Revised Draft

Fish and Wildlife Coordination Act Report

for the

Red River Valley Water Supply Project

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1.0 EXECUTIVE SUMMARY

The 2000 Dakota Water Resources Act (DWRA) directed the Secretary of the Interior, Bureau of Reclamation (Reclamation), in conjunction with the State of North Dakota, to complete an Environmental Impact Statement concerning all feasible options to meet the comprehensive water quality and quantity needs of the Red River Valley, and the options for meeting those needs, including delivery of Missouri River water to the Red River Valley. The Governor of North Dakota has selected the Garrison Conservancy District (District) to represent the State of North Dakota as the state's co-lead agency in the study.

The Red River Valley Water Supply Project Draft Environmental Impact Statement (DEIS) prepared by Reclamation and the District indicates that the project purpose is to meet the "comprehensive water quality and quantity needs of the Red River Valley." The needs are defined as municipal, rural, and industrial water supplies; water quality; aquatic environment; recreation; and water conservation measures.

There are eight alternatives being evaluated by Reclamation and the State of North Dakota. The identified alternatives include:

1. No Action.
2. North Dakota In-Basin.
3. Red River Basin.
4. Lake of the Woods.
5. Garrison Diversion Unit (GDU) Import to the Sheyenne.
6. GDU Import Pipeline.
7. Missouri River to Red River Valley Import.
8. GDU Water Supply Replacement Pipeline.

Alternatives 2, 3, and 4 would use water sources from within the Hudson Bay Drainage. Alternative 5 would meet peak day requirements with Missouri River water using the Sheyenne River as a conveyance feature. Alternatives 6 and 7 would use Missouri River water to supplement existing water sources as well as providing a 20 cfs flow to Grand Forks for blending with other water supplies. Alternative 8 would operate on a continuous basis to supply Missouri River water to meet all the water needs of the Red River Valley. All of the action alternatives are designed to meet the purpose and need for the project.

There are many potential environmental effects associated with these alternatives. The primary issues are the potential for the transfer of unwanted biota to the Hudson's Bay drainage and water depletion effects to Missouri River biota, including threatened and endangered species, from Missouri River import alternatives, flow changes on the Sheyenne River, groundwater withdrawals, and wetland/upland habitat impacts along the pipeline alignments. The DWRA requires that the fish and wildlife habitat losses incurred as a result of project construction shall

be replaced on an acre-for-acre basis, based on ecological equivalency, concurrent with project construction.

The Fish and Wildlife Service (Service) has identified the potential for impacts to both wetlands protected by easements and non-easement wetlands along the various pipeline routes. Pursuant to Executive Order 11990 (Protection of Wetlands), all wetland impacts should be mitigated, or in the case of easement wetlands, exchanged prior to construction.

The Service's planning objectives recommend developing an adequate monitoring and mitigation plan to offset the loss of natural resource habitat and biota. A long-term monitoring and mitigation plan should be developed that accurately assesses the impacts this project will have and how the impacts can be offset prior to, during, and after project construction. Baseline information should be collected to fill any data gaps and to provide a reference point for determining future impacts. Monitoring may include erosion and sedimentation, channel morphology, fish and mussel surveys, aquatic habitat, water quality, riparian vegetation surveys, soil salinity, endangered species, and groundwater monitoring. If the ecological monitoring program detects adverse environmental changes that are a result of project operations, then suitable mitigation should be implemented to offset the impacts.

If any new water conservation technologies are identified that are not included in the current plan, the new measures should be implemented in an adaptive management fashion to reduce the need to operate the project, particularly if these result in fewer impacts to fish and wildlife resources. Establishing or enhancing riparian habitat along the Sheyenne River, acquisition of key riparian blocks, vegetation plantings, erosion control, fish structures, fish stocking, mussel reintroduction, and vegetation management are conservation measures that could be implemented in a targeted way to enhance fish and wildlife resources in the project area.

The findings of all final environmental studies, as well as those in the draft stage, should continue to be incorporated into project development to better define project impacts. The Service will continue to review and analyze the environmental data from ongoing studies and reports as they become available.

2.0 IDENTIFICATION OF PURPOSE, SCOPE, AND AUTHORITY

The purpose and need statement set forth in the August 23, 2004, draft of Chapter One for the Red River Valley Water Supply Project DEIS indicates that the project purpose is to meet the "comprehensive water quality and quantity needs of the Red River Valley" [Dakota Water Resources Act Section 8(c)(2)(A)]. The needs are defined as municipal, rural, and industrial supplies (MR&I); water quality; aquatic environment; recreation; and water conservation measures [Section 8(b)(2)].

Section 8 of the 2000 DWRA directs the Secretary of the Department of the Interior to complete an EIS, with the State of North Dakota as co-lead, concerning all feasible options to meet the comprehensive water quality and quantity needs of the Red River Valley, and alternatives for meeting those needs, including delivery of Missouri River water to the Red River Valley.

Reclamation requested that the Service prepare a Fish and Wildlife Coordination Act (FWCA) report to be submitted with the EIS for the Red River Valley Water Supply Project. In response to a negotiated scope of work, the Service is providing this Revised Draft FWCA report for the Red River Valley Water Supply Project. It is prepared under the authority of and in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661-667e), the Endangered Species Act (16 U.S.C. 1531 et seq.), National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 et seq.), Federal Water Pollution Control Act ("Clean Water Act") (CWA), as amended, (33 U.S.C. 1251 et seq.), and the Migratory Bird Treaty Act of 1918 (MBTA), as amended, (16 U.S.C. 703 et seq.). This report constitutes the report of the Secretary of the Interior as required by Section 2(b) of the FWCA.

3.0 ACKNOWLEDGMENT OF INPUT, COORDINATION, AND CONCURRENCE OF STATE FISH AND WILDLIFE AGENCY

A copy of the February 28, 2005, Interim Draft Fish and Wildlife Coordination Act Report for the Red River Valley Water Supply Project was sent to the North Dakota Game and Fish Department (Department) and the Minnesota Department of Natural Resources (MNDNR), for their review and comment. At this time, no comments have been received from either agency.

The agencies will be provided copies of this Draft FWCA report for review and comment. Comments offered by the Departments will be incorporated into the Final FWCA Report. Alternatively, the agencies may submit stand alone reports which will be attached to our FWCA 2(b) report.

4.0 DISCUSSION OF RELEVANT PRIOR STUDIES OR REPORTS

Background

In January 2000, Reclamation released a report entitled "Red River Valley Water Needs Assessment Phase II: Appraisal of Alternatives to Meet Projected Shortages." This report stated that based on projected year 2050 demands, "significant shortages in surface water available for municipal and industrial users would occur during periods of drought. Additionally, groundwater currently appropriated for rural water systems is not sufficient to meet the projected future demand in that use sector" (Reclamation 2000:S-6). The Hydrology Appendix to the report concluded that if a drought equally severe as that of the 1930's had occurred in 1994, the MR&I shortage would have been 4,210 acre-feet.

In addition to the previous report, other relevant Reclamation reports include; "Red River Valley Water Needs Assessment, final Appraisal Report, Phase I Part B, Instream Flow Needs Assessment" 1999, and "Report on Red River Valley Water Supply Project Needs and Options, Aquatic Needs Assessment, Instream Flows for Aquatic Life and Riparian Maintenance, Final Report" 2003.

Reclamation has produced a May 2005, Draft Red River Valley Water Supply Needs and Options report. The information in the report pertaining to the various alternatives was used by the Service in preparing the Draft FWCA. The Needs and Options report will be incorporated into the Draft EIS for the project.

In 2002, Earth Tech, Inc. produced two reports for the Corps of Engineers (Corps) analyzing the aquatic environment for the Devils Lake Emergency Outlet Study. The Earth Tech, Inc. reports include; "Devils Lake Study Final Aquatic Impact Analysis Report" and "Devils Lake Study Final Macroinvertebrate Sampling Report." West Consultants, in 2001, produced a report for the Corps entitled "Sheyenne River Geomorphology Study." These reports are relevant to the EIS because the reports included information on aquatic resources in the Sheyenne River.

Reclamation contracted with the United States Geological Survey (USGS) to study the risk of biota transfer associated with the importation of Missouri River water into the Red River Basin. The USGS produced a 2005, report entitled "Risk and Consequence Analysis Focused on Biological Invasions Potentially Associated with Surface Water Transfers between the Missouri River and Red River Basins."

The Service produced a December 2004, Red River Valley Water Supply Project Planning Aid Letter providing background information, Service identification of potential impacts, and recommendations related to fish and wildlife resources found in the project action area.

Threatened or Endangered Species

To address Service identification of potential effects to the threatened western prairie fringed orchid (*Platanthera praeclara*) from increased flows in the Sheyenne River, the Corps of Engineers (Corps) contracted with Barr Engineering to conduct a profile model analysis in the Sheyenne River Delta to assess the potential groundwater effects of the Devils Lake Emergency Outlet Project. Barr Engineering reported that there would be essentially no effect to the groundwater from the outlet project at a distance of 1,400 feet from the river.

5.0 DESCRIPTION OF STUDY AREA

The geographic scope of the Red River Valley Water Supply Project (RRVWSP) includes the Red River Basin in North Dakota and Minnesota, the mainstem Missouri River, the Ottertail River Basin, Lake of the Woods, and 20 North Dakota and 13 Minnesota Counties (Barnes, Burleigh, Cass, Cavalier, Foster, Griggs, Grand Forks, Kidder, McLean, Nelson, Pembina, Ransom, Richland, Sargent, Sheridan, Steele, Stutsman, Traill, Walsh, and Wells Counties in North Dakota and Becker, Clay, Hubbard, Kittson, Lake of the Woods, Marshall, Norman, Ottertail, Polk, Roseau, Todd, Wadena, and Wilkin Counties in Minnesota). The Red River basin is part of the Hudson Bay Drainage system and includes the Souris-Red-Rainy River basins in Minnesota, North Dakota, South Dakota, and Manitoba.

5.1 Red River of the North

The total drainage area in the United States is 39,199 square miles, of which 20,820 square miles are in North Dakota, 17,816 square miles are in Minnesota, and 573 square miles are in South Dakota. The Red River is formed by the confluence of the Ottertail and Bois de Sioux Rivers at Wahpeton and Breckenridge. The river flows north for about 395 miles before reaching the boundary between the United States and Canada. Beyond the boundary in Manitoba, the river continues in a north-northeast direction to Lake Winnipeg, which is drained by the Nelson River, into the Hudson Bay. Tributary streams generally flow southwest or southeast in their respective headwater areas, then turn to flow northwest or northeast before reaching the Red River. The principal tributaries from the west (North Dakota) include the Wild Rice, Sheyenne, Elm, Goose, Turtle, Forest, Park, and Pembina Rivers. From the east (Minnesota), major tributaries include Two Rivers and the Mustinka, Ottertail, Buffalo, Wild Rice-Marsh, Red Lake, Middle-Snake, Tamarack, and Roseau Rivers.

During the last glacial period, the entire Red River basin was covered by a large continental ice sheet. The movement of the ice sheet had a marked effect on the surface topography of the area. As the ice sheet retreated through northwestern Minnesota and eastern North Dakota, meltwater was trapped north of the moraine near present day Lake Traverse and formed a vast freshwater lake known as Lake Agassiz. At its greatest extent, Lake Agassiz covered approximately 80,000 square miles, including all of northwestern Minnesota, much of Manitoba, and significant parts of North Dakota, Saskatchewan, and Ontario. North to south, it was over 700 miles long; its maximum depth at the northern ice border was 700 feet. What is called the Red River Valley is actually the lake plain bounded by the beach ridges of former Lake Agassiz.

While Lake Agassiz existed, the melting glaciers poured large quantities of collected debris, sand, silt, and clay into the lake. These accumulated fluvial and lacustrine sediments gradually settled to the bottom, forming a flat lake bed with sediments hundreds of feet thick. Today, the broad flat plain drains gradually north, with a slope of approximately 0.75 foot per mile. The Red River and its tributaries cut into these lake sediments and slowly discharge runoff waters

from the surrounding plains. At one time, the western edge of Minnesota was continuous prairie and scattered woodlands dotted with small wetlands known as potholes. Snow melt and spring rains were contained in these small wetlands and released slowly into surrounding streams. In some areas, virtually all of the potholes have been drained. Remnants of prairie and their associated wetlands are scattered and rare. They form the last refuge for many species of prairie plants and wildlife.

Flood plain elevations above mean sea level range from 970 feet, in the vicinity of Wahpeton-Breckenridge, to 800 feet at the Canadian border. The water surface of the entire reach of the Red River main stem is generally smooth, with the exception of a series of shallow rapids known as the Goose River Rapids at river mile 336. The river drops approximately 170 feet in its 395-mile course from Wahpeton to the border, giving an average gradient of 0.5 foot per river mile. The gradient varies from about 1.3 feet per mile near Wahpeton-Breckenridge to 0.2 feet per mile near the international border. In this distance, channel width varies from 200 to 500 feet, and average depths at bank-full stage range from 10 to 30 feet. Tributary streams vary widely in cross-sectional dimensions but exhibit somewhat similar slope characteristics. Most of the tributaries rise in the hilly extremities of the basin, flow at relatively flat gradients through the upland areas, increase in slope as they pass through the upland escarpment and beach ridges, exhibit minimum slopes through the lacustrine plain, and generally show an increase in slope in the last few miles before discharging into the main stem. Flooding along the tributaries most frequently occurs in the lacustrine plain areas.

5.2 Sheyenne River

The Sheyenne River is one of four major North Dakota tributaries to the Red River of the North, with a watershed of 6,910 square miles. From its headwaters in northwestern Sheridan County, the river flows east across the drift plain into Nelson County, where it turns southward, flowing to central Ransom County. From this point, the river turns northeast to its confluence with the Red River. From the town of Sheyenne, North Dakota, to Lake Ashtabula, the Sheyenne flows through a valley 100-150 feet deep, and ¼ to 1 mile wide, carved into Cretaceous Pierre Formation shale.

Lake Ashtabula, located about midway along the river's length, is a 5,430-acre impoundment formed by Baldhill Dam. Both the lake and dam were authorized in 1944. The construction of Baldhill Dam began in 1947 and was completed in 1951. The Corps of Engineers operates the lake for water supply and flood control. This reservoir is a popular recreation area for eastern North Dakota residents, providing swimming, boating, and a diverse sport fishery.

From Lake Ashtabula to just below Lisbon, North Dakota, the river flows through a valley ½ to 1 mile wide and as deep as 200 feet, through glacial till and Cretaceous Niobrara and Pierre Formations. The river below Lisbon to the confluence of the Red River flows across the Sheyenne Delta through an extensive sandhill area and the floor of glacial Lake Agassiz, forming the Red River Valley.

The Sheyenne River is approximately 550 miles in length, with an average slope of 1.5 feet per mile on the drift prairie, 2 feet per mile as it enters the Red River Valley, and approximately 1 foot per mile as it flows across the Red River Valley.

5.3 Ottertail River

From its headwaters about 50 miles east of Breckenridge, the Ottertail River flows out of Ottertail Lake through west central Minnesota joining the Bois de Sioux River at Wahpeton, North Dakota, forming the Red River. The Ottertail River is one of the more biologically diverse rivers in Minnesota (USEPA 1998). From the lake habitats of the headwaters through rolling hills in the deciduous woodlands across the Lake Agassiz beach ridges and onto the prairie grasslands of the flat glacial lake plain, the Ottertail River flows through a variety of riverine and riparian habitats.

5.4 Red Lake River

The Red Lake River is the largest tributary to the Red River in Minnesota and flows from Lower Red Lake to its confluence with the Red River at East Grand Forks, Minnesota. Unlike most streams in the region, the Red Lake River flows northwest over half the distance to the Red River, then turns toward the south and southwest finally turning back to the northwest to join with the Red River at Grand Forks. The Red Lake River contributes almost a third of the flow in the Red River (USEPA 1998).

5.5 Roseau River

The Roseau River flows from its headwaters in the Red Lake State Wildlife Management Area, Lake of the Woods County, Minnesota, to its confluence with the Red River 15 miles north of the international border. The watershed is extremely flat and lies within the lake bed of Glacial Lake Agassiz. There are no areas of pronounced topographic relief except for a few low beach ridges which were made as Lake Agassiz was receding. The elevation is 1,255 feet mean sea level (msl) in the headwaters region, dropping to 1,000 feet msl at the border. The floodplain, in places, exceeds two miles in width due to low banks and flat terrain. The Roseau River is wide and incised from the city of Roseau downstream and is characterized by sand and silt substrate. Portions of the Roseau River and its tributaries have been channelized or impacted by levees, bank stabilization, ditching, and tile drainage. Most of the remaining wetland areas within the watershed occur in the northern reach.

5.6 Missouri River

From the Montana/North Dakota border, the Yellowstone River runs 13 miles to its confluence with the Missouri River. Above the confluence of these two rivers, the Missouri River reaches only 3 miles upstream before it meets the Montana border. Downstream from the confluence, the Missouri River is free-flowing until it meets the headwaters of Lake Sakakawea. Depending upon Lake Sakakawea's elevation, this reach may be as little as 15 miles at the full pool elevation of 1850 feet msl to more than 50 miles at 1818 msl or below. The Missouri/Yellowstone Confluence area above Lake Sakakawea is unique along the entire Missouri River System because it exhibits characteristics of two very dissimilar rivers. The Yellowstone River is basically unregulated, displaying seasonally high flows of turbid water. On the other hand, the Missouri River upstream of the confluence is regulated by Fort Peck Dam in Montana and contributes relatively clear and cool summer flows.

Garrison Dam was closed in April of 1953, creating Lake Sakakawea. At a maximum surface elevation of 1855 msl, the lake has a storage capacity of 24,738,752 acre feet and covers 385,615 surface acres. The Missouri River below Garrison Dam is totally regulated and river flows can vary seasonally, monthly, weekly, daily, and even hourly. Major tributaries to this stretch of the river include the Knife, Heart, and Cannonball Rivers. Local run-off into the Missouri River is extremely seasonal, so the majority of flow in the Missouri River at Bismarck is from releases out of Garrison Dam. The Oahe Dam was closed in August 1958, creating Lake Oahe. Lake Oahe has a storage capacity of 23,625,315 acre feet and a surface area of 375,723 acres at a maximum elevation of 1620 feet msl. The headwaters of Lake Oahe at full pool are located just downstream of Bismarck, North Dakota.

Although most of the Missouri River floodplain has been converted to agricultural use (cropland and hayland), there is still much riparian woodland left. Most exists in woodlots from 50 to 250 acres in size. While cottonwood (*Populus deltoides*) is the dominant tree species, American elm (*Ulmus americana*), box elder (*Acer negundo*), and green ash (*Fraxinus pensylvanica*) are also common. Except for the Wildlife Management Areas (lands administered by the North Dakota Game and Fish Department), the woodlands are used extensively for pasture and feedlots. In the free-flowing sections, the river forms a series of braided channels, islands, side chutes, and backwater areas. Usually the main channel is identifiable, except during high flows when a continuous expanse of water extends from bank to bank.

5.7 Lake of the Woods

Lake of the Woods is a large 1,485 square mile lake on the U.S.-Canada border in the pine forest regions of northern Minnesota, southeast Manitoba, and southwest Ontario. It has a maximum depth of 36 feet, a very irregular shoreline, and approximately 14,000 islands. More than two thirds of the lake is in Canada. The lake is a remnant of former glacial Lake Agassiz. Lake of the Woods is fed by the Rainy River and drains to the northwest through the Winnipeg River into

Lake Winnipeg. Concern over fluctuating water levels on Lake of the Woods led governments to refer the matter to the International Joint Commission (IJC) in June 1912. A treaty between Canada and the United States, known as the 1925 Lake of the Woods Convention and Protocol, established elevation and discharge requirements for regulating Lake of the Woods based on the IJC recommendations.

6.0 IDENTIFICATION OF FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

6.1 Fish and Wildlife Resource Concerns

6.1.1 U.S. Fish and Wildlife Service Property Interests. The Service administers fee title and easement lands throughout the State of North Dakota. The Service requires that all practical actions be taken to avoid impacts to fee title lands and easements under its jurisdiction during project construction.

6.1.2 Audubon National Wildlife Refuge. Development of the Garrison Diversion Unit (GDU) has had a substantial effect on wildlife habitats at Audubon National Wildlife Refuge (NWR). The Service and Reclamation have cooperatively developed a biologically and economically balanced mitigation plan. Therefore, the DEIS should address any additional impacts to the refuge from project alternative operations.

6.1.3 Threatened and Endangered Species. Activities that influence the amount and/or quality of groundwater that feed the wetlands supporting the threatened western prairie fringed orchid, may influence the persistence of the orchid metapopulations in Minnesota and on the Sheyenne National Grasslands and adjacent private land. Optimal management for the orchid is likely to be that which best maintains quality wetland habitats within the tallgrass prairie. The Service recommends Reclamation conduct a thorough analysis of the project's effects on the quality and quantity of groundwater in aquifers that support wetland habitats with orchid populations.

6.1.4 Native Prairie Habitats. The Sheyenne National Grasslands and adjacent private land is one of the remaining large tracts of tallgrass prairie and oak savanna in North America. Many scientists have suggested remaining tracts of native prairie should be the highest priority for conserving biological diversity. Native prairie is a diminishing resource in North Dakota and Minnesota. Federal and state governments, and private conservation organizations, such as The Nature Conservancy, have initiated efforts to identify, protect, and manage the remaining examples of native mixed-grass and tallgrass prairie ecosystems. Because of the significant values of native prairie, we recommend Reclamation avoid project impacts to native prairie habitats where possible.

6.1.5 Sheyenne River. Changes in flow duration, stage, and frequency may increase erosion and sedimentation on the Sheyenne River. It is expected that the riparian habitat will experience a shift in species composition in response to a hydrological change. Loss or alteration of habitat, erosion, invertebrate impacts due to sedimentation and erosion, loss of riparian vegetation, decreased shading, and loss of detritus in the channel remain Service concerns.

6.1.6 Valley City National Fish Hatchery. A plan is currently being explored by the Service that proposes to raise non-endemic species, such as pallid sturgeon (*Scaphirhynchus albus*) and

Topeka shiner (*Notropis topeka*) at the Valley City NFH Intensive Culture Building with some modifications to the water treatment system. The fish produced would be used for future reintroduction and recovery efforts in the Missouri River system. Pallid sturgeon were raised at the Valley City NFH in the past but have not been present in the hatchery since 1999. The Service has prepared a Draft Environmental Assessment of the proposal (Appendix A). At this time, the proposal is on hold due to unresolved issues related to the number of fish that could be reared in the facility, the need for another rearing facility, and concerns involving the potential transfer of biota between drainages (Personal communication: R. Zitzow).

6.1.7. Interjurisdictional Fish. Interjurisdictional fish are fish populations whose management and allocation of use are the collective responsibility of two or more States, Tribes, and/or Nations. Interjurisdictional fish are not necessarily migratory, but can move either short or long distances between political jurisdictions in the completion of their life cycles. Fish species found in the Red River (Minnesota - North Dakota - Canada) and in Lake of the Woods (Minnesota - Canada) are interjurisdictional fish. To coordinate actions of multiple governments, interjurisdictional organizations have been formed voluntarily, by treaty, or by Act of Congress. The Service, though the Fish and Wildlife Management Assistance Program, works cooperatively with these organizations to conserve, restore and manage fish stocks and the habitat on which they depend. If interjurisdicitional fisheries issues are identified by the International Joint Commission (IJC) or the International Lake of the Woods Control Board (ILWCB), the Service would provide technical assistance to support their efforts to resolve the issues and protect the fisheries resources in the Red River or Lake-of-the-Woods respectively.

6.2 Planning Objectives.

The following are the Service's planning objectives for the proposed project:

- Operate within State water quality standards for the Sheyenne and Red Rivers.
- Develop and implement a plan to mitigate all substantial fish and wildlife resource impacts.
- Establish a monitoring plan to evaluate environmental issues of concern and effectiveness of mitigation measures.
- Develop environmental commitments and an operational plan for project alternatives that minimizes impacts, compensates for unavoidable impacts, and, where appropriate, enhances fish and wildlife resources.

7.0 DESCRIPTION OF EVALUATION METHODS

Project impacts on fish and wildlife resources where evaluated by Reclamation using the HEC5Q water quality model, and StateMod, a water quantity model. The Service used the results of Reclamation's analysis, ESRI's ArcGIS software, and Resource Categories to identify potential project impacts.

Reclamation used the HEC5Q water model as an effective way to select an alternative and a water quality constituent and view its impact to any point along the Sheyenne and Red Rivers. This model is the primary tool used to determine potential water quality impacts and their possible impact on adjacent natural resources.

StateMod is a steam simulation model derived from an earlier version of Boyle Engineering's BESTSM, which is a general purpose streamflow allocation model developed to simulate surface water and groundwater resources for complex river basins. StateMod supports complex water rights, exchanges, and importing operations.

ArcGIS software is a geographic information system for management, analysis, and display of geographic knowledge, which is represented using a series of information sets. ArcGIS is an integrated collection of GIS software products for building a complete GIS. ArcGIS enables users to deploy GIS functionality wherever it is needed in desktops, servers, or custom applications; over the Web; or in the field. ArcGIS Desktop GIS software products are used to compile, author, analyze, map, and publish geographic information and knowledge. It is used to create, import, edit, query, map, analyze, and publish geographic information.

The Service evaluates the importance of various habitats to trust resources, and whether or not the habitat is unique and irreplaceable on a national or ecoregion basis, as defined in the Service's Mitigation Policy, Federal Register, Vol. 46, No. 15, Friday, January 23, 1981. This evaluation results in the Service establishing a planning goal, thus the degree of replacement reflects the value of the habitat.

There are four Resource Categories of decreasing importance, with mitigation planning goals of decreasing stringency developed for these categories (Table 7.1).

Table 7.1. Service Resource Categories.

Resource Category	Designation Criteria	Mitigation Planning Goal
1	Habitat to be impacted is of high value for evaluation species and unique and irreplaceable on a national basis or in the ecoregion section.	No loss of existing habitat value.
2	Habitat to be impacted is of high value for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section.	No net loss of in-kind habitat value.
3	Habitat to be impacted is of high to medium value for evaluation species and is relatively abundant on a national basis.	No net loss of habitat value, while minimizing loss of in-kind habitat value.
4	Habitat to be impacted is of medium to low value for evaluation species.	Minimize loss of habitat value.

Resource Category 1 habitats warrant a planning goal recommendation of no loss of existing habitat value. An example of Resource Category 1 habitats are calcareous fens. These habitats are not replaceable in-kind, based on present scientific and engineering skills or within a reasonable time frame. At this time, no Resource Category 1 habitats appear to be affected by the proposed project.

Examples of Resource Category 2 habitats include prairie pothole wetlands, native prairie grasslands, and prairie streams acting as fluvial wetlands. All of these habitats are of high value that are relatively scarce or becoming scarce on a national and or ecoregion basis. The planning goal recommendation for these habitats is no net loss of in-kind habitat value. These high value areas can be mitigated or replaced in-kind within a reasonable timeframe through restoration, creation, or enhancement of similar systems or physical habitats.

Non-native grasslands and woodlands are of high to medium value and are relatively abundant on a national basis, and are considered to be Resource Category 3 habitats. The associated planning goal is no net loss of habitat value, thus minimizing loss of in-kind habitat value. If in-kind development is not desirable or possible, then out-of-kind replacement would be suggested.

Habitat such as agricultural fields are common in the project area and are of medium to low value for wildlife, thus they are considered to be Resource Category 4 habitats. Generally, losses of these habitats will not have significant adverse effects on fish and wildlife resources.

8.0 DESCRIPTION OF FISH AND WILDLIFE RESOURCES

8.1 EXISTING CONDITION

8.1.1 Vegetation

As glacial Lake Agassiz drained, the tall grass and mixed grass prairie dominated the plains, while oak savanna and, later, deciduous and mixed forests developed in the uplands and along the stream courses. Major changes in the ecosystem began in the 1800s, with the arrival of the white settlers. The high fertility of the soils, attributable to the accretion of tallgrass debris in the topsoil and strong subsoil formed by the Lake Agassiz sediments, has led to clearing and cultivation of nearly all arable land. Principal crops now grown are small grains, corn, potatoes, sugar beets, soybeans, and sunflowers. These crops provide sterile monotypic habitats which have greatly reduced the former diversity of prairie fauna and flora.

Vegetation on the Glacial Sheyenne Delta consists of native forest, woodland, and grassland communities and nonnative (cropland) replacement communities with associated cultivated and introduced plant species. Studies on the Sheyenne National Grassland (Bjugstad and Fortune, 1989) identified habitat associations based on similar plant species composition, soil type, and topography. In the Sandhills Habitat Association, the topography is gently rolling and undulating sandhills with relief usually of 1.7 to 3m and slope of 5 to 10 percent. Soils are primarily loamy fine sand which have typically moderate to low water holding capacity, but with high moisture due to a high water table. Within the Sandhills Habitat Association, the Lowland Grassland Habitat Type can be found on the foot and toe slopes. The soil found in this habitat type is fine sandy loam soil, and the vegetation is a wooly sedge-northern reedgrass-Baltic rush (*Carex lanuginosa - Calamagrostis inexpansa - Juncus balticus*) sedge meadow community. The western prairie fringed orchid is most often found in association with the Lowland Grassland Habitat Type.

In contrast to the marked prairie changes, floodplain forest species do not appear to have been significantly altered. The mature hardwood forest zone occurs primarily in the lowlands along the Red River and its tributaries. This zone is dominated by a variety of trees such as bur oak (*Quercus macrocarpa*), green ash, box elder, American elm, cottonwood, hackberry (*Celtis occidentalis*), and basswood (*Tilia americana*). Typically, a well-developed under story is present, composed of small trees and larger shrubs including hop hornbeam (*Ostrya virginiana*) and prickly ash (*Xanthoxylum ssp.*). Smaller berry shrubs common in the Red River valley and tributary streams are hawthorn (*Crataegus ssp.*), buckbrush (*Symphoricarpos occidentalis*), gooseberry (*Grossularia ssp.*), chokecherry (*Prunus virginiana*), juneberry (*Amelanchier alnifolia*), pin cherry (*Prunus pensylvanica*), and buffaloberry (*Shepherdia canadensis*).

State and Federal agencies have encouraged planting programs directed toward establishing shelterbelts and windbreaks. In addition to native tree and shrub species, these shelterbelts are

planted with exotic species such as pines, spruces, cedars, willow cotoneaster, and dogwood. Shelterbelt species planted in the agricultural areas tend to be more drought-resistant than the species adapted to the moist soils adjacent to the watercourses.

The deciduous forest of Minnesota extends from the northern aspen parkland to maple/basswood forests of the southeast. There are many forest communities within this landscape. The northern aspen parkland is typical of a boreal landscape, with open understory, wet meadows, aspen, willow, and alder thickets. The communities include wild flowers like the northern gentian (*Gentianella amarella*) and prairie-fringed orchid. Further south, the deciduous forest changes to one dominated by maple and basswood and scattered oak savannahs. Wild flowers are a special feature of these woods, including trillium (*Trillium grandiflorum*), hepatica (*Hepatica ssp.*), bloodroot (*Sanguinaria canadensis*), trout lily (*Erythronium americanum*), Dutchman's breeches (*Dicentra cucullaria*), and spring beauty (*Claytonia virginica*) (Moyle and Moyle 1977; Henderson and Lambrecht 1997).

The only extensive, remaining floodplain forest vegetation in the Missouri Valley of the Dakotas lies in south-central North Dakota. This region is bounded by Garrison Dam on the north and the headwaters of Lake Oahe on the south, a distance of approximately 60 miles (90 river miles). Forest communities on the floodplain are no longer periodically inundated as Garrison Reservoir has eliminated flooding throughout the area.

8.1.2 Wildlife

The wildlife habitat which remains in the area is limited to shelterbelts, woodlands, riparian areas, lawns, and parks. Almost all of the native prairie and surrounding wetlands have been converted to farmland. The strips of woodland vegetation function as important migration and travel corridors for deer, small mammals, birds, and other wildlife and provide an important ecotone or "edge effect" with adjacent areas. The riparian woodland areas provide the most important wildlife habitat remaining. White-tailed deer (*Odocoileus virginianus*) frequent the Red River bottoms, shelterbelts, and brushy areas in the stream valley. Moose are found throughout the region, including the Red River Valley area.

The mature trees found within this riparian corridor are important to wildlife, especially migratory passerine birds such as the tufted titmouse (*Parus bicolor*), scarlet tanager (*Piranga olivacea*), eastern screech owl (*Otus asio*), broad-winged hawk (*Buteo platupterus*), barred owl (*Strix varia*), red-eyed vireo (*Vireo olivacea*), and wood thrush (*Hylocichla mustelina*). Other wildlife which utilize this area include red squirrels *(Tamiascurius hudsonicus*), gray squirrels (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), cottontail rabbit (*Sylvilagus floridanus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), mink (*Mustela vison*), muskrat (*Ondatra zibethica*), and white-tailed deer. The riparian areas also provide critical winter cover for many of these species.

Waterfowl habitat along the rivers is marginal because of few oxbows and marshes along the river and aquatic plants are virtually nonexistent due to the river's high turbidity. Wood ducks (*Aix sponsa*) are the most common breeding waterfowl species in the area, with Canada geese (*Branta canadensis*), mallards (*Anas platyrhynchos*), and hooded mergansers (*Lophodytes cucullatus*) also making use of the riparian floodplain areas during migrational periods. The Red River also serves as a rest area for migrating shorebirds, other waterfowl species, birds of prey and other birds.

Waterfowl species that use the prairie wetlands of Minnesota include: redhead (*Aythya americana*), northern shoveler, blue-winged teal (*Anus discors*), mallard, gadwall (*Anus strepera*), wood duck, canvasback (*Aythya valisineria*), and Canada goose. Other waterfowl use the prairie wetlands to a lesser degree: northern pintail (*Anus acuta*), lesser scaup (*Aythya ssp.*), and ring-necked duck (*Aythya collaris*). These species rely on grains for food most of the year; but during the spring and summer, they shift to aquatic plants and insects. They depend on the wetlands for food during the breeding season.

The riparian woodlands found along the Missouri River provide some of the best wildlife habitat in North Dakota. Two big game species, white-tailed deer and wild turkeys (*Meleagris gallopavo*), attain their highest population levels along the Missouri River. In addition, waterfowl rest on the numerous sandbars in the river during migration.

The Missouri River also provides quality habitat for a wide range of resident nongame species, including a host of songbirds, raptors, and small mammals. Avian species include the red-tailed hawk (*Buteo jamaicensis*), brown thrasher (*Toxostoma rufum*), least flycatcher (*Empixonax minimus*), western meadowlark (*Sturnells neglecta*), and orchard oriole (*Icterus spurius*). Common mammal species include beaver (*Castor canadensis*), muskrat, long-tailed weasel (*Mustela frenata*), and badger (*Taxidea taxus*). Least terns (*Sterna antillarum*), an endangered species, and piping plovers (*Charadrius melodus*), a threatened species, nest on the numerous sandbars on the Missouri River.

Piping plovers primarily breed in four habitat types found within the project area - alkali lakes and wetlands, inland lakes, reservoirs, and rivers. Piping plovers prefer habitat that consists of open, sparsely vegetated areas with alkali or unconsolidated substrates.

8.1.3 Fisheries

The Red, lower Sheyenne (below Lake Ashtabula), and Tongue Rivers are classified by the North Dakota Game and Fish Department (NDGFD) as a Class I highest-valued fishery resource supporting a good population of sport fish as well as forage species. Primary sport fish include channel catfish (*Ictalurus punctatus*), northern pike (*Esox lucius*), walleye (*Sander vitreum*), sauger (*Sander canadensis)*, rock bass (*Ambloplites rupestris*), and crappie (*Pomoxis ssp.*). The Red River serves as a major avenue for fish migration in and out of its tributaries. The lower

Wild Rice (below Tewaukon National Wildlife Refuge), Goose, and Turtle Rivers are classified as Class II high-priority fishery resources and the Maple, Elm, Park, and Pembina Rivers are classified as Class III substantial fisheries resources.

The riparian habitat provides shading along the bank moderating water temperatures for the fishery resource. Fallen trees in the river create eddies and scour holes that provide habitat for invertebrates, mollusks and fish. The aquatic habitat is used for escape cover and feeding and spawning areas for fish species, such as walleye, northern pike, sauger and channel catfish.

The Red River's fishery value has decreased through the years because of poor water quality conditions resulting from heavy agricultural, industrial, and municipal use. Although the river's fishery has declined over time, it does provide an important recreational opportunity for area residents. No federally listed endangered or threatened fish species occur in the Red River.

Lake Ashtabula, above Valley City on the Sheyenne River, provides a diverse sport fishery for walleye, northern pike, muskellunge *(Esox masquinongy)*, yellow perch (*Perca flavescens*), and white bass (*Morone chrysops*). Lake Ashtabula also has provided a source for northern pike and walleye eggs for the Valley City National Fish Hatchery (U.S. Fish and Wildlife Service 2002).

Lake sturgeon once inhabited the Red River and its tributaries. However, since the turn of the century lake sturgeon populations have declined due to over harvest, pollution and water development projects. The last record of a lake sturgeon in this area came from Lake Lida in 1957. Lake sturgeon are slow growing, long lived fish which typically inhabit large river systems and the lakes associated with those rivers. Spawning usually occurs in water depths of 1-15 feet. The fertilized eggs are adhesive and attach to the rocky substrate while incubating. Hatching time is a function of water temperature and averages 8 days in water temperatures of 56°F. Adequate habitat for the various life stages of lake sturgeon is critical to the long term maintenance of a natural and/or a stocked population. Waters selected for establishment of lake sturgeon populations need protection, and where possible, enhancement of critical sturgeon habitats to ensure long term population viability.

The Minnesota Department of Natural Resources, in cooperation with the White Earth Indian Reservation, Rainy River First Nation, and the Service initiated a plan in 1997 to re-introduce lake sturgeon (*Acipenser flavescens*) into the Red River system over a twenty year time period. The plan calls for sub-adult, yearling, fingerling, and fry to be released into the Roseau, Red Lake, Wild Rice, Buffalo, and Ottertail watersheds. Fingerling lake sturgeon will be stocked into Big Detroit Lake, Otter Tail Lake, Round Lake, White Earth Lake, the Otter Tail River, and Buffalo River and lake sturgeon fry will be stocked into the Roseau and Red Lake Rivers (Aadland et. al. unpublished 2005).

The fishery resources of Lake of the Woods, located on the International Boundary, are shared by the State of Minnesota and the Provinces of Manitoba and Ontario. Fish species commonly

found in Lake of the Woods include bluegill (*Lepomis machrochirus*), cisco (*Coregonus artedii*), lake sturgeon, northern pike, sauger, smallmouth bass (*Micropterus dolomieu*), yellow perch, walleye, and white sucker (*Catostomus commersonii*).

The Missouri River supports the largest diversity of fish species and provides the highest quality river fishery in North Dakota (North Dakota Game and Fish Department 1995). Primary game fish species are walleye, sauger, northern pike, channel catfish, white bass, rainbow trout (*Onchorhynchus mykiss*), brown trout (*Salmo trutta*) and cutthroat trout (*Onchorhynchus clarki*), and Chinook salmon (*Onchorhynchus tshawytscha*). Nongame species that are important to the river's ecology include goldeye (*Hiodon alosides*), carp (*Cyprinus carpio*), buffalo (*Ictiobus cyprinellus*), and shovelnose sturgeon (*Scaphirhynchus platorynchus*). The river has been rated as Class I highest valued fishery resource by the NDGFD. It provides fish species that are of high interest to area anglers (walleye, trout, and salmon). The high quality, cold water that is released from Garrison Dam helps to maintain the fishery, but has shifted the fish species composition from warm water species to cool and cold water species below the dam.

The Valley City National Fish Hatchery (NFH) is operated by the U.S. Fish and Wildlife Service, and consists of the main hatchery at Valley City and a smaller subunit at Baldhill Dam. Production at the Valley City NFH began in 1940 and at Baldhill NFH in 1952. The hatchery was originally built for bass and bluegill production. Currently, it rears northern pike, walleye, yellow perch, tiger muskie (*Esox masquinongy X Esox lucius*), smallmouth bass, largemouth bass (*Micropterus salmoides*), and bluegill.

The Valley City NFH is currently conducting an environmental assessment of a proposal to propagate non-endemic, imperiled, or federally-listed, threatened, and endangered aquatic species [e.g. pallid sturgeon, Topeka shiner] in the Intensive Culture Building at the Valley City NFH. The Intensive Culture Building became operational in 1982. In the late 1980's, a septic system with an underground drainfield was installed on the effluent line from the building to receive the waste water. The septic system was designed to prevent non-endemic fish species reared in that building from escaping to local waters (Sheyenne River, Red River, and the Hudson Bay Drainage/Ecosystem). However, this modification does not provide absolute assurance that pathogens associated with those non-endemic species would not be introduced to the local environment.

The Intensive Culture Building can be operated like an aquarium to reduce water needs and minimize discharge. The water reuse system was designed to reuse 90 percent of the total flow, which resulted in a flow of 10 gallons-per-minute through the system. The current proposal is to make additional modifications to the water reuse system and changes in operational procedures (e.g. using water from Valley City's municipal water supply or disinfecting water from the Sheyenne River prior to use in the facility), to prevent biotic transfer between the local environment and aquatic species reared in the building. Operational changes and modifications to the water treatment system in the building will allow collection of all the waste water.

Treatment of the collected waste water (e.g.; chlorinating and de-chlorinating, before discharging to the septic system and underground drainfield) is proposed to restrict biotic transfer to the Sheyenne River.

8.1.4 Wetlands

Minnesota has lost approximately half of an estimated 18.6 million acres of wetlands that existed prior to settlement. Many rivers have been channelized in the downstream reaches to improve agricultural drainage. Most of the small wetlands that once held spring runoff have been drained for agriculture through ditches or subsurface tile systems. As a result of this facilitated drainage, damaging summer floods are becoming more common. River hydrology has been further altered through the construction of approximately 270 flood control structures within the Minnesota portion of the Red River Basin. Despite these flood control projects, the Red River remains a flood-prone system due to heavy spring snow melt, the flatness of the area, and snow/ice melting in the upstream area of the basin before that in the downstream areas.

Minnesota's wetlands can be grouped into five types: (1) temporary wetlands, (2) wet meadows, (3) marshes, (4) swamps, and (5) bogs (Bezanson 1997).

(1) Vernal pool, prairie pothole, and flood plain forest wetlands contain water for only part of the year and are among the state's most threatened wetlands. These wetlands were once common in the prairie biome, but many of them have now been drained for farmland or filled for development. They support a wide variety of crustaceans, insects, reptiles, amphibians, and mammals, and are important sources of food and rest-stops for migrating birds.

(2) Sedge meadow, wet prairie, and fresh meadow are treeless open areas with wet or clay soils, often located within a high water table. They may or may not have standing water. Some have expanses of hummock-forming sedges, and slow water movement. If the area is fed by mineral-rich ground water, an alkaline fen may develop. Many rare plants occur in these wetland types. Wet meadows support a wide variety of flowering plants, many reptiles, amphibians, small mammals and birds, as well as wide-ranging mammals such as coyotes and moose. Large birds, such as sandhill cranes, feed on the abundant crustaceans, while owls and hawks prey on small mammals and birds. They may occur in association with lakes, rivers, or with other wetland types such as marshes to form wetland complexes.

(3) Slough, prairie pothole, pond, fresh marsh, and emergent marsh are common types of wetlands. There is usually an area of open water that may be deep or shallow. Plants, often cattails or bulrushes, emerge from the water and the arrow-shaped leaves of Sagittaria species may be common near the edges. Shallow marshes, which have more emergent vegetation than deep marshes, may remove up to 90% of the nutrients and sediment from runoff water that passes through them. They store large amounts of floodwater and support a wide variety of wildlife,

including fish. Marshes with open water are especially attractive to birds, including loons, ducks, geese, herons, and egrets. They are found in both prairie and forested areas of Minnesota.

(4) Shrub carr, alder thicket, and tamarack/cedar/spruce/ash swamp are wetlands that include shrubs and trees. Swamps may occupy thousands of acres, and are especially common in northern Minnesota where they intermingle with lakes, streams, bogs, and marshes. Most form on top of decaying vegetation (peat) which builds up above the water table, providing the relatively dry substrate that trees need. Many wildlife species use swamps during part of the year; they provide winter shelter for deer, hares and grouse, and summer feed for moose. Many migrating bird species use swamps as rest stops, and woodpeckers search for insects in the abundant dead trees. Swamps are often pristine ecosystems, and support some of the state's rarest plant species, including ram's-head lady slipper and other orchids.

(5) Peatland, muskeg, and moor are wetlands that form on a thick mat of peat covered by a layer of sphagnum moss that builds up above the water table. The water in a bog is cold, oxygen-poor, and acidic; plants that do well in bogs are acid-loving plants such as cranberry, blueberry, bog rosemary, and Labrador tea. Bogs can cover large areas of land, and often include black spruce and tamarack stands. Orchids such as the pink lady's slipper thrive there, and some plants compensate for the low availability of nutrients by consuming insects: pitcher plant and sundew are examples. Mammals that thrive in bogs include a variety of lemmings, shrews, and voles, as well as moose, lynx, black bear, and (in winter) deer. The great gray owl depends on the unique features of the bog, and birds such as sharptailed grouse, spruce grouse, red-tailed hawk, and a variety of smaller birds thrive there as well. Because they are relatively inaccessible and not suitable for agriculture, bogs are often undisturbed. They occur most commonly in the coniferous forest biome of Minnesota.

Historically, North Dakota had approximately 4.9 million acres of wetlands, representing about 11 percent of the land surface. Dahl (1990) estimates that North Dakota has approximately 2.5 million acres of wetlands remaining. This represents a 49 percent loss of the State's wetland base.

The wetland resources of the Prairie Pothole Region provide many functions and values. In general, wetlands follow a yearly cycle beginning with the spring catch of snow melt runoff. Through the summer months, wetlands receive direct precipitation and runoff from the surrounding watershed, while simultaneously exporting water through evapotranspiration and losing surface water through seepage. By late summer, the wetlands are generally drawn down or dry and enter the fall and winter months in a condition that prepares them to repeat the cycle the next spring.

Wetland habitats can be grouped into broad categories, which provide different habitat values for waterfowl and other wildlife (Table 8.1). Prairie pothole habitats can generally be grouped by water regime into palustrine emergent temporarily, seasonally, and semipermanently flooded

wetlands (PEMA, PEMC, and PEMF, respectively) (Cowardin, et al. 1982). Palustrine, emergent (PEMA, PEMC, and PEMF) and aquatic bed (PABF) wetlands are the most valuable habitat types for waterfowl. Abundant research indicates that breeding waterfowl make the greatest use of these types of wetlands. They provide important pair habitat and breeding sites for dabbling ducks, including mallard, pintail, gadwall, and teal (*Anus* ssp.). Duck broods typically feed and take cover in shallow emergent wetlands. Over-water nesters such as scaup (*Aythya* ssp.), canvasback, and redheads build nests on platforms of vegetation, which grow in the more semipermanently flooded wetland sites (PEMF and PABF).

Table 8.1. Summary of National Wetlands Inventory Wetland Classifications.

SYSTEM	SUBSYSTEM	CLASS	WATER REGIME	SPECIAL MODIFIER	BRIEF DESCRIPTION
L					Lacustrine
	1				Limnetic
	2				Littoral
P					Palustrine
		EM			Emergent
		AB			Aquatic Bed
		FO			Forested
		UB			Unconsolidated Bottom
		SS			Scrub-Shrub
			A		Temporarily Flooded
			C		Seasonally Flooded
			F		Semipermanently Flooded
			G		Intermittently Exposed
				d	Partly Drained
				x	Excavated
				h	Impounded

Temporary wetlands (PEMA) are the most common wetland type on the glaciated prairie of North Dakota. They are characterized as usually being less than 1 acre in size and less than 1 foot deep. They typically lose water rapidly during the first few weeks after spring snow melt

and are dry within a month or so. Despite their fleeting existence, temporary wetlands are very important. The temporary wetlands are the first wetland type to melt in the spring, thus providing the first invertebrate food supply for migrating waterfowl. This food supply is a critical source of protein used by breeding birds during the egg laying period, as well as food for other spring migrant waterbirds.

Swanson et al. (1985) and Krapu (1974a & b) showed that not only do temporary wetlands provide a major source of protein for nesting hens, but that poor quality diets lead to reduced clutch and egg size, laying rate, and number of nesting attempts (Eldridge and Krapu 1988). Waterfowl such as mallards, gadwall, blue-wing teal, northern shoveler, and northern pintail use temporary wetlands extensively.

In addition to providing an invertebrate food supply, seasonal wetlands (PEMC) provide isolation for duck pairs and locations for over-water nesters. In high-water years, seasonal wetlands provide good brood habitat and molting areas. They are heavily used by dabbling, diving, and stiff-tailed ducks due to their greater average depth and duration of inundation. Mallard, blue-winged teal, gadwall, northern pintail, northern shoveler, redhead, green-winged teal, ruddy duck (*Oxyura jamaicensis*), wigeon (*Anus americana*), lesser scaup, canvasback, and ring-necked ducks are all extensive users of seasonal wetlands. Other wildlife, such as white-tailed deer, fox, raccoon and ring-necked pheasant (*Phasianus colchicus*), rely on emergent wetlands for food and cover. Vegetation associated with these wetlands is especially valuable as cover during winter months.

Semipermanent wetlands (PEMF) provide nearly all the requirements of the waterfowl that nest on the North Dakota prairies. Emergent vegetation contained in these wetlands provide the primary breeding habitat for diving and stiff-tailed ducks such as redhead, canvasback, and ruddy duck. Due to their large size, relative to temporary and seasonal wetlands, semipermanent wetlands are the last of the prairie wetlands to become ice free in the spring. As a result, they are not a source of invertebrates early in the spring for nesting dabbling hens.

Open water and aquatic bed habitats (L1UBG and L2ABF) provide a varying degree of importance for migratory, molting, and staging for ducks, geese, and swans. Some diving ducks, such as scaup, ringnecks, and redheads, will feed in these habitats.

Semi-aquatic furbearing animals, including muskrat, mink, and beaver, utilize wetland habitats for food, shelter, and nesting. Rabbit, skunk, badger, raccoon, red fox, coyote (*Canis latrans*), and weasel are common terrestrial furbearing mammals found near wetlands where suitable habitats exist. Additionally, many species of marsh and shorebirds use wetlands for migration and nesting habitat, including species such as white pelicans (*Pelecanus erythrorhynchos*), cormorants (*Phalacrocorax auritus*), grebes (*Aechmophorus occidentalis, Podiceps* ssp.), gulls (*Larus* ssp.), black-crowned night herons (*Nycticorax nycticorax*), great blue herons (*Ardea*

herodias), great or common egrets (*Casmerodius albus*), and American bitterns (*Botaurus lentiginosus)*.
The upper one-third of the Sheyenne River is classified as riverine, lower perennial, unconsolidated bottom, intermittently exposed (R2UBG); and riverine, lower perennial, unconsolidated bottom, permanently flooded (R2UBH) for the lower two-thirds of the river's length (Table 8.2). In addition to the river habitat, there are several other types of floodplain wetlands that occur in the Sheyenne River floodplain. For the most part, they are characterized as palustrine, emergent, temporarily, and seasonally flooded wetland habitats (PEMA and PEMC, respectively). In some areas, sedge meadow wetlands are found adjacent or near the Sheyenne River and are maintained by river flows and ground water tables. Those portions of the forested banks of the Sheyenne that are wetlands are identified by the National Wetland Inventory (NWI) as palustrine, forested, temporarily flooded (PFOA) linears or polygons.

The Red River of the North is characterized as a riverine, lower perennial, unconsolidated bottom, permanently flooded (R2UBH) river. There are occasional exposed river bars which have been classified as riverine, lower perennial, unconsolidated shore, temporarily or seasonally flooded (R2USA, and R2USC, respectively). Unlike the Sheyenne River, the Red River floodplain is largely devoid of wetland polygons of PEMA and PEMC. Floodplain wetlands, when identified, typically exist in old river scars and oxbows.

Table 8.2. Summary of National Wetlands Inventory River Classifications.

SYSTEM	SUBSYSTEM	CLASS	WATER REGIME	SPECIAL MODIFIER	BRIEF DESCRIPTION
R					Riverine
	2				Lower Perennial
	3				Upper Perennial
	4				Intermittent
		RB			Rock Bottom
		SB			Streambed
		AB			Aquatic Bed
		RS			Rocky Shore
		US			Unconsolidated Shore
		EM			Emergent
		OW			Open Water
			A		Temporarily Flooded
			C		Seasonally Flooded
			G		Intermittently Exposed
			H		Permanently Flooded

8.1.5 Aquatic Mollusks

In September 1993, The American Fisheries Society (AFS) published a paper entitled, "Conservation Status of Freshwater Mussels of the United States and Canada," by Williams et al., wherein several threats to mussels were identified. A few of the identified reasons for mussel declines were habitat destruction, channel modification, siltation, and pollution. The paper cites habitat destruction as the single most serious threat to mussel populations.

Mussels are considered good indicators of the health of aquatic ecosystems, as they are dependent on good water quality and physical habitat conditions, as well as a suitable environment that will support host fish species (Williams et al., 1993). The AFS report also cites erosion, caused by poor agricultural practices, and destruction of riparian habitats, as major factors in increased silt loads and unstable stream bottoms, which combine to produce unfavorable habitats for mussels.

Cvancara (1974) found 13 species of freshwater mussels inhabiting the Red and Sheyenne Rivers. Eight of the mussel species were found in the Red River and nine species in the Sheyenne River. The most common species found were white heelsplitter (*Lasmigona complanata*), giant floater (*Anodonta grandis*), fatmucket (*Lampsilis siliquoides*), and cylindrical papershell (*Anodontoides ferussacianus*). Less common species included Wabash pigtoe (*Fusconia flava*), three-ridge (*Amblema costata*), mapleleaf (*Quadrula quadrula*), Creek heelsplitter (*Lasmigona compressa*), fluted-shell (*Lasmigona costata*), squaw foot (*Strophitus rugosus*), pink heelsplitter (*Proptera alata*), black sandshell (*Ligumia recta latissima*), and pocketbook (*Lampsilis ventricosa*).

Jensen et.al. (2001) found threeridge, Wabash pigtoe, mapleleaf, cylindrical papershell, white heelsplitter, pocketbook, fatmucket, black sandshell, and pink heelsplitter at most sites on the Red River and a few giant floater at scattered sites. In the Sheyenne River, mussel species found only below Lake Ashtabula included threeridge, Wabash pigtoe, mapleleaf, pocketbook, black sandshell, creek heelsplitter, and pink heelsplitter. Giant floater, cylindrical papershell, white heelsplitter, and fatmucket were found both above and below Lake Ashtabula in the Sheyenne River.

8.1.6 RARE AND DECLINING SPECIES

8.1.6.1 North Dakota Rare Species

North Dakota has no threatened or endangered species statute. The North Dakota Game and Fish Department, in conjunction with the Natural Heritage Inventory, has developed a Species Priority List for North Dakota. The species identified are in decline at the national, regional, or state level or are species whose population status is not well known but is thought to be in decline.

Also identified were species that may not be in decline, but a large percentage of the population occurs in North Dakota (North Dakota Game and Fish Department 2004).

The North Dakota Parks and Recreation Department, Natural Heritage Inventory, compiles and maintains a database documenting the statewide status and location of rare flora and fauna, ecological communities, and unique geological features. Of special significance and importance are The Nature Conservancy's Pigeon Point Preserve and North Dakota Game & Fish's Mirror Pool State Nature Preserve. It is noteworthy that the Sheyenne Delta, which includes these two important natural resource preserves, supports the largest diversity of plant species in North Dakota.

The Pigeon Point Preserve, located in Ransom County, possesses a high diversity of wetland habitats and plant species. This preserve consists of a series of spring fed wetlands along the Sheyenne River. This site is host to at least 18 rare species, which have been recorded in its fen and wetland thickets. Pigeon Point has one of the best developed spring fed streams along the Sheyenne River.

Mirror Pool State Nature Preserve is a 431-acre preserve in Richland and Ransom Counties, consisting of two units located both north and south of the Sheyenne River. The wetland community is comprised of both fen and thicket communities, which are home to 15 rare plant species. Of special note is the green keeled cottonsedge (*Eriophorum viridicarinatum*), a rare sedge known to be located in only one other site in North Dakota, and moonwort (*Botrychium minganense*), which is known to be located in two other sites in the State. Mirror Pool is an excellent example of an eastern deciduous forest, complemented by an assemblage of rare fern species and extensive oxbow wetlands, with alder lined spring-fed tributaries. It is important to note that all the primary features of Mirror Pool are located in the valley bottom or associated with groundwater seepage and springs near the valley wall. It will be critical that these unique natural features are studied closely for any alteration due to Missouri River water being added to the existing flow in the Sheyenne River.

8.1.6.2 Minnesota State Listed Species

Minnesota's Endangered Species Statute (Minnesota Statutes, Section 84.0895) requires the Minnesota Department of Natural Resources (DNR) to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of special concern. The resulting List of Endangered, Threatened, and Special Concern Species (Appendix B) is codified as Minnesota Rules, Chapter 6134. The Endangered Species Statute also authorizes the DNR to adopt rules that regulate treatment of species designated as endangered and threatened. These regulations are codified as Minnesota Rules, Parts 6212.1800 to 6212.2300.

- A species is considered endangered if the species is threatened with extinction throughout all or a significant portion of its range within Minnesota.

- A species is considered threatened if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range within Minnesota.

- A species is considered a species of special concern if, although the species is not endangered or threatened, it is extremely uncommon in Minnesota, or has unique or highly specific habitat requirements and deserves careful monitoring of its status. Species on the periphery of their range that are not listed as threatened may be included in this category along with those species that were once threatened or endangered but now have increasing or protected, stable populations.

Minnesota's Endangered Species Statute and the associated Rules impose a variety of restrictions, a permit program, and several exemptions pertaining to species designated as endangered or threatened. A person may not take, import, transport, or sell any portion of an endangered or threatened species, exept as permitted by the DNR; plants on certain agricultural lands and plants destroyed in consequence of certain agricultural practices are exempt; and the accidental, unknowing destruction of designated plants is exempt. Species of special concern are not protected by Minnesota's Endangered Species Statute or the associated Rules. Persons are advised to read the full text of the Statute and Rules in order to understand all regulations pertaining to species that are designated as endangered, threatened, or species of special concern.

For more information, contact the Natural Heritage and Non-game Research Program, Division of Ecological Services, Minnesota Department of Natural Resources, 500 Lafayette Rd., Box 25, St. Paul, Minnesota 55155, (888) 646-6367, (http://www.dnr.state.mn.us/ets/index.html).

8.1.6.3 Federally Listed Species

The Service provided Reclamation with a list of federally threatened and endangered species and critical habitat for the project area on January 5, 2004. Since that time additional counties have been added to the area of potential affect. The Service's Region 3 Office lists the following species and critical habitat in these additional Minnesota Counties:

Hubbard County - bald eagle (*Haliaeetus leucocephalus*) and grey wolf (*Canis lupus*).
Lake of the Woods County - bald eagle, piping plover, grey wolf, Canada lynx (*Lynx canadensis*), grey wolf critical habitat, and piping plover critical habitat.
Todd County - bald eagle and grey wolf.
Wadena County - bald eagle and grey wolf.

On March 11, 1967, the bald eagle was listed as an endangered species in 43 of the lower 48 states and threatened in Michigan, Minnesota, Oregon, Washington, and Wisconsin. The bald eagle was downlisted in 1995 and is currently designated as threatened in the conterminous (lower 48) States. The bald eagle has been documented in Minnesota and is known to occur in mature forests near water. Bald eagles prefer mature trees in forests of corridors which buffer nesting activities, but have also been documented in residential areas and near busy transportation corridors. The Missouri River corridor and flood plain forest between Garrison Dam and Lake Oahe provides a natural migration corridor, as well as suitable nesting and wintering habitat for bald eagles. In 1988, the Service documented the first active bald eagle nest in the State of North Dakota since 1975, along the Missouri River downstream of Garrison Dam. Since then, the Service has periodically conducted aerial surveys of this reach of river for nesting pairs. The two surveys conducted in 1997 and 1999 documented eight active nests each year. In 2005 there were 14 documented bald eagle nests along the Missouri River in North Dakota. The nests on the Missouri River nearest the project area are located approximately one mile downstream of Garrison Dam. In the Red River Valley bald eagle nests have recently been identified near Fordville Dam in Walsh County, the west end of Kelly's Slough National Wildlife Refuge in Grand Forks County and approximately one mile north of East Grand Forks in Polk County, Minnesota.

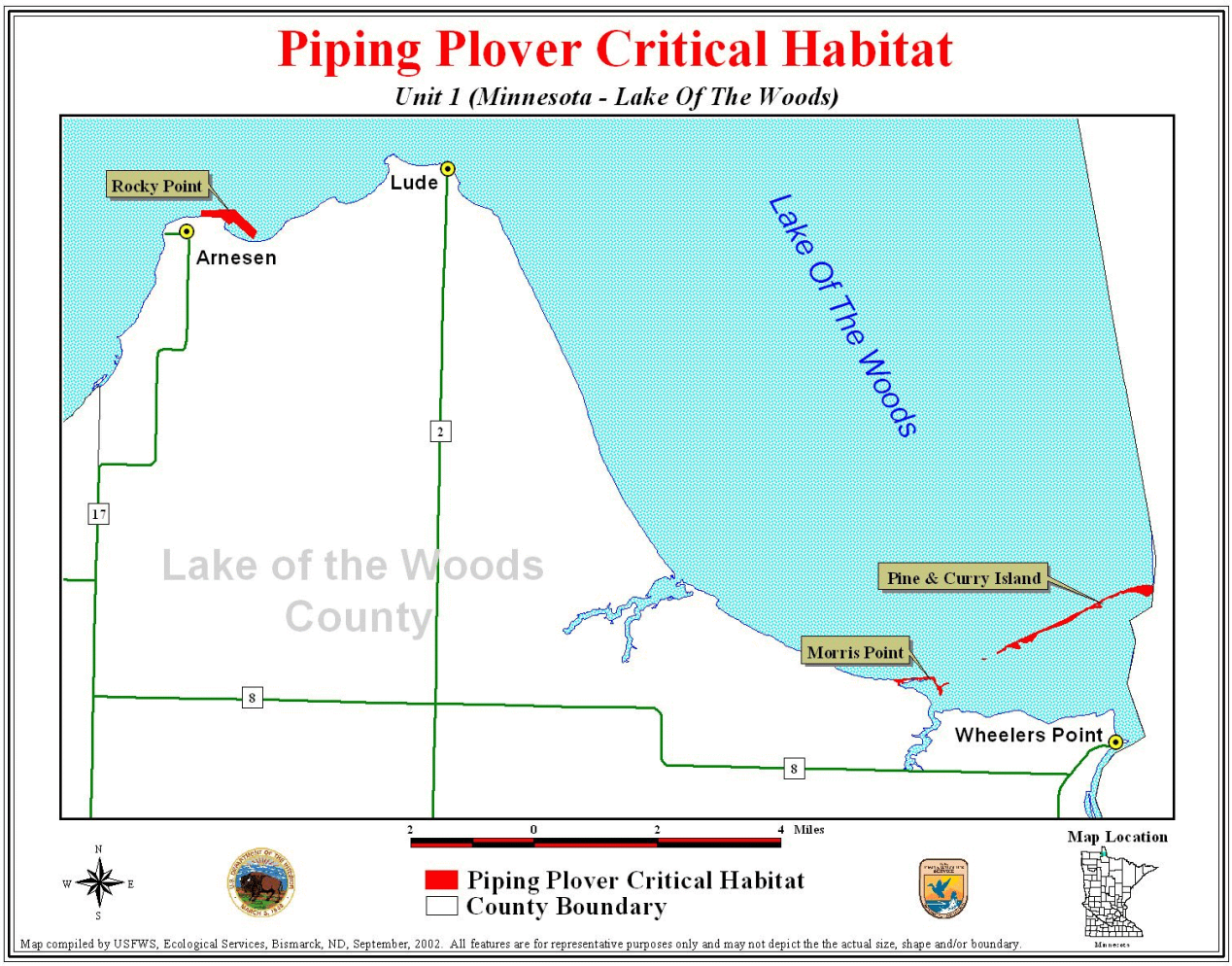
The piping plover is a small shorebird that was listed as "threatened" in 1985. Habitat loss and poor breeding success are major reasons for its population decline. North Dakota is the most important State in the Great Plains for nesting piping plovers. More than three-fourths of piping plovers in North Dakota nest on prairie alkali lakes, while the remainder use the Missouri River. Piping plovers inhabit barren sand and gravel shores of rivers and lakes.

Lake Sakakawea and Lake Audubon are significant areas for piping plovers on the Missouri River System. The average adult census for piping plovers from 1998 through 2000 is 79 birds or 16.2 percent of the System total, the third highest of the Missouri River segments supporting plovers. While piping plovers are widely distributed over much of the reservoir, important nesting areas on Lake Sakakawea include Steinke Bay, Douglas Creek Bay, the Van Hook Arm, Little Egypt, and Tobacco Garden Bay. Corps of Engineers' survey crews, from 1998 to 2003 recorded an average of 56 piping plover nests within 10 miles of the Snake Creek Embankment between Lake Sakakawea and Lake Audubon and in 2004 there were 141 nests in this area (unpublished Corps data). Piping plover nest initiation is similar to that observed on the adjacent prairie coteau wetlands, with the birds initiating nests in early to mid-May.

Piping plover critical habitat has been designated in the counties included in the action area for the Lake of the Woods, GDU Import to Sheyenne River, GDU Import Pipeline, Missouri River to Red River Valley Import, and GDU Water Supply Replacement Pipeline alternatives (50 CFR Part 17, Federal Register, Volume 66, Number 113 / Tuesday, June 12, 2001 / Proposed Rules). In North Dakota, piping plover critical habitat has been designated for the Missouri River, Lake Sakakawea, Lake Oahe, and selected alkali lakes and wetlands. On the Missouri River, critical

habitat includes sparsely vegetated channel sandbars, sand and gravel beaches on islands, temporary pools on sandbars and islands, and the interface with the river. On Lake Sakakawea and Lake Oahe, critical habitat includes sparsely vegetated shoreline beaches, peninsulas, islands composed of sand, gravel, or shale, and their interface with the water bodies. For alkali lakes and wetlands, critical habitat includes: shallow, seasonally to permanently flooded, mixosaline to hypersaline wetlands with sandy to gravelly, sparsely vegetated beaches, salt-encrusted mud flats, and/or gravelly salt flats; springs and fens along edges of alkali lakes and wetlands; and adjacent uplands 200 feet (61 meters) above the high-water mark of the alkali lake or wetland. In Minnesota, piping plovers key in on sandy points or spits in large lakes. Although many sandy beach/ large lakes exist, piping plovers are attracted to the rare combination of windswept islands or peninsulas with a lack of adjacent tree cover. Therefore, critical habitat designation in Minnesota is limited to three known sites (Figure 8.3) on Lake of the Woods where the species has been observed nesting in more than one year. Zippel Bay on Lake of the Woods and Agassiz National Wildlife Refuge were not included because breeding pairs were only observed in 1 out of 20 years at these sites.

Figure 8.3. Minnesota piping plover critical habitat map.



The least tern (*Sterna antillarum*) is found on sparsely vegetated sandbars, including those in the Missouri and Yellowstone River systems in North Dakota. These 9-inch long birds are the smallest member of the gull and tern family. About 100 of the remaining 2,500 pairs of the interior population of least terns come to North Dakota each year. They were listed as "endangered" in 1985. Their decline is due to the loss of habitat resulting from dam construction and subsequent operation of the system.

The whooping crane (*Grus americana*) is making a slow, but steady, comeback. From a low of 21 birds in the 1940s, the current wild and captive whooping crane population is believed to be about 468. Its decline is blamed on loss of habitat and excessive shooting. It was declared endangered in 1970. At a height of 5 feet, the whooping crane is the tallest bird in North America. Equally impressive is its 7-foot wingspan. Most whooping cranes migrate through North Dakota each spring and fall, frequently in the company of sandhill cranes. The whooping cranes pass through North Dakota, while migrating between their breeding territory in northern Canada and wintering grounds on the Gulf of Mexico.

The western prairie fringed orchid is restricted to west of the Mississippi River and is known from about 75 sites in Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, and in Manitoba. The only North Dakota plant on the Endangered Species List, the western prairie fringed orchid is classified as threatened, which means it is likely to become endangered. The plant, which may reach 3 feet in height, can be recognized by its large, white flowers on a single stem. The western prairie fringed orchid is a perennial orchid of the North American tallgrass prairie and is found most often on unplowed, calcareous prairies and sedge meadows. In Polk County, Minnesota, most populations and subpopulations in the Pembina Trail prairie complex lie on a lacustrine plain between two well developed beachlines of Glacial Lake Agassiz. Farther north in Kittson County, the beach ridges of Glacial Lake Agassiz are broken into discontinuous remnants with less clearly defined interbeach areas. In North Dakota, the orchid most frequently occurs in the sedge meadow community on the glacial Sheyenne Delta and also in the moist tallgrass prairies. The major cause of the species' decline is the conversion of prairie habitat to cropland. The Sheyenne National Grasslands and adjacent native prairie in southeastern North Dakota contain one of three large populations of the orchid, two in the United States (Sheyenne Delta, North Dakota, and Pembina Trail prairie complex in Minnesota), and one in Canada (Vita Prairies, Manitoba). On the Sheyenne Delta, about 95 percent of the orchids occur on the Sheyenne National Grasslands administered by the U.S. Forest Service and 5 percent on private land.

In the study area, Canada lynx occurs in northern Minnesota, preferring early successional conifer forests that provide ground cover suitable to support populations of snowshoe hare (*Lepus americanus*), as well as older forests which provide cover for denning activities. There has been one confirmed sighting at the south-central border of Roseau County, but the Canada lynx has been documented in increasing numbers over a wider range than previously recorded. The Roseau River Wildlife Management Area has been known to support Canada lynx in the past. Therefore, it is feasible that habitat within the Roseau River Watershed currently supports or provides habitat which could support Canada lynx.

An infrequent visitor to North Dakota, the gray wolf occasionally comes across the borders from neighboring Minnesota or the province of Manitoba, Canada. Once abundant in the State, the gray wolf was hunted to near extinction by 1940 at the urging of western settlers who believed wolves caused widespread livestock losses. The grey wolf is known to occur in northwestern Minnesota and prefers forested areas similar to those frequented by the Canada lynx. The eastern timber wolf and the Rocky Mountain wolf were listed as endangered in 1974. In 1978, the Service published a rule relisting the grey wolf at the species level as endangered throughout the lower 48 states except Minnesota, where the grey wolf was reclassified to threatened. In April 2003, the grey wolf was downlisted to threatened status. On February 1, 2005, a U.S. District Court in Oregon overturned the April 2003 decision and ordered the Service to rescind the rule downlisting the grey wolf. At this time, the grey wolf is listed as threatened in Minnesota and endangered throughout the rest of its range including North Dakota.

Grey wolf critical habitat has been designated in the counties included in the action area for the Lake of the Woods alternative. In Minnesota, grey wolf critical habitat has been designated for areas of land, water, and airspace in Beltrami, Cook, Itasca, Koochiching, Lake, Lake of the Woods, Roseau, and St. Louis Counties with boundaries (4th and 5th Principal meridians) identical to those of zones 1,2, and 3 as delineated in 50 CFR 17.40(d)(1).

The pallid sturgeon was placed on the Endangered Species List in 1990. This endangered fish, which can weigh up to 80 pounds, has rows of bony plates that stretch from head to tail. It prefers the bottoms of large, shallow rivers with sand and gravel bars, but construction of dams and bank stabilization has damaged or destroyed much of that habitat. The pallid sturgeon was fairly common in the Missouri and Yellowstone Rivers in North Dakota as late as the 1950s, but biologists believe fewer than 250 wild fish remain in this reach of the rivers. Since 1997, the Service in cooperation with Montana and North Dakota state fish and wildlife agencies have conducted pallid sturgeon stocking in compliance with the 1993 Pallid Sturgeon Recovery Plan. In recovery-priority area 2 (RPA-2) (the Missouri River from Ft. Peck Dam to the headwaters of Lake Sakakawea, including the Yellowstone River upstream to the mouth of the Tongue River) approximately 28,000 juvenile pallid sturgeon have been released. Releases into RPA-2 occurred in 1997, 2000, 2002, 2003, and 2004.

The Service estimates that an isolated remnant population of less than 50 individuals remain in the Garrison Reach of the Missouri River. There are no recent records (within the last 20 years) of successful pallid sturgeon reproduction in this reach. The Garrison Reach of the Missouri River is outside of the recovery-priority areas identified in the 1993 Pallid Sturgeon Recovery Plan. River reaches outside the recovery-priority areas are not excluded from implementation of recovery actions, but are designated as lower priority because these areas have been altered to the extent that major modifications would be needed to restore their natural physical and hydrologic characteristics.

The Dakota skipper (*Hesperia dacotae*), a candidate species, is a small butterfly with a 1-inch wingspan. Its current distribution straddles the border between tallgrass and mixed grass prairie ecoregions. The most significant remaining populations of Dakota skippers occur in western

Minnesota, northeastern South Dakota, north-central North Dakota, and southern Manitoba. Dakota skippers are found in native prairie containing a high diversity of wildflowers and grasses. Habitat includes two prairie types: 1) low (wet) prairie dominated by bluestem grasses (*Andropogon ssp.*), wood lily (*Lilium philadelphicum*), harebell (*Campanula rotundifolia*), and smooth camas (*Zygadenus elegans*); and, 2) upland (dry) prairie on ridges and hillsides dominated by bluestem grasses, needlegrass (*Stipa viridula*), pale purple coneflower (*Echinacea angustifolia*), and upright coneflowers (*Echinacea tennesseensis*) and blanket flower (*Gaillardia pulchella*). Dakota skipper populations have declined historically due to widespread conversion of native prairie. Remnant native prairies occupied by Dakota skippers are subject to a variety of threats.

8.2 FUTURE WITHOUT THE PROJECT

The No Action Alternative assumes that the various water supply and treatment facilities that are currently operating in the project area will continue to be utilized. As the existing systems reach their capacity or become obsolete, new measures will come on line subject to technical and economic feasibility. Included in these new measures will be water storage reservoirs, water tower replacement, transmission lines, wells, dam improvements, intake facilities, water treatment plant expansion and improvements, and regional expansion of rural water systems.

8.2.1 Aquatic Resources

Wetlands

The existing wetlands in the project area will continue to be drained or filled to facilitate industrial or urban development and agricultural activities. New and expanded ground water supply systems may impact wetlands by lowering the level of aquifers that intersect wetlands or streams (Pusc 2002). Construction of new water wells are anticipated for Gwinner and Enderlin, North Dakota and well field expansion is planned for Moorhead, Minnesota. Grand Forks - Traill Water District may acquire additional ground water appropriations. Aquifer development is proposed for the Fordville and Galesburg Aquifers. Surface water utilization can affect wetlands by reducing the amount of water available for aquifer recharge.

Fishery

Increased water withdrawals will impact fisheries resources by magnifying drought conditions resulting in low water levels for longer periods than currently experienced. Cass County Rural Water Users District and Southeast Water District have plans for system expansion in the future without the project. New water intakes and improvement of existing intakes are planned for Fargo-Moorhead Metro Area (2 on the Red River and 1 on the Sheyenne River), Grafton (replace existing intake on Red River), and Langdon/Langdon Rural Water District (Mount Carmel Dam intake improvements). Plans are for additional low head dam construction on the Red River at Fargo-Moorhead and Grafton as well as improvements to the existing low head dam at Drayton. On the Sheyenne River, low head dam improvements are proposed for Valley City. Low head dams are problematic in that they can block fish migrations, alter stream habitat, and degrade

water quality. These dams can restrict seasonal and daily fish movements until they become inundated during high flow events.

Water Quality

Water system expansions are planned for systems in the Red River Valley which will result in additional use of the surface and ground water resources. Less water available in the rivers will increase concentrations of nutrients and pollutants. The effects are less pronounced as the water moves downstream in the Sheyenne and Red Rivers and into Canada. To facilitate the increased water use, new intakes will need to be constructed and associated with the intake improvements. Low head dam construction and improvements will be required on the Sheyenne and Red Rivers. The water quality behind low head dams can be degraded through increased water temperature during the summer months and low dissolved oxygen levels during the winter. If there is little flow through the system in the winter months, dissolved oxygen levels behind the dams may reach anoxic levels and with higher spring flows, this anoxic water may be flushed downstream resulting in fish mortality. Contaminated sediments that are normally carried downstream and distributed by the river current can settle out in the slack water behind these dams at a higher rate resulting in "hot spots" that may affect aquatic organisms.

8.2.2 Terrestrial Resources

Wildlife, grasslands, woodlands, and riparian habitats within the basin will be impacted as new municipal, rural, and industrial water supply facilities are developed. Wildlife in the basin will generally be expected to relocate and adapt to the gradual loss of habitat due to these new water systems. Terrestrial resources along the Sheyenne and Red Rivers will be affected to varying degrees. The wildlife along the river corridors will relocate if adequate habitat is available. Increased agricultural production and urban development will also impact wildlife populations, grassland, woodland, and riparian habitats.

8.2.3 Threatened or Endangered Species and Rare Species

Federally listed, threatened, or endangered species are not expected to be impacted.

9.0 SUMMARY OF PLAN SELECTION PROCESS AND IDENTIFICATION OF EVALUATED ALTERNATIVES

Reclamation will not identify a preferred alternative in the DEIS. The State of North Dakota will identify their preferred alternative in the DEIS. The EIS will provide the decision makers with the information needed for alternative selection (including No Action).

A multi-step process was used to identify alternatives for further study in the DEIS to meet the water needs of the Red River Valley. Alternatives were formulated through a systematic process using public involvement, technical information, interdisciplinary and interagency discussions, and best professional judgment. Reclamation evaluated a full range of reasonable alternatives. To be considered a reasonable alternative, it had to meet the identified purpose and need for action, to a large degree, and be practical and feasible from a technical and economic standpoint.

The authorizing legislation (DWRA Section 5) required that at least one of the alternatives evaluate connecting the Garrison Diversion Unit (GDU) principal supply works to the Red River Valley. This feature is included in three alternatives: GDU Import to the Sheyenne River, GDU Import Pipeline, and GDU Water Supply Replacement Pipeline.

An interdisciplinary team developed screening criteria based on Council on Environmental Quality (CEQ) guidelines, legal mandates, and previous Red River Valley studies to formulate alternatives for detailed study, and to identify alternatives (or features of alternatives) to be eliminated. The screening criteria were:

- The alternative was included because it is mandated by law or regulation.
- The alternative was eliminated because it could cause unreasonable environmental harm based upon analysis from the Red River Valley Water Needs Assessment Phase II; Appraisal of Alternative to Meet Projected Shortages Report (Reclamation 2000).
- The alternative was eliminated because it could not be reasonably implemented.
- The alternative was eliminated because it is largely duplicative of another more desirable, reasonable, or feasible alternative.

The alternatives selected for further study include No Action, three in-basin alternatives, and four import alternatives. The following alternatives are evaluated in the Draft EIS:

No Action - the future without the federally authorized Red River Valley Water Supply Project.

North Dakota In-Basin - would use water supply sources primarily within the Red River Valley of North Dakota to meet shortages.

Red River Basin - would use available surface, and/or groundwater from the Red River Basin in Minnesota and North Dakota to supplement existing water sources to meet shortages.

Lake of the Woods - would transport water via pipeline from Lake of the Woods, Minnesota, to meet shortages.

GDU Import to Sheyenne River - would meet water shortages by linking the GDU Principal Supply Works to the Sheyenne River. The Principal Supply Works include the Snake Creek Pumping Plant on Lake Sakakawea, Audubon Lake, and McClusky Canal.

GDU Import Pipeline- would use the GDU Principal Supply Works and a pipeline system to meet the shortages.

Missouri River to Red River Valley Import - would use a pipeline from the Missouri River to import water to meet the shortages of the Red River Valley.

GDU Water Supply Replacement Pipeline - would use GDU Principal Supply Works and pipelines to replace all municipal, rural and industrial water supplies in the service area with imported Missouri River water.

10.0 DESCRIPTION OF PROPOSED ACTION AND EVALUATED ALTERNATIVES

The following alternatives, with the exception of the No Action Alternative, are being evaluated to meet the water needs of the Red River Valley through the year 2050. The needs are defined as municipal, rural, and industrial water supplies; water quality; aquatic environment; recreation; and water conservation measures. Six of the following eight alternatives are intended to supplement existing water supply sources, one will replace all existing water supplies using Missouri River water, and one (No Action) is the baseline against which the others will be evaluated. Three of the six supplemental alternatives include importation of Missouri River water.

Each alternative is designed based on two future water demand scenarios. Scenario 1 uses Reclamation's (Reclamation 2003) population projections and the intermediate future industrial water demand estimate from the North Dakota State University (2004) Red River Valley Industrial Water Needs Assessment in estimating future water demand. Scenario 2 incorporates water system users' population projections and the high future industrial water demand estimate from the North Dakota State University (2004) report estimating future water demands.

10.1 No Action Alternative (Future Without the Federally Authorized RRVWSP)

The No Action Alternative assumes that the various water supply and treatment facilities that are currently operating in the project area will continue to be utilized. As the existing systems reach their capacity or become obsolete, new measures will come on line subject to technical and economic feasibility.

10.2 North Dakota In-Basin Alternative

This supplemental alternative uses only North Dakota water sources to meet the future water needs. The major feature of this alternative is a pipeline from the Red River downstream of Grand Forks to Lake Ashtabula. The alterative functions by capturing Red River flows downstream of Grand Forks and re-circulating flows back to Lake Ashtabula to meet project water demands. The alternative also includes aquifer storage and recovery and new groundwater sources. Peak day water demands are met by providing additional groundwater capacity and some storage. Approximately 141 miles of pipeline are included in the alternative.

10.3 Red River Basin Alternative

This supplemental alternative uses a combination of North Dakota and Minnesota water sources to meet the future water needs of the Red River Valley. It includes existing Lake Ashtabula storage, aquifer storage and recovery projects in both states, and new groundwater sources from both states, particularly Minnesota. Existing Red River Valley surface water reservoirs are used as currently configured. Peak day water demands are met using groundwater sources where

available, combined with storage. Approximately 147 miles of pipeline are included in this alternative.

10.4 Lake of the Woods Alternative

This supplemental alternative uses a combination of North Dakota and Minnesota water sources to meet the future water needs of the Red River Valley. This alternative includes an import pipeline from Lake of the Woods to Grand Forks, North Dakota, south through Fargo to Wahpeton; aquifer storage and recovery projects in both states; and available storage in Lake Ashtabula. Existing Red River Valley surface water reservoirs are used as currently configured. Peak day water demands are met by water from groundwater sources, where available, and storage. Approximately 328 miles of pipeline are included in this alternative.

10.5 GDU Import to Sheyenne River Alternative

This supplemental alternative carries Missouri River water from the McClusky Canal, via a pipeline, to the upper portion of Lake Ashtabula and uses the lake as a re-regulating reservoir. The Sheyenne River, below Baldhill Dam, and the Red River convey project flows within the Red River Valley. This alternative includes a biota treatment plant located adjacent to the McClusky Canal at approximate mile marker 58 (Hoffer Lake). The treated water is pumped via pipeline to a release structure at the north end of Lake Ashtabula. The conservation pool of Lake Ashtabula (from elevation 1,257 or 28,000 ac-ft to elevation 1,266 or 68,600 ac-ft) would operate as a re-regulating reservoir to meet downstream demands for MR&I water supply. The alternative also serves the Wahpeton area's industrial needs via a pipeline spur south of Fargo. Peak day water demands are met by increased capacity in the main conveyance pipeline in conjunction with using Lake Ashtabula as a regulating reservoir. Approximately 223 miles of pipeline are included in this alternative.

10.6 GDU Import Pipeline Alternative

This supplemental alternative conveys water from the Missouri River via the McClusky Canal and a pipeline to the Red River Valley. A biota treatment plant adjacent to the McClusky Canal (Mile Marker 58 plug) is required in this alternative. The treated water is pumped east in an enclosed pipe which tees on the eastern side of North Dakota, going south towards Fargo and north towards Grand Forks. Overall pipeline sizes are larger than the other supplemental alternatives because peak day demands are met by increased pipe size rather than by storage. This in turn increases the size of the biota treatment plant. Approximately 347 miles of pipeline are included in this alternative.

10.7 Missouri River to Red River Valley Import Alternative

This supplemental alternative conveys treated water in a closed pipeline, from the Missouri River south of Bismarck, directly to Fargo and Grand Forks. The pipeline also has a spur running to Lake Ashtabula which is used as a regulating reservoir. In this alternative, a biota treatment plant is located south of Bismarck near the Missouri River. Peak day water demands are met using available groundwater sources, where available, and storage. Approximately 362 miles of pipeline are included in the alternative

10.8 GDU Water Supply Replacement Pipeline Alternative

The GDU replacement pipeline alternative meets all future water needs through 2050 by replacing all existing in-basin water sources with water from the Missouri River. The other major feature of this alternative is the biota treatment plant along the McClusky Canal. The biota treatment plant and conveyance system are designed to deliver peak day water demands. Approximately 664 miles of pipeline are included in this alternative.

11.0 Description of Impacts.

The description of impacts in sections 11.1 - 11.3.3 are related to project alternatives that use Lake Ashtabula, the Sheyenne River, and the Red River to move water as part of the alternative. Impacts discussed in section 11.4 on biota transfer are applicable to all alternatives that import Missouri River Water into the Red River Basin. All of the alternatives except No Action will result in some level of impact from pipeline construction.

11.1 Lake Ashtabula.

The addition of Missouri River water into Lake Ashtabula may result in freshening of the lake, which has experienced chronically low dissolved oxygen levels in the upper end of Lake Ashtabula during the winter and summer months. A change in the hydraulic storage ratio of the lake could result in a loss of young and adult fish, as well as a shift in algal composition and invertebrate populations due to the flushing aspect of the additional water.

11.2 Bald Hill Dam and Valley City National Fish Hatcheries.

Flows below Baldhill Dam during mid-May thru early August above 2,800 cfs would restrict the hatchery manager's ability to drain the rearing ponds at Baldhill Dam and Valley City NFHs (Ron Zitzow, Hatchery Manager, Valley City NFH, pers. commun.). The data provided (Reclamation 2005) indicate the addition of project water to the Sheyenne River below Baldhill Dam during drought conditions will not result in river flows above 2,800 cfs from mid-May thru early August. Additionally, at times when the normal flows out of Baldhill Dam are above 2,800 cfs, it is unlikely the supplemental RRVWSP alternatives would be operating. If an alternative is selected that uses the Sheyenne River as a conveyance feature, the Service will work with Reclamation to design an operational plan that will not result in impacts to the NFHs.

Reclamation has stated that a minimum flow of 13 cfs would be maintained in the Sheyenne River below Baldhill Dam. The Valley City NFH obtains water for hatchery operations from the Sheyenne River, and the minimum flow requirement will continue to provide water for the hatchery's needs.

11.3 Sheyenne and Red Rivers.

The impacts discussed in the following sections are related to the alternatives that use the Sheyenne and Red Rivers as conveyance features to meet projects needs.

11.3.1 Fish and sensitive aquatic species.

Alteration of the quantity and timing of river or streamflow can significantly affect fisheries resources. Effects of flow alterations can include blockage of fish migrations, alteration and loss of stream habitat, introduction of competing non-native fishes, degradation of water quality,

alteration of nutrient cycles, increased hybridization of closely related fishes competing for spawning sites, and decreased nutrient availability. The proposed project's effects to the fishery resource within the Sheyenne and Red Rivers will largely be connected to the river's higher than normal flows during drought years. Riffle and pool habitats are important during low-flow periods, as they provide wintering, rearing, and forage areas for fish. Additionally, the essential connection between mussels and their host fish in the Sheyenne could be disrupted. If a host fish is reduced or eliminated by hydrological changes, a loss of associated mussel species may occur.

There are 14 known host fish species dependent on the shallow and medium pool habitats in the lower Sheyenne River (Earth Tech Inc., 2001). Of those 14 species, four of them, the black crappie, bluegill, largemouth bass, and white crappie, are known host fish species for the Wabash pigtoe and the black sandshell, both of which are mussel species having a conservation priority Level II on North Dakota's species of conservation priority list. The decline or loss of these species may be significant, both to the fish and to the Wabash pigtoe and the black sandshell.

The Red River supports an internationally renowned trophy catfish fishery. Concerns have recently been expressed over the decline of large fish, angling pressure, and loss of habitat quality in the main stem Red River. At this time, it is uncertain as to what effect, if any, project operations might have on this valuable fishery.

Using river systems to convey project water may also amplify the demand for clearing and snagging along the river. Snagging and clearing of trees from the river channel is a normal practice when water managers attempt to efficiently convey water. Snags are important habitat in all riverine systems, but are especially important in the Red River for the channel catfish population.

The reintroduction of Lake sturgeon (*Acipenser fulvescens*) to the Red River by the Minnesota Department of Natural Resources should be monitored by Reclamation for possible impacts due to modified hydrology. Currently, Lake sturgeon are a Minnesota State species of special concern. At this time, it is unclear what, if any, effects project operations will have on this species.

11.3.2 Sheyenne River morphology and accelerated sedimentation and erosion.

Although increased flows may in general be beneficial to aquatic life in the Sheyenne River, the resultant changes in channel morphology and water quality may impact the availability of necessary habitat required for various life stages of aquatic species. Those species that can withstand the modified flow conditions could eventually dominate the system (Earth Tech Inc., 2001). The effects of project flows on the morphology and erosion of the Red River should be minimal due to the relatively small increases to the current flow regime.

11.3.3 Riparian habitat along the Sheyenne River.

Higher than normal low flows in drought years may shift riparian vegetation species composition. The Sheyenne River is a prairie stream with significant fluctuations in stream flow, so that historically the riparian vegetation developed with periods of very low to no flow (Reclamation 2005). Since 1950, Baldhill Dam and Lake Ashtabula have been operated for flood control and to provide water from Lake Ashtabula to the Red River Valley by releasing water down the Sheyenne River. The addition of project water into the Sheyenne River system should result in minimal loss or alteration of the existing riparian vegetation.

11.4 Biota Transfer.

To ensure compliance with the Boundary Waters Treaty of 1909, water from the Missouri River drainage basin, prior to delivery to the Red River drainage, must be pretreated to inactivate aquatic biota, including fish, larvae, fish eggs, algae, viruses, bacteria, and protozoa (U.S. Bureau of Reclamation 2000). Project alternatives that include importation of Missouri River water (GDU Import to the Sheyenne, GDU Import Pipeline, Missouri River to Red River Valley Import, and GDU Water Supply Replacement Pipeline) include biota water treatment plants (WTP) located within the Missouri River Basin. Biota WTPs for alternatives that provide supplemental water will treat the water using coagulation, flocculation, sedimentation, and ultraviolet disinfection as the primary treatment process. Only the GDU Water Supply Replacement Pipeline alternative will treat the water to Safe Drinking Water Act (SDWA) standards using lime softening, micro-filtration, and ultraviolet disinfection (U.S. Bureau of Reclamation 2005).

The Valley City NFH does not treat Sheyenne River water to fill their rearing ponds. Biota transferred to the Sheyenne River could enter the hatchery system, resulting in impacts to production and/or which may require the hatchery to install additional treatment facilities. Linder et. al. (2005), suggests that with a multiple-stage water control system (pretreatment, chemical treatment, and ultrafiltration) in place, an inter-basin water diversion project would have a biota transfer risk of “practically zero”. The report also states that biota transfer between basins is possible even in the absence of a federally authorized RRVWSP.

11.5 Impacts resulting from pipeline construction.

In most cases, pipeline projects do not result in lasting environmental impacts on wetland basins, streams, and upland sites. With appropriate environmental commitments in place the impacts to fish and wildlife resources from pipeline construction should be minimized.

The following pipeline impact analysis is based on a worst case scenario. The impacts are analyzed in this report as if all habitat within the potential construction zone will be impacted. However, the majority of the pipeline impacts will be temporary in nature and will not affect all

habitats within the potential construction zone. The actual size of the construction impact area will vary depending on the size of pipe required. At this time, the Service has no information on the final size of pipelines to be used for the various alternatives. Therefore, impacts are calculated using a 400 foot maximum construction zone along all pipeline alignments.

Each linear pipeline route provided by Reclamation was buffered 200 ft on each side to analyze the potential maximum impact zone for each alternative. The following data layers were clipped using ESRI's ArcGIS software on each of the buffered alternative routes: National Wetland Inventory wetland data (points, lines, and polygon features), North Dakota land cover data (Service, Region 6 Habitat and Population Evaluation Team Office [HAPET]), Minnesota GAP land cover data, and Service easement and fee title data produced by the Service's, Region 3 (MN) and Region 6 (ND) HAPET Offices. Where appropriate, length, acres, and hectares were calculated on the subsequent clipped data features. Attribute data from the clipped data features were brought into Microsoft's Excel software for summarization.

11.5.1 Aquatic Habitats.

Generally, projects which involve the burying of a pipeline should not significantly affect wetland basins or stream channels, provided precautions are taken to restore natural basin contours. Precautions should also be taken during installation of underground facilities by sufficiently compacting trenches through aquatic habitats to prevent drainage along the trench or through bottom seepage. However, even with these precautions in place, temporary impacts will occur during pipeline installation (Table 11.1). If appropriate environmental commitments are developed and implemented, most impacts should be minimal in nature and the habitats will typically regain their function by the next growing season. In North Dakota if permanent wetland impacts result from pipeline construction, Reclamation will mitigate using wetland mitigation credits recorded in the 2000 GDU Mitigation Enhancement Ledger (MEL). Reclamation purchased GDU mitigation lands in North Dakota to offset projected impacts from construction of Garrison Diversion project features. These mitigation lands were subsequently transferred to the Service and the North Dakota Game and Fish Department for management. The credits and debits for the impacts to date are outlined in the May 2000, MEL. For permanent wetland impacts occurring in Minnesota, Reclamation should develop a mitigation plan in conjunction with the Minnesota Department of Natural Resources (MNDNR), the Service, and local water authorities.

Table 11.1. Potential acres of aquatic habitat impacts from pipeline construction (400 foot maximum disturbance area along pipeline alignments).

		Alternatives							
		No Action	ND In-Basin	Red River Basin	Lake of the Woods	GDU Import to Sheyenne	GDU Import Pipeline	Missouri River to Red River Valley	GDU Replacement Pipeline
	Temporary		26.4	11.9	47.4	126.0	124.5	256.2	279.3
	Saturated			5.3	83.5				
	Seasonally Flooded		68.3	39.6	323.5	266.8	287.9	345.0	578.3
	Semi-permanently Flooded		43.0	29.5	10.2	100.0	131.2	114.7	220.2
	Intermittently Exposed			5.8	2.2	0.7	0.7		
Total			138	92.1	466.8	493.5	544.3	715.9	1077.8
	River Habitat		1.8	4.1	13.1	11.9	19.9	27.4	32.5
	Lake Habitat		23.9			3.9	5.9	45.8	8.1

11.5.2 Native prairie habitats.

Native prairie (Table 11.2) is defined for this analysis as historically uncultivated land that supports a native vegetation community. Every effort should be made to avoid native prairie habitats. If impacts to native prairie are unavoidable, they should be kept to the minimum necessary for construction with appropriate restoration applied to the disturbed sites. In North Dakota, if permanent grassland impacts result from pipeline construction, Reclamation will mitigate using grassland mitigation credits recorded in the 2000 GDU Mitigation Enhancement Ledger. For permanent impacts occurring in Minnesota, Reclamation should develop a mitigation plan in conjunction with Minnesota resource agencies, the Service, and local land management authorities.

Table 11.2. Acres of native prairie habitat potentially impacted by pipeline construction (400 foot maximum disturbance area along pipeline alignments).

		Alternatives							
		No Action	ND In-Basin	Red River Basin	Lake of the Woods	GDU Import to Sheyenne	GDU Import Pipeline	Missouri River to Red River Valley	GDU Replacement Pipeline
Native Prairie acres	Minnesota			3.9					
	North Dakota		378.7	125.3	367.4	1,788.5	2,004.3	2,786.6	3,818.9

11.5.3 Fish and Wildlife Service Property Interests.

The Service administers Waterfowl Production Area (WPA) fee title lands as well as wetland, grassland, and refuge easements on private land throughout Minnesota and North Dakota. Review of the proposed routes for the pipeline alternatives indicates that Service easements and fee title property may be affected (Table 11.3). The Service requires that all wetlands and grasslands protected by an easement be avoided during project construction when possible. If a project will: (1) cross or do work on Service fee title lands or (2) impact wetlands or grasslands protected by easement, a Special Use and/or right-of-way permit will be required. The issuance of Special Use or right-of-way permits are subject to the final determination of a refuge compatibility review process.

Permanent impacts to wetlands protected by Service easements are not mitigable under the National Wildlife Refuge System Improvement Act of 1997. To keep the Refuge System intact, impacted easement wetlands must be exchanged for restored wetlands of equal biological and economic value. A review of Service easement interests within the project area indicates that several easements are located along the various pipeline alignments. Wetlands under easement are protected from all draining, filling, burning, and leveling activities. Alteration of the watershed of an individual wetland resulting in reduced runoff into the wetland is also prohibited. For easements occurring in North Dakota, Reclamation proposes to use GDU credits in exchange for impacted Service easements. Currently, there are 29.2 acres of wetland easement credits available in MEL to offset impacts to Type I, III, IV, and V wetlands protected by Service easements. Impacts to Service easements in North Dakota will be counted as debits and subtracted from the available GDU credits. An appraisal will be conducted by the U.S. Fish and Wildlife Service to ensure an equal value exchange of interests.

In Minnesota, the details of easement exchanges will require further development and must be mutually agreeable to Reclamation and the Service.

Grassland easements are purchased by the Service to protect upland habitat utilized by grassland nesting birds. Pipeline construction may impact these areas by disturbing the soil, allowing non-native species to colonize the disturbed area within native prairie, and potentially disturbing nesting birds in both native and non-native grassland habitats.

Five of the easements located along the pipeline routes are Farmers Home Administration (FmHA) easements, which may include protection of any combination of grasslands, wetlands, or forested vegetation, resulting in each easement being unique in what may be protected. The Service administers all FmHA easements for the USDA.

In addition to wetland and grassland easements, the Service also administers easement refuges. Easement refuges are tracts of private land where the Service has established a sanctuary for migratory birds and other wildlife by purchasing the right to create an impoundment, control water levels, and restrict hunting.

Pipeline routes that cross Waterfowl Production Areas (WPA) would be subject to the refuge compatibility review process. Reclamation should coordinate with the respective Service Wetland Management District (WDA) early in the planning process to determine refuge compatibility and obtain the required permits. Up front coordination and environmental commitments should minimize potential project impacts to Service fee title lands.

Table 11.3. Number of individual Fish and Wildlife Service Easement & Fee Title Property Interests crossed by pipeline routes (400 foot maximum disturbance area along pipeline alignments).

		Alternatives							
		No Action	ND In-Basin	Red River Basin	Lake of the Woods	GDU Import to Sheyenne	GDU Import Pipeline	Missouri River to Red River Valley	GDU Replacement Pipeline
Service Administered Easement	Wetland Easement		ND-11	ND- 3 MN-4	ND-1	ND-49	ND-52	ND-76	ND-119
	Grassland Easement					ND-1	ND-1	ND-1	ND-3
	Farmers Home Administration Easement							ND-2	ND-3
	Easement Refuge								ND-1
Fee Title	Waterfowl Production Area			MN-1 5.0 acres				ND-5 32.8 acres	ND-1 1.5 acres

11.6 Threatened or Endangered Species and Rare Species.

Reclamation has not completed their determination of impacts to federally listed threatened or endangered species expected to occur from the proposed project. State listed rare species could be impacted due to pipeline construction or modified river flows. The Service will provide additional analysis of potential impacts to Minnesota state listed species once we have had a chance to review more specific information related to pipeline construction specifications, biota transfer, and the effects of project operation on flow/stage for the Sheyenne and Red Rivers.

11.7 Impacts to the Missouri River.

The Service has not reviewed Reclamation's Missouri River depletion study for the Red River Water Supply Project because it is not yet available. Therefore, the impacts to the Missouri River system have not been analyzed in this report.

11.8 Lake Audubon and the McClusky Canal.

The use of the principal supply works to convey Missouri River water to the Red River Valley may have impacts to Lake Audubon and the McClusky Canal. In Lake Audubon, a flushing effect could occur from the additional water moving through the system but the lake elevation should not be affected. The water temperature of the lake may decrease due to the import of colder water from Lake Sakakawea. Nutrients, phytoplankton, and zooplankton may be flushed from the lake into the canal reducing the lake's available forage for fish species. The results of these impacts would be a decrease in fish production in Lake Audubon.

The McClusky Canal and the Chain of Lakes located along the canal may also experience the affects of flushing flows as well as higher water levels. The flushing effect may impact these resources in the same manner as at Lake Audubon, and the higher water levels could result in increased erosion and sedimentation.

Slide repair activities along the McClusky Canal will result in temporary impacts to vegetation and water quality along the canal. With appropriate environmental commitments in place, the impacts to these habitats will be minimal.

11.9 Audubon National Wildlife Refuge and Audubon Wildlife Management Area.

The Service's Audubon National Wildlife Refuge and the North Dakota Game and Fish Department's Audubon Wildlife Management Area are located on Lake Audubon. Impacts to the lake could affect these areas through changes in water quality and productivity. These areas are important for waterfowl production. Any decline in primary productivity could impact waterfowl reproduction and survival. Reclamation, the North Dakota Game and Fish Department, and the Service have agreements in place to address project impacts to fish and wildlife resources.

11.10 Ground water resources.

The area being considered for development of groundwater sources in North Dakota has been identified as the Brightwood, Gwiner, Milnor Channel, and Spiritwood Aquifers. These are relatively deep (>100 feet) aquifers with no clear connection with surface wetlands. Therefore, wetland impacts from groundwater withdrawals should be minimal if well sites and transmission pipelines do not intersect wetland basins.

Due to the potential to impact wetlands in the Sheyenne Delta Aquifer that support the threatened Western Prairie Fringed Orchid, Reclamation has designed the alternatives so that no well field development is proposed for this Aquifer.

Groundwater withdrawal from Minnesota aquifers (Ottertail Outwash and Pelican River) may have unknown impacts to wetland resources that may be connected to these aquifers. The hydrologic modeling for the potential well field development of these aquifers is not currently available. Once the well field information has been completed and is available for review, specific impacts to fish and wildlife resources can be analyzed.

One of the features Reclamation proposes is to acquire existing water appropriations from the Elk Valley Wellfield located in the Elk Valley Aquifer to serve Grand Forks and Grand Forks/Traill Water Users water needs. There would be minimal impact from this feature since the water is currently being withdrawn for irrigation purposes and the result would be no net increase in water withdrawals from the Elk Valley Aquifer.

11.11 Low Head Dams.

Low head dams are proposed for intakes at water treatment plants to maintain water surface elevations. Low head dams are problematic in that they can block fish migrations, alter stream habitat, and degrade water quality. These dams can restrict seasonal and daily fish movements until they become inundated during high flow events. Low head dams can modify stream habitat by changing flowing riffle/pool habitat to slack water deep/pool habitat. Riffle and pool habitats are important during low-flow periods, as they provide wintering, rearing and forage areas for fish. The water quality behind low head dams can be degraded through increased water temperature during the summer months and low dissolved oxygen levels during the winter. If there is little flow through the system in the winter months, dissolved oxygen levels behind the dams may reach anoxic levels. With higher spring flows this anoxic water may be flushed downstream, resulting in fish mortality. Contaminated sediments that are normally carried downstream and distributed by the river current can settle out in the slack water behind these dams at a higher rate resulting in “hot spots” that may affect aquatic organisms.

The locations and designs for the proposed low head dams have not been identified. Additional analysis of specific impacts will be required once the dams are described in more detail.

12.0 EVALUATION AND COMPARISON OF THE SELECTED PLAN AND EVALUATED ALTERNATIVES

Reclamation has not selected a preferred alternative for the DEIS. The State of North Dakota has identified the GDU Import to the Sheyenne River Alternative as their preferred alternative to meet the purpose and need for the project. All the proposed alternatives impact the natural resources in the project area to some extent (positively or negatively). The extent of the foreseeable environmental impacts to natural resources resulting from project construction are identified in the DEIS.

Significance of fish and wildlife resource losses: Permanent losses of terrestrial and/or aquatic habitats have been reduced through careful project planning, coordination, and development of environmental commitments to protect resources. Any unavoidable impacts to fish and wildlife resources due to the selected project alternative will be mitigated through use of GDU Mitigation Enhancement Ledger credits for impacts in North Dakota and through coordination with the Minnesota DNR and the Service for impacts in Minnesota.

Responsiveness to stated fish and wildlife planning objectives: Early Service concerns over impacts to the threatened western prairie fringed orchid from groundwater withdrawals in the Sheyenne Delta Aquifer have been alleviated. Reclamation has moved the location of the proposed well fields to other aquifers south of the Sheyenne Delta Aquifer. Groundwater withdrawal from these deeper aquifers should have no impacts to wetland habitats that support orchid populations.

Extent to which impacts have been or can be avoided and/or reduced: Reclamation has developed environmental commitments to avoid, minimize, and compensate for resource impacts resulting from project construction. These environmental commitments have been developed in cooperation with the resource agencies to ensure all concerns have been addressed. Reclamation has been responsive to public comments and coordinated with agencies and stakeholders to avoid and/or reduce adverse impacts to fish and wildlife resources in the development of project alternatives. The following actions have been taken by Reclamation to avoid/reduce impacts:

- Incorporation of water conservation measures.

- Planning pipeline alignments to avoid fish and wildlife habitats as designated in GIS databases, including Minnesota and North Dakota Natural Heritage Programs, public land databases (State and Federal), NWI, and piping plover critical habitat designations
.
- Selection of alternatives avoided areas of environmental concern (draft of Chapter 2 of the EIS; e.g., alternative design that avoided impacts to the Sheyenne Delta and the upper Sheyenne River and no use of ring dikes).

- Aquatic need was incorporated into the alternatives by including a minimum fish and wildlife conservation pool of 28,000 acre-feet in Lake Ashtabula, by maintaining a minimum release of 13 cfs from Baldhill Dam, and by setting Q90 on Minnesota tributaries to the Red River in the hydrology modeling.

- Modeling the most efficient flows using StateMod to design alternative features.

- Completion of instream flow and aquatic need studies to assist in alternative selection and design.

- Designing pipelines to maximize efficiency and meet needs thereby minimizing pipeline size and resultant impacts.

- Avoiding special natural resource habitats by the selection of the pipeline intake site at Lake of the Woods and designing a horizontal collector well system for the Missouri River intake.

13.0 FISH AND WILDLIFE CONSERVATION MEASURES

The Red River Valley Water Supply Project DEIS will evaluate alternatives to meet the water needs of the Red River Valley out to year 2050. Careful consideration of potential impacts to fish and wildlife resources early in the planning process can result in a project designed to meet its goals, while maintaining and/or enhancing environmental quality.

The construction and operation of the Red River Valley Water Supply Project will require that a mitigation plan be developed and implemented to offset unavoidable impacts to fish and wildlife resources. It is likely that the greatest potential for fish and wildlife resource impacts will be located on the Sheyenne River, and consist primarily of alteration of natural flow patterns and its associated effects to the aquatic habitat and biota. Lesser impacts to wetlands and uplands are expected to occur as a result of the construction of pipelines. Project mitigation must be based on the best judgement of anticipated impacts. Long-term monitoring will be required to fully identify the impacts that may occur in the future as a result of project operation.

The anticipated loss of habitat on the Sheyenne River could affect not only the fish and other wildlife species dependent on those habitats, but also a wide array of other aquatic life, such as mussels. If project operations result in adverse impacts to aquatic species, Reclamation should develop a mitigation plan to replace the habitat functions and values for that array of species. A complete mitigation plan for potential impacts cannot be developed until a preferred alternative is selected and a project operation plan has been identified and impacts analyzed. This FWCA report and the EIS cannot be finalized until a preferred alternative is selected.

Changes in river stage and flow affect the amount and distribution of aquatic habitat types on the river. Downstream of Lake Ashtabula, in the lower Sheyenne, project operations should be designed to follow the natural hydrograph as closely as possible. Shallow pool habitat is particularity important as it is inhabited primarily by young-of-the-year and juvenile fishes. Medium pool habitat is utilized by a variety of species during their life stages.

To protect conservation lands under Service administration, Reclamation should contact the appropriate Wetland Management District with as much lead time as possible for coordination of water pipeline routes when crossing Service administered easements or fee title lands.

Adaptive management techniques should be used to implement new water conservation measures as they become available to reduce the amount of time the project must operate. A reduction in water demand will mean fewer fish and wildlife impacts from project operation. Establishing or enhancing the riparian habitat along the Sheyenne River, acquisition of key riparian blocks, planting, erosion control, fish structures, fish stocking, mussel reintroduction, and vegetation management are other conservation measures that could be implemented to enhance fish and wildlife resources in the project area.

14.0 LIST OF RECOMMENDATIONS

The Service provides the following recommendations to protect and enhance fish and wildlife resources in the project action area:

1. The DEIS should include a separate section outlining Reclamation's environmental commitments. This should be a description of the design features and mitigation measures (environmental commitments) that will be used to avoid or minimize project impacts. The DEIS should clearly state the environmental commitments developed to insure minimal impacts to fish and wildlife resources in the project area, and Reclamation's intention to monitor construction and operation activities for compliance.

2. Contact the following Service Wetland District Managers early in the planning process to coordinate ground water well locations and pipeline routes prior to final design, to minimize unavoidable impacts to Service property interests.

   North Dakota
   For Cavalier, Grand Forks, Nelson, Pembina, and Walsh Counties, contact Roger Hollevoet, Project Leader, Devils Lake Wetland Management District (WMD), P.O. Box 908, 221 Second Street West, Devils lake, North Dakota 58301, (701-662-8611).

   For Foster County, contact Kim Hanson, Project Leader, Arrowwood National Wildlife Refuge, 7745 11th Street SE, Pingree, North Dakota 58476-8308, (701) 285-3341.

   For Barnes, Cass, Griggs, Steele, and Traill Counties, contact Kory Richardson, Valley City Wetland Management District, 11515 River Road, Valley City, North Dakota 58072-9619, (701-845-3466).

   For McLean and Sheridan Counties, contact Lloyd Jones, Project Leader, Audubon National Wildlife Refuge, 3275 11th Street NW, Coleharbor, North Dakota 58531-9419, (701-442-5474).

   For Burleigh and Kidder Counties, contact Paul VanNingen, Project Leader, Long Lake National Wildlife Refuge, 12000 353rd Street SE, Moffit, North Dakota 58560-9740, (701-387-4397).

   For Stutsman and Wells Counties, contact Mick Erickson, Chase Lake Prairie Project Wetland Management District, 5924 19th Street SE, Woodworth, North Dakota 58496-6422, (701-752-4218).

For Ransom, Richland, and Sargent Counties, contact Jeff King, Refuge Manager, Tewaukon National Wildlife Refuge, 9754 143½ Avenue SE, Cayuga, North Dakota 58013, (701-724-3598).

Minnesota
For Becker, Clay, Norman, and Polk Counties, contact Mark Chase, Project Leader, Detroit Lakes Wetland Management District, Route 3, Box 47D, 26624 N. Tower Road, Detroit Lakes, Minnesota 56501-7959, (218-847-4431).

For Otter Tail, Wadena, and Wilkin Counties, contact Kevin Brennan, Project Leader, Fergus Falls Wetland Management District, 21932 State Highway 210, Fergus Falls, Minnesota 56537-7627, (218-739-2291).

3. Contact Minnesota Natural Heritage Database Coordinator, Sarah Hoffman,500 Lafeyette Rd, St. Paul, Minnesota 55115 (651-296-7863), to obtain a complete list of state species of concern and unique habitats located within potentially affected Minnesota counties.

4. Evaluate the project's effects to Audubon NWR from using the Garrison Diversion Principle Supply Works (Lake Audubon and McClusky Canal) to move Missouri River water to the Red River Valley.

5. Conduct a thorough analysis of the proposed project's effects on the quality and quantity of groundwater in aquifers that support wetland habitats, especially those with western prairie fringed orchid populations.

6. Work with the Service, NDGFD, MNDNR, and other interested parties to identify and implement measures to enhance fish and wildlife resources in the project area.

7. Avoid/minimize/mitigate project impacts to native prairie habitats.

8. Minimize impacts to riparian habitats along the Sheyenne River.

9. Defer the timing of construction to late summer (after July 15) or fall so as not to disrupt waterfowl or other wildlife during the nesting season and to avoid high water conditions.

10. Where practicable, use directional boring techniques to cross wetland basins and stream channels. Locate construction to avoid placement of fill in wetlands along the route.

11. For impacts that are unavoidable, ensure full mitigation for those impacts. Replace unavoidable loss of wetland habitat with functionally equivalent wetlands and native trees/shrubs at a ratio of two acres planted for each one removed.

12. Install and maintain appropriate erosion control measures to reduce sediment transport to adjacent streams and wetlands. As soon as practicable, reseed disturbed areas with a mixture of local native grass and forb species.

15.0 SUMMARY OF FINDINGS AND SERVICE POSITION

Construction related impacts from pipelines in the Missouri River import alternatives are relatively greater than the In-Basin alternatives due to more miles of pipeline proposed. However, with appropriate environmental commitments in place, most of the impacts resulting from pipeline construction should be temporary in nature.

Groundwater development, biota transfer, shifts in water quality and quantity, flow modification (timing, magnitude, and duration), and low head dams could all adversely affect fish and wildlife resources. Additional information related to these variables is required to adequately quantify the impacts to resources in the action area.

The overall extent of the fish and wildlife resource impacts that may result from selection of any one of the proposed alternatives are unknown at this time due to incomplete information. All of the alternatives may have more or less impact depending on a number of factors such as construction specifications, environmental commitments, operation and mitigation plans, monitoring, and environmental factors. As project alternatives are refined and additional information is collected and analyzed, the Service will provide more detailed resource impact assessments and recommendations for avoiding, minimizing, and compensating for the identified impacts.

After the potential impacts have been described, the Service will recommend that the least environmentally damaging alternative that meets all project purposes be selected as the preferred alternative. A long-term monitoring plan should be developed to identify and describe unanticipated natural resource impacts. Furthermore, a mitigation plan should be implemented for the unavoidable impacts currently identified and periodically updated for future impacts identified through the monitoring plan. Reclamation should develop an operational plan that includes assurances that all future impacts to fish and wildlife resources resulting from operation of the project will be fully mitigated by the project sponsors.

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