

Chapter 3: Refuge Environment



Introduction

All lands administered by Agassiz NWR are located in northwestern Minnesota. The northern boundary of the Refuge is within 40 miles of the Canadian province of Manitoba and Lake of the Woods, which straddles the U.S.Canadian border. The nearest city is Grand Forks, North Dakota, 75 highway miles to the southwest.

This rural corner of Minnesota, which is 260 air miles or six hours by car north-northwest of Minneapolis and St. Paul, consists of thinly

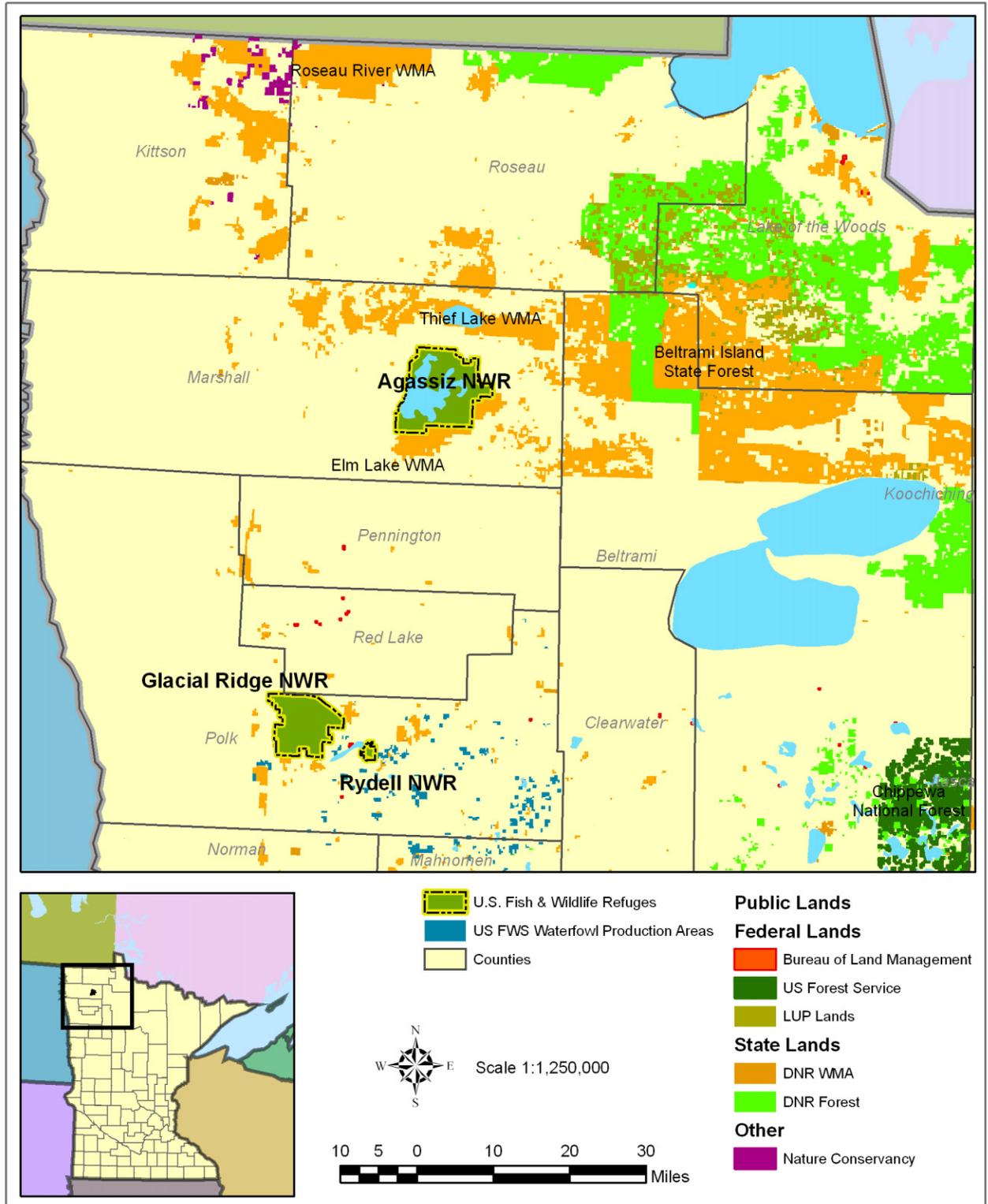
populated agricultural and forestland, with a number of farming villages and towns scattered across the mostly flat countryside. The region includes several large American Indian reservations, including the Red Lake Indian Reservation, which cooperates with Agassiz NWR on matters related to wildlife and resource management. Natural lakes and artificial reservoirs are also much in evidence, although these are not as abundant as they are to the south and east. Drainage around the Refuge is into the Thief River, which joins the Red Lake River to the south of the Refuge at the town of Thief River Falls. The Red Lake River in turn is a tributary of the Red River of the North, which flows by Grand Forks on its way north past Winnipeg, Manitoba and ultimately, Hudson Bay.

Agassiz NWR is an integral part of a sizeable complex of lands managed for wildlife. The Minnesota Department of Natural Resources (Minnesota DNR) has acquired and manages over 50,000 acres in three large and several smaller nearby Wildlife Management Areas (WMAs): Elm Lake WMA is contiguous with the Refuge's southern boundary, Eckvoll WMA is contiguous with the southeastern boundary, and Thief Lake WMA sits several miles to the north (Figure 4). The Minnesota DNR works closely with Refuge staff on issues of mutual concern.

Climate

Northern Minnesota possesses a continental climate, with long, cold winters and relatively short, hot summers. The Refuge's mean annual temperature is 38 degrees Fahrenheit, but this average hides wide and rapid variations in temperature. The Refuge's 30-year mean January maximum is 13 degrees F, and mean minimum -8 degrees F, while its mean July maximum is 80 degrees F, and minimum 55 degrees F.

Figure 4: Conservation Lands in Northwestern Minnesota



Annual mean precipitation at Agassiz is 22 inches, which includes an average 39 inches of snowfall a year. Winter is relatively dry, and the wettest months of the year are June, July, and August. Seventy-five percent of annual precipitation falls in the 6 months from April through September. Thunderstorms are the main source of rain in the area, these occur some 25 to 30 times a year on average (Agassiz NWR, 1978).

The major threat of flooding at Agassiz is the result of spring runoff of snowmelt following wet winters. Flood peaks are affected by the amount of moisture in the soil at freeze-up, amount of accumulated moisture at the start of the spring melt, and weather conditions during the spring melt. Spring and summer thunderstorms that drop more than 5 inches of rainfall on a single day occur occasionally and can cause severe flooding. From June 9-11, 2002, more than 8 inches of rain fell throughout northwest Minnesota, raising Refuge pool levels from 1 to 4 feet, and causing flooding that impacted wildlife habitat, waterfowl nesting, and Marshall County Road 7 (the main Refuge road, which traverses east-west in the southern part of Agassiz NWR).

Geography, Topography, and Hydrology

Agassiz NWR is located in the eastern Red River Valley in what was once the lakebed of ancient Glacial Lake Agassiz. The terrain is relatively flat, with a gentle gradient averaging 1.5 feet per mile, sloping from east to west across the Refuge. Underlying rocks in the area are Precambrian in origin, overlain by sedimentary rock – sandstones, limestones, and shales – dating to the Paleozoic and Mesozoic eras. Overlying all of these strata are thick deposits of glacial till and lake sediments from the Pleistocene Epoch. The layer of till and lake sediments on Agassiz NWR is estimated to exceed 200 feet in depth (Agassiz NWR, 1978).

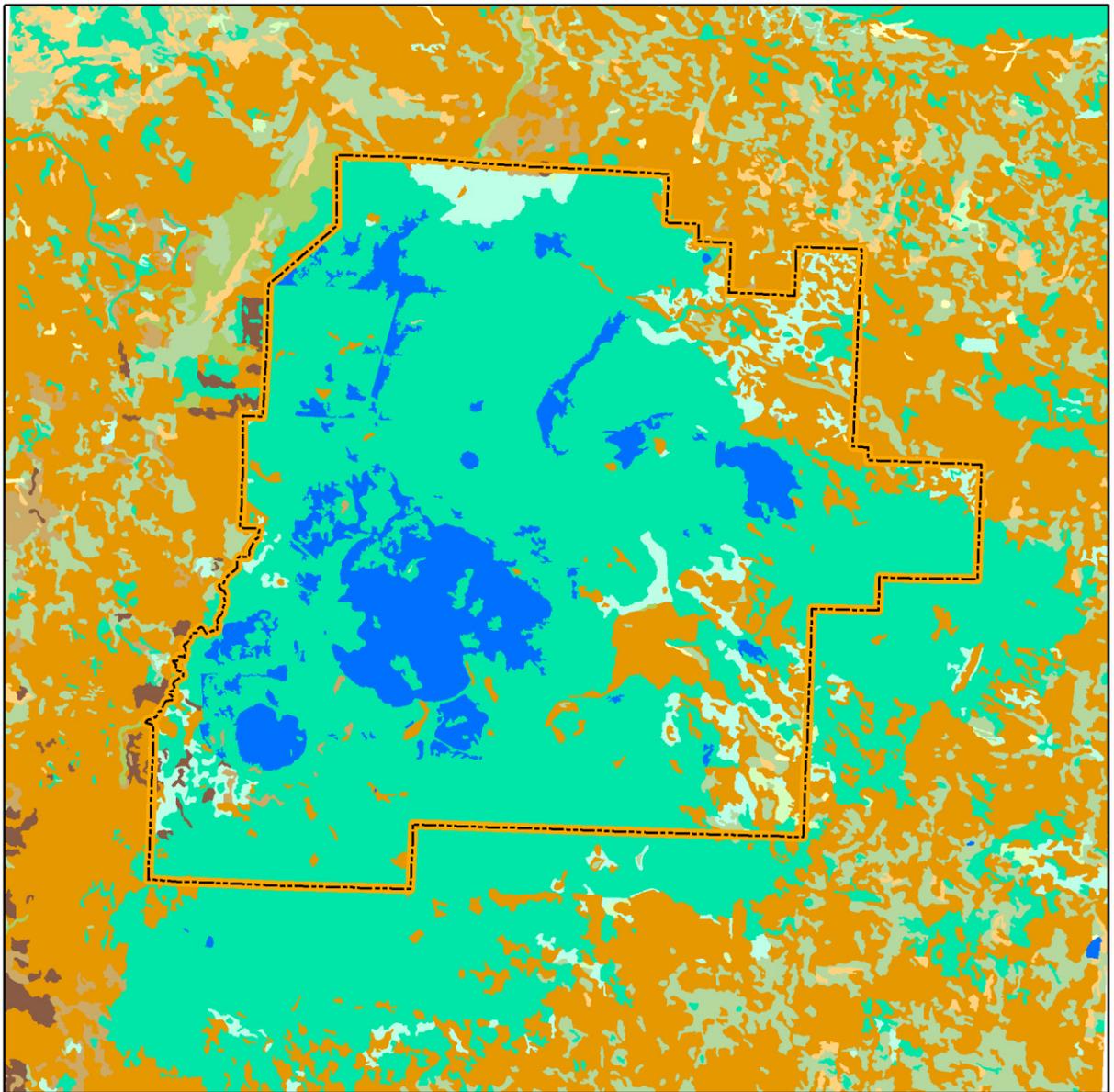
The Refuge's surface soils are typical of lakebed deposits, consisting of mostly peat or silty loams and clays (Figure 5). Peat occurs at depths of 1-2 feet but is thicker in some areas. Clay-dominated glacial drifts with pockets and lenses of sand are found beneath the surface soils. Except for the peat, these soils have generally lent themselves well to dike construction. However, they are vulnerable to erosion because fine-grained silts and clays predominate. Also, dike slopes need to be protected from wave action by encouraging heavy vegetative cover. Peat soils may be used to dress the dike slopes (U.S. Department of the Interior, 1967).

The glacial lake sediments and drift deposits of sand and gravel contain ground water in quantities sufficient for domestic and stock use. Local ground water is of good quality but is relatively hard and high in iron. Over much of the Refuge the depth to the water table is only 1-4 feet. This proximity to the surface has been favorable for pothole development, but conversely, makes building construction difficult and subsurface waste disposal impractical. The relative impermeability of the Refuge's surface soils impedes recharge of even its more permeable aquifers.

As previously described, the Refuge lies within the Red Lake River watershed, which drains into the northward-flowing Red River of the North. Approximately 610 square miles of drainage basin are upstream of Agassiz NWR's outlet. The largest contributing watershed is the Thief River basin, which drains about 350 square miles above the northern boundary of the Refuge (Figure 6). Mud River drains 160 square miles to the confluence of the Mud River diversion and Judicial Ditch 11, 2 miles east of the Refuge. Impermeable soils and subsurface rock layers in combination with flat topography and minimal stream gradient favor the ponding of surface waters in and around the Refuge, as well as overtopping of banks and flooding.

The Thief River drains Thief Lake, a large marsh managed by the Minnesota DNR and located 4 miles north of the Refuge. This lake, in turn, is fed by the Moose River. The Mud River Judicial Ditch 11 system drains from the east into the Refuge. The channel capacity of Thief River is

Figure 5: Soils Types on Agassiz NWR Figure 6: Watersheds of Northwestern Minnesota



Legend

 Agassiz NWR

SSURGO County Soil Data

Soil Composition

 Clay

 Clay-Loam

 Loam

 Loamy Fine Sand

 Loamy Sand

 Sandy Loam

 Fine Sandy Loam

 Very Fine Sandy Loam

 Muck-Fine Sandy Loam

 Muck-Loam

 Muck

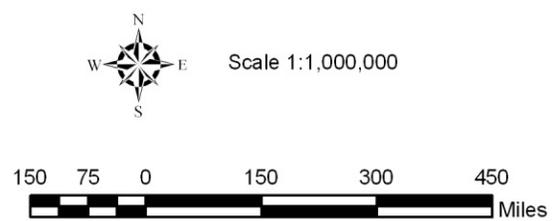
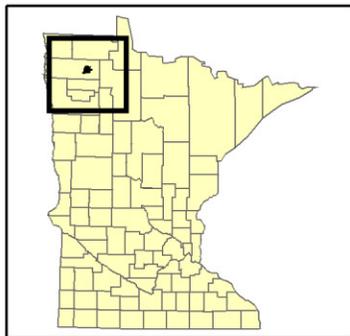
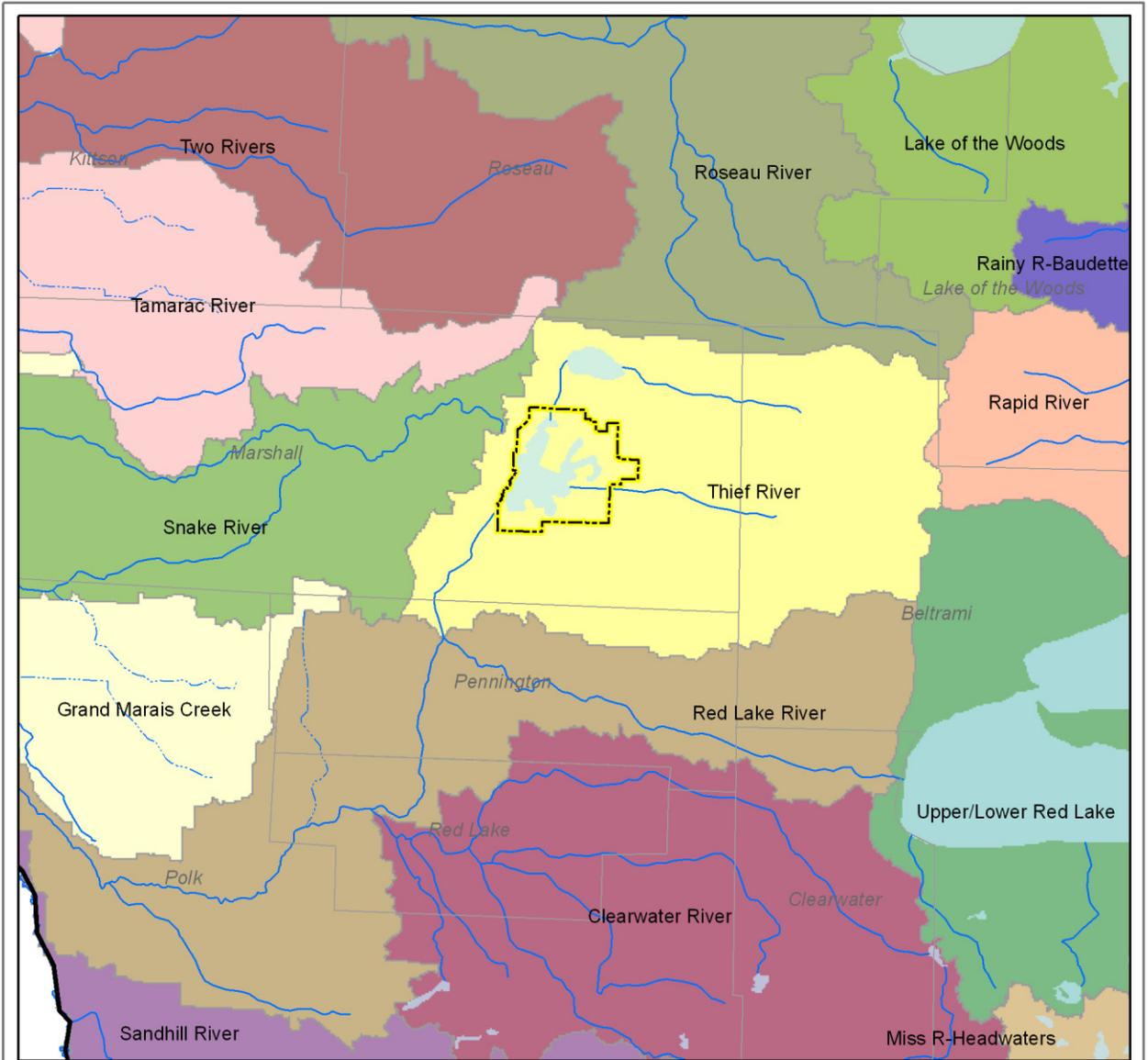
 Muck-Peat

 Water



Scale 1:170,000





- Legend**
- Counties
 - Agassiz NWR
- Watersheds**
- Examples**
- Clearwater River
 - Rainy R.-Baudette
 - Upper/Lower Red Lake
 - Etc.



approximately 1,500 cubic feet per second (cfs), while that of Ditch 11 is about 900 cfs at the Mud River diversion. Despite the smaller size of its drainage area and channel, Mud River usually contributes more water to Agassiz NWR than the Thief River does due to the storage effect of Thief Lake and its controlled outlet. The Refuge's many pools furnish water storage capacity. In April and May of 1996, two flood events occurred back to back. The first was caused by snowmelt and the second by rainfall. The Refuge stored a total of 102,071 acre-feet during these two events.

Flooding is one of the key issues affecting the Refuge – both its habitat and its facilities – as well as the neighboring region. Not only does flooding affect the Refuge and surrounding private lands, roads, and infrastructure directly, but it also has a big impact on relations between the Refuge and property-owners and officials in the surrounding community. Floods occur most often during March, April and May, when spring rains may combine with snowmelt to exceed channel capacity. The largest flood discharge ever recorded at the Thief River Falls gauge 15 miles downstream of the Refuge was 5,610 cfs in May 1950. During that flood an estimated 108,000 acre-feet of water was stored in the Refuge's various pools. During the 1997 flood event, inflows to the Refuge averaged 5,985 cfs for six consecutive days (April 15 to April 21, 1997). The average outflow at the Refuge was 808 cfs during the same time period, resulting in over 10,350 acre-feet of water put into storage on the Refuge per day, making a dramatic difference in reducing the level of flooding in downstream communities.

Agassiz NWR includes 26 impoundments (known variously as lakes, ponds, pools, or moist soil units) and three natural lakes. Whiskey Lake and Kuriko Lake are located in the Wilderness Area and Webster Lake is located in the northeast area of the Refuge. The artificial impoundments vary widely in size, ranging from 30 acres to the approximately 9,000 acres that comprise the Agassiz Pool. Water is contained within the impoundments by an extensive network of dikes, and water levels can be raised or lowered in any given impoundment by adjusting water control structures at pool outlets. Agassiz's impoundments with their marshes, mudflats, and open water are the dominant geographic features of the Refuge. They are also the focus of the Refuge's aquatic habitat management efforts on behalf of migratory birds.

Natural History

Eleven thousand years ago, during the waning days of the Pleistocene Epoch or Ice Age, meltwaters from the retreating eastern edge of the Des Moines Lobe of the Laurentide Ice Sheet formed a sprawling inland sea named Glacial Lake Agassiz (Bluemle, 2002). Lasting some 4,000 years, this lake was the largest in all of North America at the time – 700 feet deep and covering more than 100,000 square miles in what are now Minnesota, North Dakota, and Manitoba. Dammed to the north by the immense continental glacier, Glacial Lake Agassiz's waters drained southward, carving the Minnesota River Valley. As the last of the northern ice melted away, Lake Agassiz's outlet shifted to the north, and it emptied rapidly into Hudson Bay and the North Atlantic in such a surge of freshwater that it is believed to have altered ocean circulation patterns and the very climate of the earth for a while (Hu et al., 1997; Rosenberg, 2003).

As Glacial Lake Agassiz rose and ebbed over the eons, its dynamics formed and shaped many of the geologic features that still characterize the present-day Red River Valley. Strand lines (or beaches) of sand and gravel mark periods of stability in the lake level. Large alluvial fans mark the site of ancient river deltas flowing into the lake. The continental glaciers themselves also left their own marks on the valley as they went through successive advances and retreats.

With the final disappearance of Glacial Lake Agassiz, terrestrial plants gradually returned to sites from which they had been absent for thousands of years. In northern Minnesota, pollen studies have documented ceaseless shifts in the region's vegetation communities over the millennia of the Holocene Epoch. Today Agassiz NWR finds itself within a dynamic zone of ecological transition, between the boreal forest to the north and east, the prairie pothole province to the west, and the northern temperate forest to the south. Over time spans of thousands of years, this area's vegetation communities or habitat have undergone perpetual change. This change may not be obvious from year to year, but over centuries or millennia it is strikingly evident. With the arrival of Native Americans, the pace of change accelerated as tools like fire were used to manipulate the landscape. With the later appearance of Euro-American settlers, and the wholesale clearing of forests and draining of swamps and lakes they effected, impacts on plant communities and wildlife habitats and populations were abrupt, drastic, and in some ways irreversible. Figure 7 is a depiction of the land cover and habitats at the time of European settlement in the late 19th century.

Archeological and Cultural Values

Responding to the requirement that CCPs consider the archaeological and cultural values of the planning unit, the Service contracted for a cultural resources overview and management direction study. This section of the CCP derives mostly from the September 2002 "*Cultural Resources Management Plan for Agassiz NWR, Marshall County, Minnesota.*"

The *Cultural Resources Management Plan* provided background information about the contextual zone, resources, previous research, and historical contexts that have been used in the preparation of this CCP. The Cultural Resources Management Plan also described the historical context of Judicial Ditch 11 and an overview of management goals and the legislative framework for cultural resources management on the Refuge.

The *Cultural Resources Management Plan* is incorporated into the CCP by reference. It identifies management measures for cultural resources on the Refuge that are necessary to comply with the National Wildlife Refuge System Improvement Act of 1997 and Section 106 of the National Historic Preservation Act of 1966. These measures include:

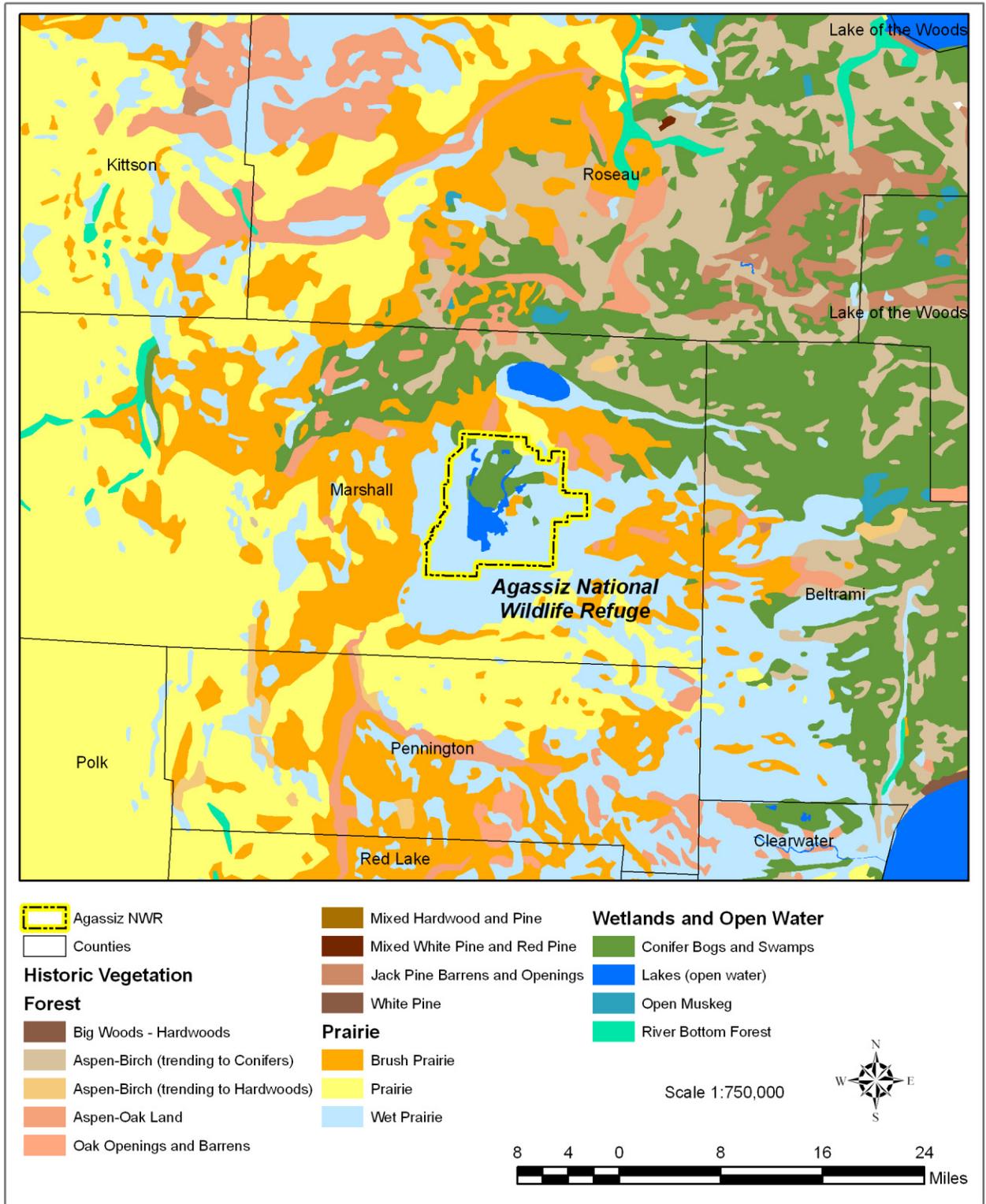
- # Establishing internal procedures and identifying key personnel for archeology, architectural history, and traditional cultural properties.
- # Developing a programmatic agreement if desirable.
- # Identifying and consulting with interested parties.
- # Responding to inadvertent discoveries.
- # Establishing a system of records management.

Cultural resources are important parts of the nation's heritage. The Service is committed to protecting valuable evidence of human interactions with each other and the landscape. Protection is accomplished in conjunction with the Service's mandate to protect fish, wildlife, and plant resources.

Pre-Contact Period

This context resembles that of eastern North America and is divided into several stages based on material culture like projectile-points and ceramic types as well as subsistence adaptations like hunting, gathering, fishing, or agriculture/horticulture.

**Figure 7: Historic Vegetation (1895) in the Vicinity of Agassiz
NWR**



The Paleoindian Stage

The Paleoindian Stage (c. 10,000 B.C. to 6000 B.C.) was characterized by small, nomadic bands of big-game hunters. Based on the paucity of Paleoindian sites in Minnesota as well as the presence of Glacial Lake Agassiz covering these lands for much of this time, sites from this stage are not expected to occur on

Agassiz NWR and none have been found.

The Archaic Stage

The Archaic Stage (c. 6000 B.C. to 1000 B.C.) was characterized by adaptation to the warmer and drier post-glacial environment and the development of efficient hunting and gathering cultures and greater utilization of the local environment for food and tools. Technological innovations of this stage include notched projectile points, the use of copper for tools, and new flaked-stone tools like scrapers and drills. No archaic stage sites have been discovered on Agassiz NWR, but small settlements and seasonal base camps might be expected.

The Ceramic/Mound Stage

The Ceramic/Mound Stage (c. 1000 B.C. to A.D. 1100) was characterized by the initial appearance of pottery and the construction of earthen mounds. No ceramic/mound state sites have been identified on the Refuge, but seasonal habitations or campsites might be expected.

The Late Prehistoric Stage

The Late Prehistoric Stage (c. A.D. 800 to A.D. 1700) is characterized by a move from riverine to lakeshore and possibly by the utilization of wild rice. In northern Minnesota, it is divided into the Blackduck complex and the Sandy Lake ceramic series. Blackduck ceramics are typically globular, sand-tempered and cord marked, and associated features of the archeological culture include small, circular burial mounds that sometimes include grave goods such as small mortuary pots, beads and knives. Sandy Lake ceramics are typically globular, squat and cord marked, and either grit- or shell-tempered. It is generally agreed that their makers were Siouan-speaking peoples. No sites from the Late Prehistoric Stage have been identified on the Refuge but seasonal fishing stations and campsites might be expected.

Contact Period

The contact-period contexts for Agassiz NWR are based on those groups – both indigenous and Euro-American – that inhabited the northwestern part of the state from 1650 to 1837, the latter date being when treaties were signed with the Dakota, Ho-Chunk, and Anishinaabe peoples.

The Eastern Dakota (pre-1650 to 1837) may have left behind cultural landscapes and traditional cultural properties in unmodified portions of the Refuge that have not been obliterated by the large-scale drainage, diking, and pool-creation projects of the 20th century. There are no known Eastern Dakota properties on Agassiz NWR, but examples of what might be expected include village sites, summer residential/logistical bases, winter encampments, muskrat procurement sites, cranberry camps, deer hunting base camps, deer cache sites, deer kill sites, and scaffold burial sites.

The Anishinaabe (c. 1740 to 1837), like the Eastern Dakota, may be represented by cultural landscapes and traditional cultural properties that have not been destroyed by large-scale habitat modifications. There are no known Anishinaabe properties on the Refuge, but examples of what might be expected include seasonal villages, wintering camps, cemeteries, fishing stations, religious/ ceremonial/sacred places or structures, sites of battles, and traditional cultural properties.

The French (1660 to 1760) were almost certainly the first Europeans to enter the region, especially explorers, Jesuits, and fur traders. French fur-trading posts also existed throughout Minnesota until the mid-19th century. No French context properties have been found on the Refuge, but expected property types would include fortified entrepôts, temporary outposts, accommodations at Indian villages, special activity areas, canoe accident sites and fur-trade posts.



The British (1760 to 1803) also had fur-trading posts throughout Minnesota. While no properties are been identified on the Refuge, expected property types would be wintering posts, small posts and central places.

The Initial United States Presence (1803 to 1837) in the region could be represented on Agassiz NWR by military campsites, forts, fur-trade posts, and Native American habitation sites, although none have yet been discovered on the Refuge.

Post-Contact Period

There are three general post-contact contexts on the Refuge:

Indian Communities and Reservations

The Indian Communities and Reservations (1837 to 1934) context includes nearly a century of settlement and use by the Anishinaabe people (Ojibwe and Chippewa tribes). By 1837, the Anishinaabe occupied the northern part of Minnesota, with the Dakota having been relegated to the southern part of the state. The Red Lake Reservation was one of eight reservations established for the Anishinaabe in northern Minnesota, and it encompassed most of Agassiz NWR lands until 1889. While no properties have been found on the Refuge, the potential for discovery of properties from this context is considered high, and would include habitation sites, trails, cultural landscapes, and traditional historic properties.

Railroads and Agricultural Development

The Railroads and Agricultural Development (1870 to 1940) context relates to the arrival of Euro-American homesteaders beginning in the 1890s and the subsequent construction of railroads and drainage ditches. The construction of the Great Northern Railroad into Holt, 6 miles west of what is now the Refuge, and the excavation of Judicial Ditch 11 both contributed to a local population boom, which peaked at 150-200 homesteaders around 1915. Known property types that occur on the Refuge include Judicial Ditch 11 itself, former homesteads and farmsteads, schools, and other public institutions.

Federal Relief Construction in Minnesota

The Federal Relief Construction in Minnesota (1933 to 1941) context includes establishment of a national wildlife refuge and the contribution of the Civilian Conservation Corps (CCC). As a result of poor farming productivity from a debilitating combination of droughts and floods, farmers were unable to make their payments on drainage assessments and Marshall County's bond payment went into default. The Midwestern drought and the national economic depression of the late 1920s and early 1930s aggravated local financial duress. Eventually, the State of Minnesota intervened. Using funds provided by the U.S. Resettlement Administration, it purchased the lands through condemnation, and ultimately transferred

ownership and maintenance responsibilities to the Bureau of Sport Fisheries and Wildlife (predecessor to the U.S. Fish and Wildlife Service) for the establishment of Mud Lake NWR. These actions led to protests and civil disobedience on the part of local farmers in 1938, including the breaching of an earthen dam on Judicial Ditch 11. Also in 1938, the CCC arrived at Agassiz NWR. Their extensive efforts on the Refuge – the results of which are still much in evidence more than 60 years later – included surveying and delineating boundaries, construction of miles of dikes, clearing of drainage ditches, gravelling truck roads, and construction of many buildings, of which only a few remain.



It should be emphasized that while a century of extensive and intensive landscape modification on Agassiz NWR may have destroyed or compromised historic properties from pre-contact, contact, and post-contact contexts, there is still potential for undiscovered cultural resources at the Refuge, especially in those portions that have not been heavily subjected to such modification.

Social and Economic Context

Agassiz NWR is located in Marshall County while its Refuge Management District (RMD) spans six additional counties in northwestern Minnesota: Red Lake, Pennington, Kittson, Roseau, Lake of the Woods, and part of Beltrami County. These seven counties occupy the northwestern corner of Minnesota, a rural region with a generally low population density whose economic mainstay is agriculture. Within its 1,675 square miles, Marshall County had an estimated 10,025 residents in 2001, for an average population density of six per square mile, compared to the state's average population density of 57 per square mile. The

county population declined by about 8 percent since 1990. Overall, about half of the counties in the seven-county Management District are experiencing modest population growth, and the other half population declines. The percentage of minorities as a share of the overall population tends to be lower in these counties than in Minnesota as a whole, with the exception of Beltrami County. Because of the Red Lake Reservation, Beltrami County's population is 20 percent American Indian compared to 1 percent for the state.

The thick, rich glacial drift soils of the Red River Valley are very productive, and are used to cultivate wheat and a variety of other crops, including soybeans, sugarbeets, barley, dry beans, alfalfa, potatoes, corn, sunflowers and canola. Specialty crops grown locally include rhubarb and asparagus. Livestock

numbers are generally low in Marshall County but beef cattle, dairy cows, horses and some sheep can be found.

Like most rural regions of the United States, the seven counties in the RMD are not as affluent as Minnesota's more urban regions. In Marshall County, for example, the median household income in 1999 was approximately \$16,300 compared to \$23,200 for the state as a whole. Ten percent of Marshall County's population lived below the poverty level in the same year, versus 8 percent for Minnesota (U.S. Census Bureau, 2003). To some extent however, lower incomes are offset by a lower cost of living at least in some aspects, such as housing costs.

The nearest communities to Agassiz NWR are Holt, Middle River, Gatzke, Grygla, Goodridge, and Thief River Falls, the latter two of which are located in Pennington County just to the south of Marshall County. Thief River Falls has about 8,400 residents and the other communities are much smaller. Thief River Falls touts itself as the "birthplace of snowmobiling" and as one of the top wildlife and birding areas in the country. Indeed, Arctic Cat snowmobiles have been manufactured in town for more than 30 years while the Pine to Prairie Birding Trail, which passes through Thief River Falls, is Minnesota's first such trail. Further to the northeast within the RMD, Lake of the Woods is a major tourist, fishing, and boating destination.



Natural Resources Plant Communities

Agassiz NWR is situated within an ecological transition zone or ecotone, specifically, the aspen parkland transitional zone between the coniferous or boreal forest to the north and east and the tallgrass prairie and prairie pothole zone to the west and south. Figure 8 illustrates the major habitat types at the Refuge, which are described in the following paragraphs. Habitat acreages are based on the 1997 vegetation classification and digitized map. There are:

- # 37,400 acres of wetland and shallow open water ("pools");
- # 11,650 acres of shrubland;
- # 9,900 acres of woodland;
- # 1,710 acres of grassland;
- # 670 acres of developed land (roads, parking lots, and buildings); and
- # 170 acres of cropland managed for the benefit of wildlife.

Wetlands and Open Water

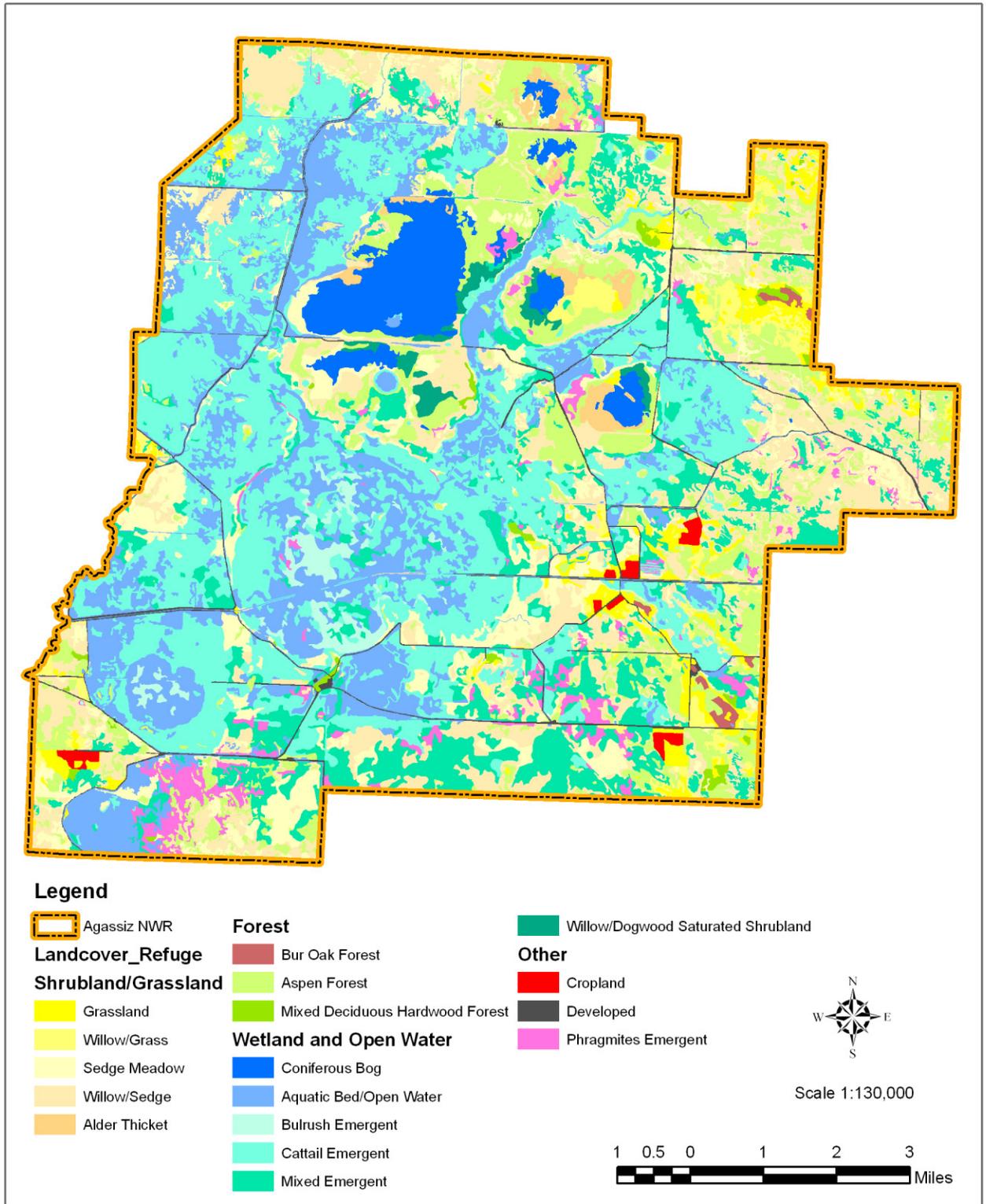
Wetlands and open water comprise approximately 37,400 acres or 61 percent (almost two-thirds) of Agassiz's 61,500 acres. Included are cattail/mixed emergent marsh, bulrush emergent, open

water/mudflats, sedge meadow, and common reed (Figure 8). Wetlands and open water are important or indispensable to many of the migratory birds found on the Refuge, either during nesting season or in transit during migration. Ducks, geese, shorebirds, wading birds and certain songbirds and raptors are all heavily dependent on various kinds of wetland, open water and mudflat habitat. A number of mammals, especially the furbearers, utilize or depend on these habitats as well.

These habitats are to some extent amenable to management (that is, controlling viability, vigor, composition, distribution, and extent) by adjusting water levels in the Refuge's various impoundments. The Refuge has a Marsh and Water Management Plan that provides overall guidance in these matters. Emergent vegetation consists of aquatically-adapted species that respond differently to various flooding regimes and water depths. Emergents have their lower stems and roots underwater and extend their upper stems, leaves, flowers and fruits above the water surface. The seeds of most species of emergents require moist mudflats or very shallow water to germinate. At Agassiz NWR, hybrid cattail (*Typha glauca*) and hardstem bulrush (*Scirpus acutus*) can tolerate water depths greater than 2 feet for more than 2 or 3 years. Under stable water regimes, cattail can increase to undesirable densities and must be controlled through drawdown, prescribed fire, and mechanical or chemical control. Emergent marsh habitat is important to Franklin's Gulls, Red-winged Blackbirds, Yellow-headed Blackbirds, Long-billed Marsh Wrens, Black-crowned Night Herons, and Least Bitterns.

Submerged aquatic vegetation and associated invertebrates provide essential food for waterbirds. Submergents are present throughout the marsh but reach their greatest densities in open bays free of emergents. They also provide some nesting material for the five grebe species.

Figure 8: Current Land Cover, Agassiz NWR (1997 Classification)



Mudflats in seasonally flooded wetlands promote the growth of moist soil plants, which germinate on exposed mudflats during drawdown. In general, early drawdown in May favors seed production in annual plants like smartweed, whereas later drawdown favors perennial plants such as cattail and bulrush. When mudflats are shallowly flooded during the winter, moist soil vegetation furnishes outstanding habitat for

invertebrates which are then available to spring migrants.

Sedge meadow is dominated by several species of sedges (*Carex* spp.) but also includes cattail (*Typha* sp.), bluejoint reedgrass (*Calamagrostis canadensis*), manna grass (*Glyceria grandis*), and dark-green bulrush (*Scirpus atrovirens*). Important forbs in this community include marsh cinquefoil (*Potentilla palustris*), marsh milkweed (*Asclepias incarnata*), purple-stem aster (*Symphotrichum puniceum*), marsh bellflower (*Campanula aparinoides*), spotted joe-pye weed (*Eupatorium maculatum*), meadowsweet (*Spiraea alba*), and small bedstraw (*Galium trifidum*). Sedge meadow typically does not support the diversity or abundance of breeding birds usually associated with other wetland types, but it is a rare and declining habitat type in Minnesota, and several species do prefer to breed or nest in this community. These include the American Bittern, Mallard, Northern Harrier, Sandhill Crane, Sora, Common Snipe, Yellow Rail, Sedge Wren, LeConte's Sparrow and Swamp Sparrow. Each of these has been recorded nesting at Agassiz NWR.

Lowland Shrub

Lowland shrub extends across approximately 11,650 acres of the Refuge, or about 19 percent. This plant community is dominated by willows (*Salix* spp.), speckled alder (*Alnus* sp.) and dogwoods (*Cornus* spp.).

Alder swamps typically have canopies of tall shrubs dominated by speckled alder, frequently in association with other shrub species such as willows and bog birch (*Betula glandulifera*). Common understory species are tussock sedge (*Carex stricta*), prairie sedge (*Carex prairea*), lake-bank sedge (*Carex lacustris*), broad-leaved cattail (*Typha latifolia*), bluejoint reedgrass, northern marsh fern (*Thelypteris palustris*), jewel-weed (*Impatiens capensis*), and Sphagnum squarrosum. The ground layer tends to be sparse because of the dense shrub canopy. Alder lowlands are found in water discharge areas of the bogs.

Willow swamp typically has a canopy of medium to tall shrubs dominated by willows and red-osier dogwood (*Cornus stolonifera*). Other shrubs, such as speckled alder and bog birch are common in the tall shrub layer. The most common herbs are tussock sedge (*Carex stricta*), prairie sedge (*C. prairea*), lake-bank sedge (*C. lacustris*), broad-leaved cattail (*Typha latifolia*), bluejoint reedgrass, northern marsh fern, and jewel-weed.

Among the species that commonly utilize lowland shrub habitat are the moose, white-tailed deer, LeConte's Sparrow, Yellow Warbler, Common Yellowthroat, and Black-billed Cuckoo. The use of this habitat by moose and deer means that it indirectly benefits the gray wolf, which preys on these two ungulates. Other migratory birds and waterfowl also use this habitat for nesting and cover.

Woodland

Upland woodlands on the Refuge consist of about 9,900 acres (16 percent of the Refuge) of primarily aspen and mixed hardwood forest patches, bur oak savanna, and coniferous bog. Only the coniferous bog community is characterized by large expanses of closed-canopy forest; the other communities tend to be open forests with abundant undergrowth. Fire has always been integral to the maintenance of the deciduous aspen forests.



The aspen/mixed hardwood community is a broad category that includes several different forest types, but in general includes trees such as trembling aspen (*Populus tremuloides*), balsam poplar (*P. balsamifera*) paper birch (*Betula papyrifera*), bur oak (*Quercus macrocarpa*), basswood (*Tilia americana*), American elm (*Ulmus americana*), and green ash (*Fraxinus pennsylvanica*). The understory of aspen forests tends to be brushy with beaked hazelnut (*Corylus cornuta*), American hazelnut (*C. americana*) and red-osier dogwood. The

groundlayer is composed mostly of forest herbs and grasses able to survive in the shade beneath the dense shrub layer. These species include wild sarsaparilla (*Aralia nudicaulis*), Canada mayflower (*Maianthemum canadense*), sedge (*Carex pensylvanica*), false melic grass (*Schizachne purpurascens*), and mountain rice-grass (*Oryzopsis asperifolia*). Aspen-dominated woodland is an early-successional or pioneering community. Individual aspen trees themselves are shade-intolerant and relatively short-lived. With extended absence of fire or other disturbances, aspen woodland will eventually succeed to mid-successional mixed hardwood forests with some of the other species listed above in the canopy. The Refuge's aspen and mixed hardwood forests benefit such wildlife species as the white-tailed deer, Bufflehead, Hooded Merganser, Ruffed Grouse, and deciduous forest warblers.

Prior to Euro-American settlement in Minnesota, oak savanna flourished in a long, narrow diagonal zone northwest to southeast across the state. This area represented the ecological transition zone or ecotone between prairie to the west and conifer-hardwood forest to the northeast. It was heavily influenced by fire and contained a mix of woodland, brushland and savanna. Oak savanna is now classified by the state as endangered.

Bur oak comprises at least 30 percent of the canopy in an oak forest at Agassiz NWR, with other species like aspen, paper birch, and green ash making up the remainder. The actual composition, however, varies significantly in response to variation in soil moisture, soil type, fire history, and climate. In addition to bur oak itself, bur oak savanna contains other species including some of those listed above. They have

relatively open canopies, with less than 80 percent cover. Because of the open canopy, the shrub layer is often very dense. American hazelnut dominates the shrub layer, which also often contains grey bark dogwood and raspberries. Some of the more common groundlayer species are the sedge, wild geranium (*Geranium maculatum*), Virginia creeper (*Parthenocissus inserta*), wild sarsaparilla (*Aralia nudicaulis*), Juneberries (*Amelanchier* spp.) and hog-peanut (*Amphicarpaea bracteata*).

In general, the Refuge's aspen/mixed hardwood and bur oak savanna habitats are utilized by a wide variety of bird species, including the Ovenbird, Whip-poor-will, Northern Flicker, Eastern Bluebird, Screech Owl and Great-horned Owl, Red-tailed Hawk and Cooper's Hawk, Goshawk, and various sparrows and warblers. Winter residents include Gray Jays, Ravens, Chickadees, Nuthatches, Finches, Ruffed Grouse, Downy, Hairy, Black-backed and Pileated Wood-peckers, and Great-horned Owls. A variety of mammals also utilize woodlands at Agassiz NWR, including shrews, bats, squirrels, voles, mice, red fox, porcupine, raccoon, fisher, weasels, black bear, skunk, bobcat, moose, deer, and wolf.

Coniferous bog occurs primarily within Agassiz NWR's designated Wilderness Area in the northern part of the Refuge. This vegetation community is dominated by trees such as black spruce (*Picea mariana*) and tamarack (*Larix laricina*), while abundant shrubs include willow (*Salix* sp.), bog birch (*Betula glandulosa*), alder (*Alnus* sp.), Labrador tea (*Ledum groenlandicum*), and leatherleaf (*Chamaedaphne calyculata*). A nearly continuous mat of sphagnum moss species forms the ground layer. The Refuge's coniferous bog habitat benefits plants like orchids and ferns and bird species such as the Olive-sided Flycatcher, Yellow-bellied Flycatcher, Yellow-rumped Warbler, Connecticut Warbler, Nashville Warbler, Palm Warbler, Hermit Thrush, Dark-eyed Junco, Chipping Sparrow, Lincoln's Sparrow and Winter Wren.

Grassland

Agassiz NWR has approximately 1,710 acres of prairie grasslands, comprising about 3 percent of the Refuge area. Most Refuge grasslands are dominated by introduced species such as smooth brome (*Bromus inermis*), red top (*Panicum rigidulum*) and aggressive invaders like reed canary grass (*Phalaris arundinacea*) and common reed (*Phragmites australis*). Restored native prairie sites with tall grasses like big bluestem (*Andropogon gerardii*) and Indiangrass (*Sorghastrum nutans*) tend to dominate on moist sites, while mid-height grasses such as little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), porcupine grass (*Stipa spartea*), and Junegrass (*Koeleria macrantha*) are important to dominant on drier sites. Prairie dropseed (*Sporobolus heterolepis*) may occur on both dry and moist sites. Grasslands typically contain forbs, which may be abundant and have high local diversity. Forb species composition varies with site moisture, although some forb species occur on almost all sites, moist or dry. Several low shrub or scrub-shrub species occur frequently on upland prairie grasslands. Taller brush and trees are absent or scattered, but at Agassiz NWR, brush or woodland areas can be interspersed with grasslands as part of the "aspen parkland" complex described in Chapter 1.

The Refuge's grasslands provide feeding, foraging, or breeding habitat for numerous species of birds and mammals. Among them are geese, nesting dabbling ducks, Marbled Godwit, Northern Harrier, Red-tailed and Rough-legged Hawks, American Kestrel, Sharp-tailed Grouse, Western Meadowlark, Killdeer, Short-eared and Great-horned Owls, and the Bobolink. Mammals that particularly utilize grasslands include the woodchuck, eastern cottontail rabbit, plains pocket gopher, meadow vole, meadow jumping mouse, red fox, white-tailed deer, and wolves.

Cropland

Approximately 170 acres, or about 0.3 percent of the Refuge, are cultivated for crops of value to wildlife. Winter wheat, barley, oats, and sunflowers are grown on seven units: Rodahl, John's Field, East 80, Goose Pen, Golden Valley, North Dahl, South Dahl. Cropland was originally established at Agassiz to offset depredation of privately-owned grainfields by waterfowl. These crop fields furnish excellent wildlife viewing areas for the public, especially for larger animals like white-tailed deer, bear, and Sandhill Crane. They also augment winter food sources for both resident and migratory wildlife.

Fish and Wildlife Communities

The assorted habitats described in this chapter support a diverse assemblage of wildlife species native to northwestern Minnesota. Many kinds of birds, mammals, fish, reptiles, and amphibians inhabit the lands administered by Agassiz NWR, for which the Refuge is recognized internationally. Wildlife experts have documented the presence of 287 species of birds, 49 species of mammals, 12 species of amphibians, and nine species of reptiles on the Refuge.



Birds

The Refuge has been designated a Globally Important Bird Area for its outstanding value to wild birds and their habitats, as well as its efforts to conserve these. The Refuge is especially important to migratory birds, both during nesting and migrating seasons. It supports 17 species of breeding ducks as well as giant Canada Geese. The following numbers are the maximum estimates during the past 10 years. Approximately 11,570 pairs of ducks and 600 pairs of geese nest on the Refuge. During migration, it hosts up to 50,000 ducks, 23,000 geese, and 2,000 Sandhill Cranes.

The Refuge also supports one of the world's largest colonies of Franklin's Gulls – between 25,000-40,000 breeding pairs – as well as 750 nesting pairs of Black Terns, 900 nesting pairs of Black-crowned Night Herons, 50-500 nesting pairs of Eared Grebes, and 3,000-5,000 non-breeding American White Pelicans.

Overall, more than 120 species of birds have been recorded breeding and nesting at Agassiz NWR, of which the federally threatened Bald Eagle is one of the most majestic. After a 30-year absence, Bald Eagles began nesting on the Refuge in 1992. Today there are four active nests.

Mammals

Forty-nine species of mammals have been documented on Agassiz NWR. Without question, the two most prominent mammals on the Refuge – though not the most frequently observed – are the moose and the federally listed threatened wolf. For a long time, the moose population on the Refuge and adjoining state wildlife management areas averaged approximately 275 animals. In 1993, the population plummeted for unknown reasons. From a low of 65 animals in 1999, the number of moose has slowly increased to an estimated 86 in the February 2002 big game transect survey. Two wolf packs inhabit Agassiz NWR and adjacent wildlife management areas, however they are rarely seen.

Two other large mammals found on Agassiz NWR are the black bear and the white-tailed deer. Black bears are observed infrequently but regularly on the Refuge, while deer are commonplace. In February 2002 the population was estimated at 1,600, for a density of approximately 12 per square mile. Deer are

hunted at Agassiz NWR, with 93 harvested in 2002.

Most mammals, however, are far less conspicuous than moose, wolves, deer and bears. They include such hairy little creatures as shrews, bats, woodchucks, rabbits, hares, squirrels, chipmunks, muskrats, mice, and voles.

There are many members of the Mustelid or weasel family, including fisher, ermine, least and long-tailed weasels, mink, badger, striped skunk, and river otter. Also present are beaver, porcupine, raccoon, coyote, and the red fox. The Refuge's diversity of habitats meets the needs of these mammals for food, cover, and water.

Amphibians

Twelve species of amphibians have been recorded on the Refuge, including the wood frog, western chorus frog, leopard frog, spring peeper, gray treefrog, Copes gray treefrog, American toad, Canadian toad, and tiger salamander. Marshall County Central High School has set pit fall traps every year since 1994, recording five species of amphibians over that period. Since 2000, Agassiz NWR has also participated in statewide amphibian surveys coordinated by Hamline University of St. Paul, Minnesota.



Reptiles

Nine species of reptiles are known to occur at Agassiz NWR, six of which are snakes. None are threatened or endangered, and none are the subject of management efforts.

Fish

Thirty species of fish have been documented in pools, ponds, and watercourses on the Refuge. Twenty of these species are small fish species like shiners, darters and daces. The most abundant species are the brook stickleback (*Culaea inconstans*) and the fathead minnow (*Pimephales promelas*). None are threatened or endangered. Fishing is not permitted on the Refuge due to the paucity of sportfish and disturbance to marsh nesting birds. Sufficient water depth to maintain the small fish species is critical to the food chain in supporting other birds and mammals.

Migratory Bird Conservation Initiatives

Several migratory bird conservation plans have been published over the last decade that can be used to help guide management decisions for the Refuge and its Management District. Bird conservation planning efforts have evolved from a largely local, site-based orientation to a more regional, even inter-continental, landscape-oriented perspective. Several transnational migratory bird conservation initiatives have emerged to help guide the planning and implementation process. The regional plans relevant to Agassiz NWR and the RMD are:

- # The Upper Mississippi River/Great Lakes Joint Venture Implementation Plan of the North American Waterfowl Management Plan;
- # The Partners in Flight Boreal Hardwood Transition [land] Bird Conservation Plan;
- # The Upper Mississippi Valley/Great Lakes Regional Shorebird Conservation Plan; and
- # The Upper Mississippi Valley/Great Lakes Regional Waterbird Conservation Plan.

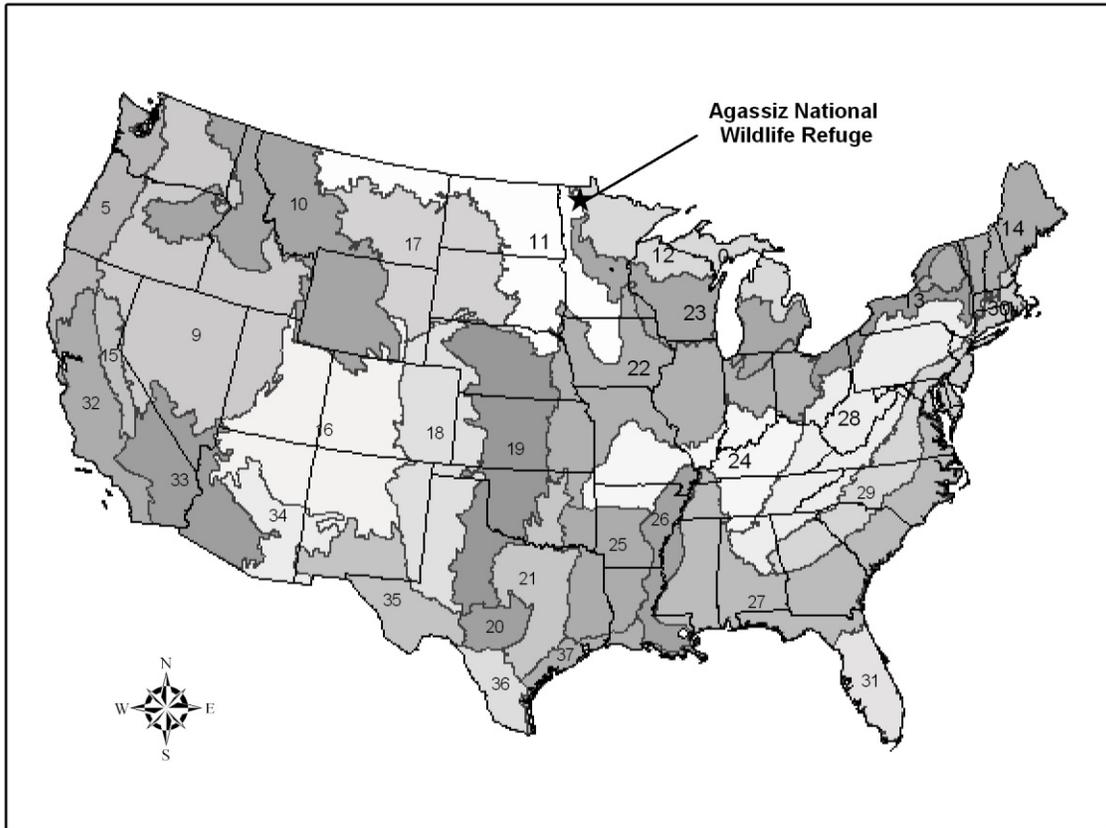
All four conservation plans will be integrated under the umbrella of the North American Bird Conservation Initiative (NABCI) in the Prairie Potholes, Eastern Tallgrass and Prairie Hardwood Transition Bird Conservation Regions (BCR 11, 22 and 23) (Figure 9). Each of the bird conservation initiatives has a process for designating priority species, modeled to a large extent on the Partners in Flight method of computing scores based on independent assessments of global relative abundance, breeding and wintering distribution, vulnerability to threats, area importance, and population trend. These scores are often used by agencies in developing lists of priority bird species. The Service based its 2001 list of Non-game Birds of Conservation Concern primarily on the Partners in Flight, shorebird, and waterbird status assessment scores.

Recently, the Minnesota Bird Conservation Initiative (MBCI) has been established by federal and state agencies and statewide conservation organizations. The MBCI will integrate all bird conservation plans and step them down to a local level. This will allow Agassiz NWR to better refine population and habitat objectives and determine the role it should play in regional bird conservation.



USFWS

Figure 9: Bird Conservation Regions, Agassiz NWR



Wildlife Species of Management Concern

Figure 1 summarizes information on the status and current habitat use of important wildlife species found on lands administered by Agassiz NWR. Individual species, or species groups, were chosen because they are listed as Regional Resource Conservation Priorities or State-listed threatened or endangered species. Other species are listed due to their importance for economic or recreational reasons, because the Refuge or its partners monitor or survey them, or for their status as a nuisance or invasive species.

Table 1: Wildlife Species of Conservation Concern to Agassiz NWR and Refuge Management District

Species (* = Managing habitat for these species)	Monitor ed on Refuge or RMD by staff or MnDNR ?	Regional/St ate Status R3- Conservation Priority in Region 3 E- Federal Endangered T- Federal Threatened SE- State Endangered ST-State Threatened SSC-State Special Concern	Potential Benefit By Habitat used for Production (P) or Migration (M)					
			Wetlands/ Mudflats/Op en water	Lowla nd shrub	Conifero us bog	Upland forest:Asp en &	Grasslan ds	Cropla nd
Mammals								
Short-tailed Shrew <i>Blarina brevicauda</i>	Yes		P	P	P	P	P	
Pygmy Shrew <i>Sorex hoyi</i>	Yes		P	P	P	P	P	
Masked Shrew <i>Sorex cinereus</i>	Yes		P	P	P	P	P	
Meadow Vole <i>Microtus pennsylvani cus</i>	Yes		P				P	
Deer Mouse <i>Peromyscus maniculatus</i>	Yes			P	P	P	P	
Red-Backed Vole <i>Clethrionom ys gapperi</i>	Yes			P	P	P		
Meadow Jumping Mouse <i>Zapus hudsonius</i>	Yes		P	P			P	
Woodland Jumping Mouse <i>Napaeozapu s insignis</i>	Yes			P	P	P		
Coyote <i>Canis latrans</i>	Yes			P	P	P	P	
*Gray Wolf <i>Canis lupus</i>	Yes	T ST		P	P	P	P	
Mink <i>Mustela vison</i>	Yes		P	P	P			

Least Weasel <i>Mustela nivalis</i>	No	SSC	P	P	P	P	P	
Fisher <i>Martes pennanti</i>	Yes			P	P	P		
River Otter <i>Lutra canadensis</i>	Yes		P					

Table 1: Wildlife Species of Conservation Concern to Agassiz NWR and Refuge Management District (Continued)

Species (* = Managing habitat for these species)	Monitored on Refuge or RMD by staff or MnDNR ?	Regional/State Status R3- Conservation Priority in Region 3 E- Federal Endangered T- Federal Threatened SE- State Endangered ST- State Threatened SSC- State Special Concern	Potential Benefit By Habitat used for Production (P) or Migration (M)					
			Wetlands/ Mudflats/Open water	Lowland shrub	Coniferous bog	Upland forest: Aspen &	Grasslands	Cropland
Raccoon <i>Procyon lotor</i>	Yes		P	P	P	P		
Red Fox <i>Vulpes vulpes</i>	Yes			P		P	P	
*Muskrat <i>Ondatra zibethica</i>	Yes		P					
Beaver <i>Castor canadensis</i>	Yes		P			P		
Black Bear <i>Ursus americanus</i>	Yes			P	P	P		P
Bobcat <i>Lynx rufus</i>	Yes			P	P	P		
*Moose <i>Alces alces</i>	Yes		P	P	P	P		
*White-tailed Deer <i>Odocoileus virginianus</i>	Yes			P	P	P	P	P
Birds								
Common Loon <i>Gavia immer</i>	Yes	R3	M					

Horned Grebe <i>Podiceps auritus</i>	Yes	ST	M, P					
American White Pelican <i>Pelecanus erythrorhynchos</i>	Yes	SSC	M					
Double-Crested Cormorant <i>Phalacrocorax auritus</i>	Yes	R3 (nuisance)	M, P					
*American Bittern <i>Botaurus lentiginosus</i>	Yes	R3	M, P				P	
*Least Bittern <i>Ixobrychus exilis</i>	Yes	R3	M, P					

Table 1: Wildlife Species of Conservation Concern to Agassiz NWR and Refuge Management District (Continued)

Species (* = Managing habitat for these species)	Monitored on Refuge or RMD by staff or MnDNR ?	Regional/State Status	Potential Benefit By Habitat used for Production (P) or Migration (M)					
			Wetlands/Mudflats/Open water	Lowland shrub	Coniferous bog	Upland forest: Aspen &	Grasslands	Cropland
Black-Crowned Night Heron <i>Nycticorax nycticorax</i>	Yes	R3 Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	M, P					
*Franklin's Gull <i>Larus pipixcan</i>	Yes		M, P					
Great Blue Heron <i>Ardea herodias</i>	Yes		P, M					

Great Egret <i>Casmerodius albus</i>	Yes		P, M					
Snow Goose <i>Chen caerulescens</i>	Yes	R3	M					M
*Canada Goose <i>Branta canadensis</i>	Yes		M, P					M
Trumpeter Swan <i>Cygnus buccinator</i>	Yes	R3, ST	M, P					
*Wood Duck <i>Aix sponsa</i>	Yes	R3	M, P		M, P	P		
*American Black Duck <i>Anas rubripes</i>	Yes	R3	M, P				P	
*Mallard <i>Anas platyrhynchos</i>	Yes	R3	M, P				P	M
*Blue-Winged Teal <i>Anas discors</i>	Yes	R3	M, P				P	
*Northern Pintail <i>Anas acuta</i>	Yes	R3	M, P				P	
*Canvasback <i>Aythya valisineria</i>	Yes	R3	M, P					
*Lesser Scaup <i>Aythya affinis</i>	Yes	R3	M, P					
*Bald Eagle <i>Haliaeetus leucocephalus</i>	Yes	T, R3, SSC (proposed for delisting from ESA)	M, P			M, P		
Northern Harrier <i>Circus cyaneus</i>	No	R3	M, P			M, P	M, P	

Table 1: Wildlife Species of Conservation Concern to Agassiz NWR and Refuge Management District (Continued)

Species (* = Managing habitat for these)	Monitored on Refuge or RMD by staff	Regional/State Status	Potential Benefit By Habitat used for Production (P) or Migration (M)
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species)	or MnDNR ?	R3- Conservation Priority in Region 3 E- Federal Endangered T- Federal Threatened SE- State Endangered ST-State Threatened SSC-State Special Concern						
			Wetlands/ Mudflats/Op en water	Lowla nd shrub	Conifero us bog		Grasslan ds	Cropla nd
Northern Goshawk <i>Accipiter gentilis</i>	No	R3			M, P			
Swainson's Hawk <i>Buteo swainsoni</i>	No	R3					M	
Peregrin Falcon <i>Falco peregrinus</i>	Yes	R3, ST	M				M	
*Yellow Rail <i>Coturnicops noveboracen sis</i>	Yes	R3, SSC	M, P					
Sharp-tailed Grouse <i>Tympanuchu s pallidicinctu s</i>	Yes						P	
Ruffed Grouse <i>Bonasa umbellus</i>	Yes				P	P		
*Virginia Rail <i>Rallus limicola</i>	Yes		M, P					
*Sora <i>Porzana carolina</i>	Yes		M, P					
*Semipalma ted Plover <i>Charadrius semipalmatu s</i>	Yes		M					
*Killdeer <i>Charadrius vociferus</i>	Yes		M, P				M, P	
*Greater Yellowlegs <i>Tringa melanoleuca</i>	Yes	R3	M					

*Lesser Yellowlegs <i>Tringa flavipes</i>	Yes		M					
*Solitary Sandpiper <i>Tringa solitaria</i>	Yes		M					
*Spotted Sandpiper <i>Actitis macularia</i>	Yes		M, P					
*Upland Sandpiper <i>Bartramia longicauda</i>	Yes	R3					M	

Table 1: Wildlife Species of Conservation Concern to Agassiz NWR and Refuge Management District (Continued)

Species (* = Managing habitat for these species)	Monitored on Refuge or RMD by staff or MnDNR?	Regional/State Status R3- Conservation Priority in Region 3 E- Federal Endangered T- Federal Threatened SE- State Endangered ST- State Threatened SSC- State Special Concern	Potential Benefit By Habitat used for Production (P) or Migration (M)					
			Wetlands/ Mudflats/ Open water	Lowland shrub	Coniferous bog	Upland forest: Aspen &	Grasslands	Cropland
*Marbled Godwit <i>Limosa fedoa</i>	Yes	R3, SSC	M, P				M, P	
*Hudsonian Godwit <i>Limosa haemastica</i>	Yes	R3	M					
*Stilt Sandpiper <i>Calidris himantopus</i>	Yes	R3	M				M	
*Buff-breasted Sandpiper <i>Tryngites subruficollis</i>	Yes	R3	M				M	

*Short-billed Dowitcher <i>Limnodromus griseus</i>	Yes		M					
*Semipalmated Sandpiper <i>Calidris pusilla</i>	Yes		M					
*Least Sandpiper <i>Calidris minutilla</i>	Yes		M					
*Bairds Sandpiper <i>Calidris bairdii</i>	Yes		M					
*Pectoral Sandpiper <i>Calidris melanotos</i>	Yes		M					
*Common Snipe <i>Gallinago gallinago</i>	Yes		M, P		M, P			
*Wilson's Phalarope <i>Phalaropus tricolor</i>	Yes	SE	M, P					
*Red-necked Phalarope <i>Phalaropus lobatus</i>	Yes		M					
*American Woodcock <i>Scolopax minor</i>	Yes (RMD only)			M, P	M, P	M, P	M, P	
Common Tern <i>Sterna hirundo</i>	No	R3, SE	M					
Black Tern <i>Chlidonias niger</i>	Yes	R3	P, M					

Table 1: Wildlife Species of Conservation Concern to Agassiz NWR and Refuge Management District (Continued)

Species (* = Managing habitat for these species)	Monitored on Refuge or RMD by staff or	Regional/State Status	Potential Benefit By Habitat Production (P) or Migration (M)	Habitat used for
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	MnDNR ?	R3- Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Wetlands/ Mudflats/Open water	Lowland shrub	Coniferous bog	Upland forest: Aspen &	Grasslands	Cropland
*Forster's Tern <i>Sterna forsteri</i>	No	R3	M, P					
Black-billed Cuckoo <i>Coccyzus erythrophthalmus</i>	No	R3		M, P		M, P	M, P	
Long-eared Owl <i>Asio otus</i>	No	R3			M	M		
Short-eared Owl <i>Asio flammeus</i>	Yes	R3	M, P				M, P	
Whip-poor-will <i>Caprimulgus vociferus</i>	No	R3			M, P	M, P		
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i>	No	R3				P		
Northern Flicker <i>Colaptes auratus</i>	No	R3				M, P		
Olive-sided Flycatcher <i>Contopus cooperi</i>	No	R3			M			
Sedge Wren <i>Cistothorus platensis</i>	No	R3	M, P	M, P			M, P	
Golden-winged Warbler <i>Vermivora chrysoptera</i>	Yes	R3		M		M		
Cape May Warbler <i>Dendroica tigrina</i>	No	R3			M			
Connecticut Warbler <i>Oporornis agilis</i>	No	R3		M, P		M, P		

Canada Warbler <i>Wilsonia canadensis</i>					M, P	M, P		
Grasshopper Sparrow <i>Ammodramus savannarum</i>	No	R3					M	

Table 1: Wildlife Species of Conservation Concern to Agassiz NWR and Refuge Management District (Continued)

Species (* = Managing habitat for these species)	Monitored on Refuge or RMD by staff or MnDNR ?	Regional/State Status R3- Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Potential Benefit By Habitat used for Production (P) or Migration (M)					
			Wetlands/Mudflats/Open water	Lowland shrub	Coniferous bog	Upland forest: Aspen &	Grasslands	Cropland
LeConte's Sparrow <i>Ammodramus leconteii</i>	No	R3	M, P	M, P			M, P	
Nelson's Sharp-tailed Sparrow <i>Ammodramus nelsoni</i>	No	R3	M, P				M, P	
Bobolink <i>Dolichonyx oryzivorus</i>	No	R3					M, P	
Western Meadowlark <i>Sturnella neglecta</i>	No	R3					M, P	
Rusty Blackbird <i>Euphagus carolinus</i>	No	R3			M			
Amphibians								
Wood Frog <i>Rana sylvatica</i>	Yes		P	P			P	
Western Chorus Frog <i>Pseudacris triseriata</i>	Yes		P	P			P	P

Spring Peeper <i>Pseudacris crucifer</i>	Yes		P		P			
Northern Leopard Frog <i>Rana pipiens</i>	Yes		P					
American Toad <i>Bufo americanus</i>	Yes		P	P		P	P	
Gray Treefrog <i>Hyla versicolor</i>	Yes		P	P	P	P		
Copes Gray Treefrog <i>Hyla chrysoscelis</i>	Yes		P	P	P	P		
Canadian Toad <i>Bufo hemiophrys</i>	Yes		P	P		P	P	
Tiger salamander <i>Ambystoma tigrinum</i>	Yes	R3	P	P		P		
Mussels								
Giant Floater <i>Pyganodon grandis</i>	Yes		P					

Table 1: Wildlife Species of Conservation Concern to Agassiz NWR and Refuge Management District (Continued)

Species (* = Managing habitat for these species)	Monitored on Refuge or RMD by staff or MnDNR ?	Regional/State Status R3- Conservation Priority in Region 3 E-Federal Endangered T-Federal Threatened SE-State Endangered ST-State Threatened SSC-State Special Concern	Potential Benefit By Habitat used for Production (P) or Migration (M)					
			Wetlands/Mudflats/Open water	Lowland shrub	Coniferous bog	Upland forest: Aspen &	Grasslands	Cropland
Cylindrical Papershell <i>Anodontoides</i>	Yes		P					

<i>ferussacianus</i>								
Fat Mucket <i>Lampsilis siliquodea</i>	Yes		P					
Pink Heel-Splitter <i>Potamilus alatus</i>	Yes		P					
White Heel-Splitter <i>Lasmigona complanata</i>	Yes		P					