lamprey	G5 S?	-	Lakes, reservoirs, large rivers.
<i>Moxostoma valenciennesi</i>	Greater redhorse	G4 S2	-	Clear, moderate to fast flowing rivers. Cass, Rans, Rich
<i>Nocomis biguttatus</i>	Hornyhead chub	G5 S3	-	Clear streams with permanent flow. Gravel bottoms. Gfor Stut, Wals
<i>Notropis anogenus</i>	Pugnose shiner	G3 S1	-	Clear, moderately flowing waters with aquatic vegetation. Gfor, Rans, Stut
<i>Notropis heterolepis</i>	Blacknose shiner	G4 S3	-	Quiet pools of small, clear streams with bottom of muck and aquatic vegetation. Rans, Rich, Stut
<i>Notropis rubellus</i>	Rosyface shiner	G5 S3	-	Medium sized streams in shallow water over gravel. Barn, Cass, Gfor, Grnt, Rans
<i>Percina caprodes</i>	Logperch	G5 S3	-	Lakes, streams and rivers with gravelly bottom. Cass, Trai
<i>Percina shumardi</i>	River darter	G5 SU	-	Large rivers in deep chutes and riffles with swift current and gravel bottom.

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<i>Percopsis omiscomaycus</i>	Trout-perch	G5 S?	-	Lakes, deep flowing creeks. Rivers over sand.
<i>Phoxinus eos</i>	Northern redbelly dace	G5 S4	-	Slow flowing creeks with clear water and vegetation. Bill, Burl, Cass, Dunn, Gfor, Grnt, McLe, Merc, Mort, Pemb, Rans, Rich, Slop, Star, Trai, Wals, Will
<i>Phoxinus neogaeus</i>	Finescale dace	G5 SU	-	Cool bog lakes, streams and some larger lakes. May be in beaver ponds. Gfor, Pemb, Will
<i>Platygobio gracilis</i>	Flathead chub	G5 S?	-	Rivers with turbid waters and swift current. Emmo, McKe, Moun, Siou, Will
<i>Polyodon spathula</i>	Paddlefish	G4 S?	-	Large rivers with swift currents. Burl, Emmo, McKe, McLe, Merc, Mort, Moun, Siou, Will
<i>Pylodictis olivaris</i>	Flathead catfish	G5 S4	-	Deep areas of large rivers and reservoirs. Emmo
<i>Scaphirhynchus albus</i>	Pallid sturgeon	G1 S1	LE	Large, turbid rivers with strong current and firm sand bottom. Dunn, Emmo, McKe, McLe, Mort, Moun, Siou, Will
<i>Semotilus margarita</i>	Pearl dace	G5 S3	-	Cool, clear ponds, creeks and lakes. McLe, Role, Stee, Wals
INVERTEBRATES:				
BIVALVES:				
<i>Fusconaia flava</i>	Wabash pigtoe mussel	G5 S4	-	Large permanent streams. Barn, Cass, Grig, Nels, Pemb, Rans, Rich, Trai, Wals
<i>Ligumia recta</i>	Black sandshell mussel	G5 S4	-	Large permanent streams. Barn, Cass, Gfor, Pemb, Rans, Rich, Trai, Wals
<i>Potamilus alatus</i>	Pink heelsplitter mussel	G5 S4	-	Large permanent streams. Cass, Gfor, Pemb, Rans, Rich, Trai, Wals
<i>Potamilus ohiensis</i>	Pink papershell mussel	G5 SU	-	Small permanent streams. Burl, Grnt, Merc, Mort, Siou
<i>Quadrula</i>	Mapleleaf mussel	G5 S3	-	Large permanent streams. Cass, Gfor, Pemb, Rans, Trai, Wals
GASTROPODS:				

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<i>Vertigo arthuri</i>	Callused vertigo snail	G5 S?	-	Moist, undisturbed forested areas on limestone or schist substrate.
INSECTS:				
<i>Altica nancyae</i>	A flea beetle	G? S2	-	Range grasses. McKe
<i>Apobaetis lakota</i>	A mayfly	G1 S?	-	
<i>Atrytone arogos iowa</i>	Arogos skipper	G3G4T3T4 S?	-	Strictly prairie species. Rans, Slop, Ward
<i>Bembidion henshawi</i>	A beetle	G? S?	-	
<i>Catocala praeclara manitoba</i>	Manitoba underwing	G5TU S?	-	
<i>Chlorochroa belfragii</i>	Belfragi's chlorochroan bug	G? S?	-	Native wet prairie habitats—swamps, marshes, seeps.
<i>Chlosyne acastus</i>	Acastus checkerspot	G4G5 S?	-	
<i>Cicindela circumpecta johnsonii</i>	A tiger beetle	G5T5 S?	-	Saline soils. Gfor
<i>Cicindela formosa</i>	A tiger beetle	G5 SU	-	Open sand, hilly areas.
<i>Cremastocheilus nitens</i>	A scarab beetle	G3G5 S3	-	Sandhills. Adults found in sand, larvae in ant hills.
<i>Dyschirius criddlei</i>	A beetle	G? S?	-	
<i>Euphyes dion</i>	Dion skipper	G4 S1	-	Freshwater sedge marshes in or near woodlands in Sheyenne Sandhills region. Rans
<i>Hesperia dacotae</i>	Dakota skipper	G2 S2	(PS:C)	Tallgrass and midgrass prairie with little bluestem, needle and thread, and purple coneflower. Barn, Bott, Burk, Dunn, Eddy, Grig, McHe, McKe, Moun, Oliv, Rans, Rich, Role, Sarg, Stut, Ward, Well
<i>Hesperia ottoe</i>	Ottoe skipper	G3G4S?	-	Midgrass to tallgrass prairies and dry fields.

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<i>Megacyllene powersi</i>	A longhorn beetle	G? SU	-	Sandhills. Rans, Rich
<i>Oarisma poweshiek</i>	Poweshiek skipper	G2G3 S?	-	Rans, Rich
<i>Phyciodes batesii</i>	Tawny crescent	G4 S3	-	Moist forest borders in riparian situations and moist valley bottoms that border riparian woodlands. Bens, Bott, Cass, Dunn, McHe, McKe, Pemb, Slop, Ward
<i>Platysystrophus minutus</i>	A weevil	G? SU	-	Oak trees. Found in Sheyenne River area.
<i>Poanes massasoit</i>	Mulberry wing	G4 S2	-	Freshwater sedge marshes in or near woodlands in Sheyenne Sandhills region. Rans, Rich
<i>Poanes viator</i>	Broad-winged skipper	G5 S2	-	Freshwater sedge marshes in or near woodlands in Sheyenne Sandhills region. Rans, Rich
<i>Speyeria idalia</i>	Regal fritillary	G3 S2	-	Virgin tallgrass prairies. Burl, Cass, Dick, Loga, Rans, Rich, Sarg, Siou
<i>Tachys halophilus</i>	A beetle	G? S?	-	

This list should be cited as: Dirk, C.N.G. 2012. North Dakota Animal Species of Concern. [Unpublished list]. North Dakota Natural Heritage Program, Bismarck. 11 pp.

PLANTS

Scientific Name	Common Name	Heritage		USFWS	NDNHI Occurrence Distribution	Habitat
		State Rank	Global Rank	Federal Status		
<i>Acorus americanus</i>	Sweetflag	S4	G5	-	Bott, McHe, Rans	Peatlands, fens and seeps.
<i>Allium canadense</i> L.	Meadow onion	S1	G5	-	Sarg	Prairies, open woods.
<i>Allium tricoccum</i> Ait.	Wild garlic	S3	G5	-	Rich	Rich undisturbed woods.
<i>Apios americana</i> Medik.	American groundnut	SH	G5	-	Rans	Moist woods, thickets, banks.
<i>Arabis canadensis</i> L.	Sicklepod	S1	G5	-	Sarg	Mesic woodlands.
<i>Arnica cordifolia</i> Hook.	Heart-leaved arnica	S3	G5	-	Loga	Open woodlands.
<i>Asclepias lanuginosa</i>	Woolly milkweed	S1	G4?	-	Dunn, Grnt, McHe, Star, Stut	Sandy or rocky calcareous prairie.
<i>Asclepias sullivantii</i> Engelm. ex Gray	Sullivant's milkweed	S2	G5	-	Cass, Rich	Mesic tallgrass prairies.
<i>Astragalus drummondii</i> Dougl. ex Hook.	Drummond's milkvetch	S1	G5	-	Gfor, Will	Open or wooded hillsides, ravines.
<i>Astragalus neglectus</i> (Torr. and Gray) Sheldon	Cooper's milkvetch	S1	G4	-	Pemb	Sandy, gravelly shores, mesic gravelly prairies.
<i>Astragalus vexilliflexus</i> Sheldon	Bent-flowered milkvetch	S3	G4	-	Dunn, Slop, Star	Barren badland slopes and buttes.
<i>Athyrium filix-femina</i> Roth	Northern lady-fern	S3	G5	-	Cava, Gfor, Pemb, Rans, Rich	Moist woods, thickets, bogs, along streams.
<i>Botrychium campestre</i> W.H. Wagner & Farrar ex. W.H. & F.Wagner	Prairie grapefern	S1	G3G4	-	McHe	Dry, gravelly or sandy prairie.
<i>Botrychium matricariifolium</i> (A. Braun ex Dowell)A. Braun ex Koch	Chamomile grapefern	S1	G5	-	McHe, Ward	Moist woodlands.

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<i>Botrychium minganense</i> Victorin	Moonwort	S1	G4	-	Bott, Burk, Cava, Rans	Wooded, often north-facing slopes, meadows.
<i>Botrychium multifidum</i> (Gmel.) Trev.	Leathery grapefern	S1	G5	-	Cava	Wet meadows, rich woodlands.
<i>Botrychium simplex</i> E. Hitchc.	Least grapefern	S2	G5	-	Rans	Meadows, barrens and woods; subacid soils.
<i>Bromus kalmii</i> Gray	Kalm's brome	S3	G5	-	Cava, Pemb	Open oak woods, sandy soils.
<i>Calla palustris</i> L.	Water arum	S2	G5	-	Pemb, Role	Northern marshes and swamps.
<i>Campanula aparinoides</i> Pursh	Marsh bellflower	S2S3	G5	-	Pemb, Rans, Rich	Wetland thickets, seepage peatlands.
<i>Cardamine bulbosa</i> (Schreb. ex Muhl.) B.S.P.	Spring cress	S1	G5	-	Rans	Wet meadows and woods, springs.
<i>Carex alopecoidea</i> Tuckerman	Foxtail sedge	S2	G5	-	Barn, Bott, Pemb, Rans Rich, Role	Damp, rich, wooded areas.
<i>Carex athrostachya</i> Olney	Jointed-spike sedge	S3	G5	-	Bens, Divi, Moun, Will	Low prairie, marsh margins.
<i>Carex backii</i> Boott	Back's sedge	S3	G4	-	Bott, Burk, Cava	Damp, wooded areas.
<i>Carex brunnescens</i> (Pers.) Poir.	Brown sedge	S1	G5	-	McHe	Fens, wet wooded areas.
<i>Carex buxbaumii</i> Wahlenb.	Buxbaum's sedge	S2	G5	-	Barn, Stut	Wet meadows, fens.
<i>Carex capillaris</i> L.	Hair-like sedge	S2	G5	-	Bott, McHe	Wet meadows, fens.
<i>Carex chordorrhiza</i> Ehrh. ex L. F.	Creeping sedge	S1	G5	-	Bott	Sphagnum bogs, poor fens.
<i>Carex convoluta</i> Mackenzie	Spiral sedge	S2	G5	-	Sarg	Rich, deciduous woodlands.
<i>Carex diandra</i> Schrank	Lesser-panicked sedge	S3	G5	-	Bott, Burk, Gfor, Role	Swamps, meadows, shores.
<i>Carex echinata ssp echinata</i>	Spiny sedge	S1	G5T5	-	Bott	Sphagnum bogs.

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<i>Carex festucacea</i> Schkuhr ex Willd.	Fescue sedge	S2	G5	-	Cass	Wooded area.
<i>Carex foenea</i> Willd.	Dry-spiked sedge	S3	G5	-	Bott, Dunn	Aspen woods, ravines.
<i>Carex formosa</i> Dewey	Handsome sedge	S1	G4	-	Rich	Low, moist, eastern woodlands.
<i>Carex garberi</i> Fern.	Elk sedge	S1	G5	-	Bens, Burk, McHe	Fens, swamps, pond margins.
<i>Carex gracillima</i> Schwein.	Graceful sedge	S1	G5	-	Pemb	Moist, swampy woods.
<i>Carex gynocrates</i> Wormskj. ex Drej.	Pistillate sedge	S1	G5	-	McHe	Peaty fens.
<i>Carex haydenii</i> Dewey	Hayden's sedge	S1	G5	-	Dunn	Wet meadows, sloughs.
<i>Carex lasiocarpa</i> Ehrh.	Wiregrass sedge	S3	G5	-	Bott, Gfor, McHe, Rans, Rich	Sphagnum bogs, seepage-fed peatlands, lake borders.
<i>Carex leptalea</i> Wahlenb.	Delicate sedge	S3	G5	-	Cava, McHe, Pemb, Rans, Rich	Shrubby peatland fens, swampy woods and thickets.
<i>Carex limosa</i> L.	Mud sedge	S2	G5	-	Bott, Mche	Sphagnum bogs, fens.
<i>Carex nebrascensis</i> Dewey	Nebraska sedge	S2	G5	-	Emmo, Lamo, Slop	Wet meadows, stream margins.
<i>Carex pedunculata</i> Muhl. ex Willd.	Peduncled sedge	S2	G5	-	Cava	Moist oak or birch woodlands.
<i>Carex richardsonii</i> R. Br.	Richardson's sedge	S1	G5	-	Cass, McHe, Rich	Low, usually sandy, prairie.
<i>Carex scirpoidea</i> Michx.	Spikerush sedge	S2	G5	-	Dunn, McHe, Role	Rocky slopes, wet meadows.
<i>Carex scoparia</i> Schkuhr ex Willd.	Pointed broom sedge	SH	G5	-	Bens, Gfor, Stut, Wals	Damp woods, low prairie, lakeshores.
<i>Carex simulata</i> Mackenzie	Copycat sedge	S2	G5	-	Burk, Divi, McHe	Calcareous fens, wet meadow.
<i>Carex sterilis</i> Willd.	Sterile sedge	S1	G4	-	McHe	Seepage peatland fens, wet meadows.

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<i>Caulophyllum thalictroides</i> (L.) Michx.	Blue cohosh	S1	G4G5	-	Cass, Rans Rich, Role	Moist rich woods.
<i>Chaenactis douglasii</i> (Hook.) Hook. & Arn.	Douglas' dusty- maiden	S2	G5	-	Bill, Gold	Scoria slopes and buttes.
<i>Cheilanthes feei</i> T. Moore	Slender lip fern	S1	G5	-	Dunn	Dry rocky slopes, on sandstone or limestone.
<i>Chenopodium subglabrum</i> (S. Wats.) A. Nels.	Smooth goosefoot	S1	G3G4	-	Bill, Slop	Sandy river banks and terraces.
<i>Clematis columbiana var</i> <i>tenuiloba</i> (Gray) J. Pringle	Slender-lobed clematis	S1	G5?T4?	-	Dunn	Rocky slopes, limestone soil.
<i>Collinsia parviflora</i> Lindl.	Blue lips	S2	G5	-	Bill, Dunn, Slop	Mesic slopes of buttes.
<i>Crataegus mollis</i> Scheele	Downy hawthorn	S1	G5	-	Cass, Gfor, Rans	Open mesic woods.
<i>Cryptantha torreyana</i> (Gray) Greene	Torrey's cryptantha	S1	G5	-	Bill, Bowm	Butte slopes, on scoria.
<i>Cyperus bipartitus</i> Torr.	Brook flatsedge	S2	G5	-	Cass, Rans, Rich, Stut	Cool, spring-fed streams.
<i>Cyperus diandrus</i> Torr.	Low flatsedge	S2	G5	-	Rans, Rich	Sandy or muddy shores, stream margins.
<i>Cypripedium candidum</i> Muhl. ex Willd.	White lady's- slipper	S2	G4	-	Bens, Cass, Eddy, Gfor, Grig, Nels, Rans Rich, Role, Sarg, Wals	Low prairie, wet meadows.
<i>Cypripedium parviflorum</i> Salisb.	Small yellow lady's- slipper orchid	S2	G5	-	Bens, Bott, Cava, Dunn, Gfor, McHe, Pemb, Rans, Role, Sarg, Wals	Damp woods, fens, stream banks.
<i>Cypripedium parviflorum var.</i> <i>pubescens</i> (Willd.) Knight	Large yellow lady's- slipper	S2	G5T5	-	Bens, Eddy, Rans, Role	Boggy areas, wet prairies.
<i>Cypripedium reginae</i> Walt.	Showy lady's- slipper	S2	G4	-	Bens, Cava, Eddy, Pemb, Rans, Rich	Swampy woodlands and thickets, fens.

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<i>Dalea enneandra</i> Nutt.	Nine-anthered dalea	S3	G5	-	Bill, Grnt, Merc, Mort, Siou	Sandy or gravelly slopes, dry mixed grass prairie.
<i>Desmanthus illinoensis</i> (Michx.) Macm. ex B. L. Robins. & Fern	Prairie mimosa	S1	G5	-	Emmo, Sarg	Prairies with rocky or sandy soil.
<i>Dicentra cucullaria</i> (L.) Bernh.	Dutchman's breeches	S1	G5	-	Gfor, Rans, Sarg	Rich eastern woodlands.
<i>Diervilla lonicera</i> P. Mill.	Dwarf honeysuckle	S3	G5	-	Cava	Shady woods, usually aspen.
<i>Dirca palustris</i> L.	Leatherwood	S1	G4	-	Cava	Shady, damp woodland slopes.
<i>Drosera rotundifolia</i> L.	Round-leaved sundew	S1	G5	-	Bott	Acid bogs, swamps.
<i>Dryopteris carthusiana</i> (Vill.) H.P. Fuchs	Spinulose woodfern	S3	G5	-	Cava, Pemb, Rans, Rich	Rich, moist woods, ravines, boggy areas, alder thickets.
<i>Dryopteris cristata</i> (L.) Gray	Crested woodfern	S3	G5	-	Bott, Cass, Cava, Pemb, Rans, Rich	Swampy woods and thickets, seeps.
<i>Eleocharis parvula</i> (Roemer & J.A. Schultes) Link ex Bluff., Nees & Schauer	Dwarf spikerush	S2	G5	-	Burl, Gfor, Nels, Sarg	Brackish or alkaline shores.
<i>Eleocharis pauciflora</i> (Lightf.) Link	Few-flowered spikerush	S3	G5	-	Bens, Burk, Kidd, McHe, Role, Stut, Well	Calcareous fens and seeps.
<i>Eleocharis wolfii</i> (Gray) Gray ex Britt.	Wolf's spikerush	SH	G3?	-	Cass	Shores, low, wet prairie.
<i>Elymus glaucus</i> Buckl.	Blue wildrye	S2	G5	-	Bott, McHe	Open woods, prairie slopes.
<i>Epilobium coloratum</i> Biehler	Purple-leaved willowherb	S3	G5	-	Rans, Rich, Stut	Marshes, seeps, shores.
<i>Epilobium pygmaeum</i> (Speg.) P. Hoch & Raven	Smooth-spike primrose	S2	G5	-	Bill, Hett	Along streams and early- drying vernal pools.
<i>Equisetum palustre</i> L.	Marsh horsetail	S2	G5	-	Rans, Rich	Willow or alder thickets, swampy woods, stream banks.

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<i>Equisetum pratense</i> Ehrh.	Meadow horsetail	S2	G5	-	Barn, Cass, Pemb, Rans, Rich	Moist boggy woods, shady river banks and shores.
<i>Equisetum sylvaticum</i> L.	Wood horsetail	S2	G5	-	Bens, Cava, Pemb	Moist aspen or lowland woods, seeps.
<i>Equisetum variegatum</i> Schleich. ex F. Weber & D.M.H. Mohr	Variegated horsetail	S1	G5	-	McHe	Marl pools of calcareous fens.
<i>Erigeron divergens</i> Torr. & Gray	Spreading fleabane	S1	G5	-	Gold, Nels	Dry, open rocky or sandy sites, buttes.
<i>Erigeron radicans</i> Hook.	Cushion fleabane	S1	G3G4	-	Dunn	Dry, exposed hillsides, buttes at higher elevations.
<i>Eriogonum cernuum</i> Nutt.	Nodding buckwheat	S1	G5	-	Dunn, Slop	Buttes on scoria or limestone.
<i>Eriogonum visherii</i> A. Nels.	Dakota buckwheat	S2	G3	-	Bill, Gold, Grnt, McKe, Moun, Siou, Slop	Clayey badland buttes and slopes, sandy-clay outwash areas.
<i>Eriophorum chamissonis</i> C.A. Mey.	Chamisson's cottongrass	S2	G5	-	Barn, Bott, Lamo, McHe, Role	Bogs, marshes, peaty fens.
<i>Eriophorum gracile</i> W.D.J. Koth	Slender cottongrass	S1	G5	-	Rans	Seepage fens.
<i>Eriophorum viridicarinatum</i> (Engelm.) Fern.	Green keeled cottongrass	S2	G5	-	Bott, Pemb, Rans	Sphagnum bogs, peaty fens.
<i>Euonymus atropurpureus</i> Jacq.	Wahoo	S3	G5	-	Rans, Rich	Rich deciduous woods, woodland edges, river banks.
<i>Euphorbia robusta</i> (Engelm.)	Rocky mountain spurge	S3	G5	-	Bill	Dry, sandy or gravelly prairie slopes.
<i>Fraxinus nigra</i> Marsh.	Black ash	S2	G5	-	Cava, Pemb	Swampy or wet lowland woods.
<i>Fritillaria pudica</i> (Pursh) Spreng.	Yellow fritillary	S3	G5	-	Bill, Mort	Ephemerally moist areas of buttes.
<i>Galium labradoricum</i> (Wieg.) Wieg.	Bog bedstraw	S3	G5	-	Bott, McHe, Rans, Rich	Wetland thickets, fens, swampy woods.
<i>Gentianopsis crinita</i> (Froel.) Ma	Fringed gentian	S2	G5	-	Burk, Eddy, Kidd, Pemb, Town	Low, wet prairies, stream banks.

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<i>Geranium maculatum</i> L.	Wild geranium	SH	G5	-	Cass	Rich, eastern, deciduous woods.
<i>Geum rivale</i> L.	Water avens	S2	G5	-	Pemb	Marshes, wet meadows, river banks.
<i>Gymnocarpium dryopteris</i> (L.) Newman	Oakfern	S2	G5	-	Cava, Rans	North-facing or shady wooded slopes.
<i>Halenia deflexa</i> (Sm.) Griseb.	Spurred gentian	S3	G5	-	Cava, Pemb	Wetland thickets, damp shady woods.
<i>Helianthemum bicknellii</i> Fern.	Bicknell's sunrose	S1	G5	-	Pemb, Rans	Open woods, prairies, usually dry sandy soil.
<i>Hudsonia tomentosa</i> Nutt.	Woolly beach-heather	S1	G5	-	Rans	Sand prairies and dunes.
<i>Iris missouriensis</i> Nutt.	Rocky mountain iris	S2	G5	-	Burl, Emmo, Kidd, Loga	Mesic areas within mixed grass prairie.
<i>Juncus brevicaudatus</i> (Engelm.) Fern.	Short-tailed rush	S2	G5	-	Bott, McHe	Wet meadows, fens, marshes.
<i>Juncus vaseyi</i> Engelm.	Vasey's rush	S2	G5?	-	Bott	Wet meadows, shores.
<i>Lappula cenchrusoides</i>	Stickseed	S1	G4	-	Bill, Dunn, McKe, Siou, Slop, Will	Dry soils in the open.
<i>Lechea stricta</i> Leggett ex Gray	Upright pinweed	S2	G4?	-	Bowm, Rans, Rich	Dry, sandy woods and prairie.
<i>Leersia virginica</i> Eilld.	Whitegrass	S3	G5	-	Rich	Moist woods, stream banks.
<i>Leucocrium montanum</i> Nutt. ex Gray	Sand lily	S2	G5	-	Bill, Bowm, Gold, Slop	Dry prairie, sandy or clay soils.
<i>Linnaea borealis</i> L.	Twinflower	S4	G5	-	Bott, Cava, Dunn	Moist, wooded, (north-facing) slopes.
<i>Liparis loeselii</i> (L.) L. C. Rich.	Loesel's twayblade	S2	G5	-	Bens, Kidd, Pemb, Rans, Stut	Damp woods, prairie swales, fens.
<i>Lipocarpa micrantha</i> (Vahl) G. Tucker	Small-flowered lipocarpa	S1	G5	-	Cass	Wet sandy areas, sandbars.
<i>Mehonia repens</i> (Lindl.) G. D	Creeping barberry	S2	G5	-	Bill, Bowm	Coulees, slopes of high plains.

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<i>Mentzelia pumila</i> Nutt. ex Torr. & Gray	Dwarf mentzelia	S1	G4	-	Slop	Dry sandy or clayey soils.
<i>Menyanthes trifoliata</i> L.	Buckbean	S2	G5	-	Bott, McHe, Rans	Sphagnum bogs, fen peatlands.
<i>Mimulus guttatus</i> DC.	Yellow monkeyflower	S1	G5	-	Gfor	Marshes, along streams and lake shores.
<i>Minuartia dawsonensis</i> (Britt.) House	Stiff sandwort	S1	G5	-	Cava	Open rocky or gravelly areas, on shale.
<i>Mitella nuda</i> L.	Naked mitrewort	S3	G5	-	Cava, Pemb, Role	Swampy lowland woods and thickets.
<i>Monotropa uniflora</i> L.	Indianpipe	S3	G5	-	Bott, Cava, Dunn, Rans, Role	Rich shady woods.
<i>Muhlenbergia filiformis</i> (Thurb. ex S.Wats.) Rydb.	Pull-up muhly	S1	G5	-	Burk	Marl pools of calcareous fens.
<i>Myosurus aristatus</i> Benth	Sedge mousetail	S2	G5	-	Slop, Ward, Will	Moist areas, vernal wetlands of mixed grass prairies.
<i>Myriophyllum pinnatum</i> (Walt.) B.S.P.	Cutleaf watermilfoil	S2	G5	-	Barn, Lamo, Loga, Stut	Shallows of marshes and shores.
<i>Najas guadalupensis</i> (Spreng.) Magnus	Southern naiad	S1	G5	-	Emmo	Lakes or streams.
<i>Najas marina</i> L.	Spiny naiad	S1	G5	-	Emmo, Rich	Alkaline lakes, ponds.
<i>Oenothera rhombipetala</i> Nutt. ex Torr. & Gray	Rhombic evening-primrose	S2	G4G5	-	Gfor, Rich	Sandy prairies.
<i>Onoclea sensibilis</i> L.	Sensitive fern	S2	G5	-	Pemb, Rans, Rich, Sarg	Wetland thickets, fen peatlands, damp, shady woodlands.
<i>Ophioglossum pusillum</i> Raf.	Adder's-tongue fern	S2	G5	-	Rans, Rich	Low prairie swales.
<i>Orobanche uniflora</i> L.	One-flowered broom-rape	SH	G5	-	Cass	Damp woods and thickets.
<i>Oxytropis deflexa</i> (Pallas) DC	Drooping locoweed	S2	G5	-	Bott, Cava, Pemb, Role	Sandy lake shores, low meadows, aspen woodland clearings.

North Dakota Species of Conservation Priority in the Red River Basin

<i>Oxytropis sericea</i> Nutt.	White locoweed	S1	G5	-	Bens, Bill, Slop	Mixed grass prairie on slopes or buttes.
<i>Parnassia palustris</i> var. <i>parviflora</i> (DC) Boivin	Small-flowered grass-of-Parnassus	S3	G4	-	Bott	Calcareous fens or bogs.
<i>Pellaea glabella</i> Mett. ex Kuhn	Smooth cliffbrake	S3	G5	-	Adam, Bowm, Dunn, Gold, Grnt, Hett, McKe, Mort, Oliv	Sandstone caprock of buttes and ledges.
<i>Penstemon procerus</i> Dougl. ex Graham	Small-flowered penstemon	S1	G5	-	Burk	Northern prairie slopes.
<i>Petasites frigidus</i> (L.) Fries	Sweet coltsfoot	S2	G5	-	Bott, Cava	Damp meadows and woods.
<i>Phlox alyssifolia</i> Greene	Alyssum-leaved phlox	S2	G5	-	Bill, Gold, Will	Sandy, gravelly or clayey slopes and ridges, buttes.
<i>Phlox pilosa</i> L.	Downy phlox	S1	G5	-	Cass, Rich	Mesic prairies of open woods.
<i>Pinus flexilis</i> James	Limber pine	S1	G5	-	Bill, Slop	Exposed scoria ridge.
<i>Piptatherum pungens</i> (Torr. ex Spreng.) Dorn	Slender mountain- ricegrass	S2	G5	-	Cava	Xeric slopes, usually shale.
<i>Platanthera clavellata</i> (Michx.) Luer	Green woodland orchid	SH	G5	-	Gfor	Swampy woods, bogs.
<i>Platanthera praeclara</i> Sheviak & Bowles	Western prairie fringed orchid	S2	G3	LT	Rans, Rich	Moist prairie swales of sandhills.
<i>Pogonia ophioglossoides</i> (L.) Ker-Gawl	Rose pogonia	S1	G5	-	Gfor	Bogs, swampy woods.
<i>Polygonum hydropiperoides</i> Michx.	Swamp smartweed	S1	G5	-	Pemb	Rooted in or near water.
<i>Polygonum leptocarpum</i> B. L. Robins.	Thin-fruited knotweed	S1	G2G4Q	-	Grnt	Damp or dry soils, on clay.
<i>Polygonum punctatum</i> Ell.	Dotted smartweed	S3	G5	-	Cava, Emmo, Gfor, Rich	Swampy thickets, river banks, wet meadows.
<i>Polygonum sagittatum</i> L.	Arrow-leaved tearthumb	S2	G5	-	Bott	Marshes, wet meadows.

North Dakota Species of Conservation Priority in the Red River Basin

<i>Populus x acuminata</i> Rydb.	Lanceleaf cottonwood	S2	GNA	-	Bill, Slop	Riparian areas, slopes.
<i>Potamogeton diversifolius</i> Raf.	Water-thread pondweed	S3	G5	-	Bill, Emmo, Slop, Stut	Shallow ponds, marshes.
<i>Potamogeton filiformis</i> Pers.	Slender pondweed	S3	G5	-	Barn, Divi, Rams	Shallow lakes, ponds and streams.
<i>Potamogeton natans</i> L.	Floating pondweed	S2	G5	-	Bott, Bruk, Role	Cold, shallow to deep lakes and streams.
<i>Potamogeton praelongus</i> Wulfen	White-stemmed pondweed	S1	G5	-	Bott, Ward	Usually cool, deep water of lakes.
<i>Potamogeton strictifolius</i> Benn.	Narrow-leaved pondweed	S1	G5	-	Bott, McHe	Shallow lakes, streams.
<i>Potamogeton vaginatus</i> Turcz.	Sheathed pondweed	S3	G5	-	Bott, Gfor, Kidd, Oliv, Role, Stut	Usually deep cold lakes, ponds.
<i>Potentilla diversifolia</i> Lehm.	Mountain meadow cinquefoil	S1	G5	-	Bill, Slop, Star	Along drainages, meadows.
<i>Potentilla palustris</i> (L.) Scop.	Purple cinquefoil	S2	G5	-	Bott, Gfor, McHe	Fens, wet meadows, bogs.
<i>Potentilla tridentata</i> Ait.	Three-toothed cinquefoil	S1	G5	-	Bill, Cava	Open, dry outcrops on shale or scoria.
<i>Primula incana</i> M. E. Jones	American primrose	S2	G4G5	-	Burk, Divi, Moun	Alkali, wet meadows, fens.
<i>Psoralea tenuiflora</i> Pursh	Slim-flowered scurfpea	SH	G5	-	Bowm	Dry prairie, high plains.
<i>Ranunculus cardiophyllus</i> Hook.	Heart-leaved buttercup	S1	G4G5	-	McKe, Will	Wet meadows, seeps.
<i>Ranunculus flammula</i> L.	Acrid spearwort	S1	G5	-	Burk	Marshes, damp shores.
<i>Ranunculus recurvatus</i> Poir.	Hooked crowfoot	S1	G5	-	Gfor, Rich	Wooded ravines, swampy woods.
<i>Rhynchospora capillacea</i> Torr.	Hair beakrush	S2	G4	-	Bens, Bott, McHe, Stut, Well	Calcareous fens, seeps.
<i>Ribes cynosbati</i> L.	Prickly gooseberry	S3	G5	-	Barn, Cass, Gfor, Rans, Rich	Moist rich woods.

North Dakota Species of Conservation Priority in the Red River Basin

<i>Rorippa calycina</i> (Engelm.) Rydb.	Hayden's yellowcress	SH	G3	-	McKe	Riverbanks, shores.
<i>Salix maccalliana</i> Rowlee	Swamp willow	S1	G5?	-	Bott	Bogs, swamps.
<i>Salix pedicellaris</i> Pursh	Bog willow	S3	G5	-	Bens, Bott, McHe, Rans, Role	Sphagnum bogs, fens.
<i>Sanicula gregaria</i> Bickn.	Cluster sanicle	SH	G4Q	-	Rich	Rich, moist woodlands.
<i>Scheuchzeria palustris</i> L.	Scheuchzeria	S1	G5	-	Bott	Sphagnum bogs.
<i>Scirpus cyperinus</i> (L.) Kunth	Cottongrass bulrush	SNR	GNR	-	Pemb	Wet meadows, fresh marshes, boggy areas, fen wetlands.
<i>Selaginella rupestris</i> (L.) Spring	Ledge spike-moss	S1	G5	-	Pemb	Sandy soils, near oak woods.
<i>Senecio eremophilus</i> Richards.	Northern ragwort	S2	G5	-	Bott, Role	Open sites in aspen woodlands.
<i>Smilax ecirrhata</i> (Engelm. S. Wats. ex Kunth)	Upright greenbrier	S2	G5?	-	Bott, Gold	Rich woods, thickets.
<i>Solidago flexicaulis</i> L	Zigzag goldenrod	S2	G5	-	Cass, Rans, Rich, Sarg	Rich deciduous woods.
<i>Solidago riddellii</i> Frank ex Riddell	Riddell's goldenrod	SH	G5	-	Rich	Low prairies, wet meadows.
<i>Sphagnum recurvum</i> P. Beauv.	Recurved sphagnum	S1	G5	-		Bogs, fens, forests, near wetlands..
<i>Sphagnum teres</i> (Schimp.) Angstr. In Hartm.	Round-leaved sphagnum	S1	G5	-	Bott	Bogs, fens, forests, near wetlands.
<i>Spiranthes cernua</i> (L.) L.C. Rich.	Nodding ladies'- tresses	S1	G5	-	Bens, McHe, Rich, Stut	Fens, low prairies.
<i>Spiranthes romanzoffiana</i> Cham.	Hooded ladies'- tresses	S1	G5	-	Bens, Burk, McHe	Fens, wet meadows.
<i>Sporobolus airoides</i> (Torr.) Torr.	Alkaki sacaton	S3	G5	-	Bill, Bowm, Gfor, Slop	Moist or drying soil, alkali seeps.

North Dakota Species of Conservation Priority in the Red River Basin

<i>Stephanomeria minor</i> (Hook.) Nutt.	Narrow-leaved wirelettuce	S3	G5	-	Bill, Slop	Dry, clay outcrops.
<i>Talinum parviflorum</i> Nutt.	Prairie fameflower	S2	G5	-	Grnt, Mort, Siou, Slop	Sandy outcrops, butte slopes.
<i>Thelesperma subnudum</i> var. <i>marginatum</i> (Rydb.) T.E. Melchert ex Cronq.	Greenthread	S2	G5T5	-	Divi, Will	Sandy prairie, open plains.
<i>Thelypteris palustris</i> Schott	Marsh fern	S3	G5	-	Kidd, McHe, Pemb, Rans, Rich	Wetland thickets, shrubby fens.
<i>Townsendia hookeri</i> Beaman	Hooker's townsendia	S1	G5	-	Bill	Butte summits.
<i>Triantha glutinosa</i> (Michx.) Pers.	Sticky false- asphodel	S1	G5	-	Bens	Fens, wet meadows.
<i>Triplasis purpurea</i> (Walt.) Chapman	Purple sandgrass	S1	G4G5	-	Rans, Rich	Sandy prairies, blowouts.
<i>Utricularia intermedia</i> Hayne	Flat-leaved bladderwort	S2	G5	-	Bott, McHe, Pemb	Calcareous fens, seepage peatlands.
<i>Utricularia minor</i> L.	Lesser bladderwort	S2	G5	-	Bens, Burk, Eddy, Kidd, McHe, Pemb, Stut	Calcareous fens, seeps.
<i>Uvularia sessilifolia</i> L.	Sessile-leaved bellwort	S2	G5	-	Cass, Cava	Rich deciduous woods.
<i>Veronicastrum virginicum</i> (L.) Farw.	Culver's-root	SH	G4	-	Pemb	Low prairie, rich woods.
<i>Viola conspersa</i> Reichenb.	Bog violet	S2	G5	-	Bill, Cass, Dunn, Gfor, Rans, Rich	Moist woods, stream banks.
<i>Viola incognita</i> Brainerd	Large-leaved white violet	SH	G4G5T4T5	-	Pemb	Moist woods.
<i>Wolffia columbiana</i> Karst.	Southern watermeal	S2	G5	-	Cava, Pemb, Rich, Ward	Aquatic in quiet water.

This list should be cited as: North Dakota Natural Heritage Program. 2012. North Dakota Plant Species of Concern. [Unpublished list]. North Dakota Natural Heritage Program, Bismarck. 7 pp.

**South Dakota State Listed Species Found in the Red River
Basin**

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South Dakota State Listed Species Found in the Red River Basin

Group	Name	SD State Status	Federal Status
Plant	Dakota Skipper (<i>Hesperia dacotae</i>)	None	Threatened
Plant	Poweshiek Skipperling (<i>Oarisma Poweshiek</i>)	None	Endangered
Bird	Bald Eagle (<i>Haliaeetus leucocephalus</i>)	Threatened	None
Bird	Whooping Crane (<i>Grus Americana</i>)	Endangered	Endangered
Mammal	Northern River Otter (<i>Lontra canadensis</i>)	Threatened	None

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COSEWIC and SARA Listed Species in the Province of Manitoba

Data from: Government of Canada's Species at Risk Public Registry website
http://www.registrelep-sararegistry.gc.ca/search/SpeciesSearch_e.cfm.
Updated to reflect species occurring within the Red River Basin.

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COSEWIC and SARA Listed Species in the Province of Manitoba

Common Name	Scientific Name	Taxon	COSEWIC Status	SARA Status
American Badger taxus subspecies	<i>Taxidea taxus</i>	Mammals	Special Concern	No Status
Baird's Sparrow	<i>Ammodramus bairdii</i>	Birds	Special Concern	No Status
Bank Swallow	<i>Riparia</i>	Birds	Threatened	No Status
Barn Swallow	<i>Hirundo rustica</i>	Birds	Threatened	No Status
Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	Fish	Special Concern	Special Concern
Bobolink	<i>Dolichonyx oryzivorus</i>	Birds	Threatened	No Status
Buff-breasted Sandpiper	<i>Tryngites subruficollis</i>	Birds	Special Concern	No Status
Buffalograss	<i>Bouteloua dactyloides</i>	Vascular Plants	Special Concern	Threatened
Burrowing Owl	<i>Athene cunicularia</i>	Birds	Endangered	Endangered
Canada Warbler	<i>Cardellina canadensis</i>	Birds	Threatened	Threatened
Caribou	<i>Rangifer tarandus</i>	Mammals	Threatened	Threatened
Chestnut-collared Longspur	<i>Calcarius ornatus</i>	Birds	Threatened	Threatened
Chimney Swift	<i>Chaetura pelagica</i>	Birds	Threatened	Threatened
Common Nighthawk	<i>Chordeiles minor</i>	Birds	Threatened	Threatened
Dakota Skipper	<i>Hesperia dacotae</i>	Arthropods	Endangered	Threatened
Dusky Dune Moth	<i>Copablepharon longipenne</i>	Arthropods	Endangered	Endangered
Eastern Tiger Salamander	<i>Ambystoma tigrinum</i>	Amphibians	Endangered	No Status
Eastern Whip-poor-will	<i>Antrostomus vociferus</i>	Birds	Threatened	Threatened
Eastern Wood-pewee	<i>Contopus virens</i>	Birds	Special Concern	No Status
Eskimo Curlew	<i>Numenius borealis</i>	Birds	Endangered	Endangered
Fascicled Ironweed	<i>Vernonia fasciculata</i>	Vascular Plants	Endangered	No Status
Ferruginous Hawk	<i>Buteo regalis</i>	Birds	Threatened	Threatened
Flooded Jellyskin	<i>Leptogium rivulare</i>	Lichens	Special Concern	Threatened
Gattinger's Agalinis	<i>Agalinis gattingeri</i>	Vascular Plants	Endangered	Endangered
Gold-edged Gem	<i>Schinia avemensis</i>	Arthropods	Endangered	Endangered

COSEWIC and SARA Listed Species in the Province of Manitoba

Golden-winged Warbler	<i>Vermivora chrysoptera</i>	Birds	Threatened	Threatened
Great Plains Toad	<i>Anaxyrus cognatus</i>	Amphibians	Special Concern	Special Concern
Greenish-white Grasshopper	<i>Hypochlora alba</i>	Arthropods	Special Concern	No Status
Gypsy Cuckoo Bumble Bee	<i>Bombus bohemicus</i>	Arthropods	Endangered	No Status
Hairy Prairie-clover	<i>Dalea villosa</i>	Vascular Plants	Special Concern	Threatened
Horned Grebe	<i>Podiceps auritus</i>	Birds	Special Concern	No Status
Lake Sturgeon	<i>Acipenser fulvescens</i>	Fishes	Endangered	No Status – Listing Decision on Hold
Least Bittern	<i>Ixobrychus exilis</i>	Birds	Threatened	Threatened
Little Brown Myotis	<i>Myotis lucifugus</i>	Mammals	Endangered	Endangered
Loggerhead Shrike Prairie subspecies	<i>Lanius ludovicianus excubitorides</i>	Birds	Threatened	Threatened
Monarch	<i>Danaus plexippus</i>	Arthropods	Special Concern	Special Concern
Mottled Duskywing	<i>Erynnis martialis</i>	Arthropods	Endangered	No Status
Northern Leopard Frog	<i>Lithobates pipiens</i>	Amphibians	Special Concern	Special Concern
Northern Myotis	<i>Myotis septentrionalis</i>	Mammals	Endangered	Endangered
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Birds	Threatened	Threatened
Ottoe Skipper	<i>Hesperia ottoe</i>	Arthropods	Endangered	Endangered
Pale Yellow Dune Moth	<i>Copablepharon grandis</i>	Arthropods	Special Concern	Special Concern
Peregrine Falcon anatum/tundrius	<i>Falco peregrinus anatum/tundrius</i>	Birds	Special Concern	Special Concern
Piping Plover circumcinctus subspecies	<i>Charadrius melodus circumcinctus</i>	Birds	Endangered	Endangered
Polar Bear	<i>Ursus maritimus</i>	Mammals	Special Concern	Special Concern
Poweshiek Skipperling	<i>Oarisma poweshiek</i>	Arthropods	Endangered	Threatened
Prairie Skink	<i>Plestiodon septentrionalis</i>	Reptiles	Endangered	Endangered
Red Knot rufa subspecies	<i>Calidris canutus rufa</i>	Birds	Endangered	Endangered

COSEWIC and SARA Listed Species in the Province of Manitoba

Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	Birds	Threatened	Threatened
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Birds	Special Concern	No Status
Riddell's Goldenrod	<i>Solidago riddellii</i>	Vascular Plants	Special Concern	Special Concern
Ross's Gull	<i>Rhodostethia rosea</i>	Birds	Threatened	Threatened
Rough Agalinis	<i>Agalinis aspera</i>	Vascular Plants	Endangered	Endangered
Rusty Blackbird	<i>Euphagus carolinus</i>	Birds	Special Concern	Special Concern
Short-eared Owl	<i>Asio flammeus</i>	Birds	Special Concern	Special Concern
Small White Lady's-slipper	<i>Cypripedium candidum</i>	Vascular Plants	Threatened	Endangered
Smooth Goosefoot	<i>Chenopodium subglabrum</i>	Vascular Plants	Threatened	Threatened
Snapping Turtle	<i>Chelydra serpentina</i>	Reptiles	Special Concern	Special Concern
Sprague's Pipit	<i>Anthus spragueii</i>	Birds	Threatened	Threatened
Verna's Flower Moth	<i>Schinia verna</i>	Arthropods	Threatened	Threatened
Western Grebe	<i>Aechmophorus occidentalis</i>	Birds	Special Concern	No Status
Western Prairie Fringed-orchid	<i>Platanthera praeclara</i>	Vascular Plants	Endangered	Endangered
Western Silvery Aster	<i>Symphyotrichum sericeum</i>	Vascular Plants	Threatened	Threatened
Western Spiderwort	<i>Tradescantia occidentalis</i>	Vascular Plants	Threatened	Threatened
Western Tiger Salamander	<i>Ambystoma mavortium</i>	Amphibians	Special Concern	No Status
White Flower Moth	<i>Schinia bimatrix</i>	Arthropods	Endangered	Endangered
Whooping Crane	<i>Grus americana</i>	Birds	Endangered	Endangered
Wolverine	<i>Gulo</i>	Mammals	Special Concern	No Status
Wood Bison	<i>Bison athabasca</i>	Mammals	Special Concern	Threatened
Yellow Rail	<i>Coturnicops noveboracensis</i>	Birds	Special Concern	Special Concern
Yellow-banded Bumble Bee	<i>Bombus terricola</i>	Arthropods	Special Concern	No Status

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Appendix B-B: Ecosystem Restoration and Conservation Programs in the Red River Basin

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Ecosystem Restoration and Conservation Programs in the Red River Basin

Program	Administering Agency	Purpose	Funding	Eligibility/Examples in the Basin
Project Modification for Improvements to the Environment (Section 1135)	U.S. Army Corps of Engineers	Assist in the restoration of degraded ecosystems through the modification of Corps' structures, operations, or implementation of measures in affected areas.	The initial study is 100% federally funded up to \$100,000. All planning costs after the first \$100,000 are cost shared 50/50. All design and construction costs are cost shared 75% federal and 25% non-federal. The federal cost limit is \$10,000,000.	Eligibility: any existing Corps of project. Example: Sand Hill River Fish Passage Project.
Aquatic Ecosystem Restoration (Section 206)	U.S. Army Corps of Engineers	Assist in planning, engineering and design, and construction of projects to restore degraded ecosystem structure, function and dynamic processes to a less degraded, more natural condition when the restoration will improve the environment, is in the public interest and is cost-effective.	The initial study is 100% federally funded up to \$100,000. All planning costs after the first \$100,000 are cost shared 50/50. All design and construction costs are cost shared 65% federal and 35% non-federal. The federal cost limit is \$10,000,000.	Eligibility: throughout the United States Examples: None in basin.
Outdoor Heritage Fund	Minnesota DNR	Programs or projects to protect, restore and enhance habitat in Minnesota.	This fund is for grants over \$400,000.	Eligibility: Minnesota Examples: Many; http://www.legacy.leg.mn/projects/project/12
Conservation Partners Legacy Program	Minnesota DNR	Award grants for smaller projects that protect, restore and enhance habitat in Minnesota.	Grants between \$5,000 and \$400,000.	Eligibility: Minnesota Examples: Many smaller projects throughout basin.

Ecosystem Restoration and Conservation Programs in the Red River Basin

Conservation Stewardship Program	Natural Resources Conservation Service (NRCS)	Helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resources concerns.	Payment rates vary by state and resource of conservation. Minimum annual payment of \$1,500.	Eligibility: throughout the United States. Requires a contract of five years, with the option to renew with successful fulfillment of initial contract.
Environmental Quality Incentives Program	Natural Resources Conservation Service	Provides financial and technical assistance to agricultural producers in order to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat.	Payment rates vary by state and are set each fiscal year.	Eligibility: nationally throughout the United States. Must be an agricultural producer.
Water Bank Program (WBP)	Natural Resources Conservation Service	The intent of WBP is to keep water on the land for the benefit of migratory wildlife such as waterfowl.	Payment Rates: <ul style="list-style-type: none"> • \$50/acre/year for cropland • \$35/acre/year for grazing land • \$20/acre/year for forestland 	Eligibility: Minnesota, North Dakota and South Dakota.
Agricultural Conservation Easement Program	Natural Resources Conservation Service	Provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits.	NRCS pays between 50 and 75% of fair market value and 50 to 75% of the restoration cost.	Eligibility: nationally throughout the United States.
Conservation Innovation Grants (CIG)	Natural Resources Conservation Service	Support the use of innovative technologies or approaches to address	Funding varies.	Eligibility: nationally throughout the United States.

Ecosystem Restoration and Conservation Programs in the Red River Basin

		natural resource conservation concerns. The natural resource concerns eligible for funding through CIG will be identified in the funding announcement and may change annually.		Example: Carbon Credit for Avoided Conversion (North Dakota and South Dakota)
Prairie Pothole Wetland and Grassland Retention Project	Natural Resources Conservation Service	Offers financial and technical assistance opportunities that can be adopted voluntarily to limit the conversion of grasslands and wetlands to annual crop production.	Funding varies.	Eligibility: portions of eastern North Dakota, eastern South Dakota, central Iowa and western Minnesota.

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