Chapter 4: Refuge and District Management

Current Refuge and District Programs: Where We Are Today

Consistent with its authorizing legislation, Agassiz NWR conducts a broad array of wildlife management activities on the Refuge and its seven-county management district. Agassiz NWR's Master Plan, completed in 1978, developed a list of planned activities consistent with the purpose of the Refuge:

Waterfowl Production – Diver and dabbler ducks, geese
Waterfowl Maintenance – Diver and dabbler ducks, geese, swans
Environmental Preservation
Special Recognition Species – marsh birds and shorebirds, raptors
Wildlife/Wildlands Observation
Interpretive Foot Trails
Wildlife Auto Tour Routes
Visitor Center
Visitor Contact Points
Interpretive Exhibits/Demonstrations
Environmental Education
Hunting – Migratory waterfowl, big game, upland game

In the quarter-century since publication of the Master Plan, Refuge management has made significant progress in implementing these planned activities and products. Refuge planning and management, however, are a continual work in process that evolves over time depending on feedback and monitoring as well as changing values, needs, and priorities in wildlife management at the Refuge, regional, and national scale. Hence the value of a new plan – this CCP – which updates and modifies Agassiz NWR's management emphasis.

This chapter summarizes current management programs, operations, and facilities at Agassiz NWR as well as off-Refuge habitat management and restoration on the Refuge Management District. It also describes the participation and cooperation of Refuge staff and management activities with our partnering agencies and

stakeholders in the wider community on efforts to balance competing demands for natural resources, wildlife, and protection from environmental hazards like flooding.

Habitat Restoration

Much of current management efforts on the Refuge and Management District focus on restoring valuable wildlife habitats that have declined regionally since the advent of intensive habitat modification and destruction wrought by Euro-American settlement, agricultural development and drainage projects. Agassiz NWR staff carry out wetland and upland habitat restoration projects both on and off the Refuge.

Habitat Restoration on the Refuge

Habitat restoration efforts at Agassiz NWR focus on both upland and wetland habitats. There are minimal opportunities to restore degraded or former wetlands on the Refuge by means of dikes and water control structures. However, within managed impoundments there are opportunities to restore habitat to more desirable conditions.

In recent years, upland habitat restoration has focused on improving the quality and quantity of oak savanna and native prairie grasslands. Aspens

have been supplanting limited oak savanna habitat. Several methods are used to remove the aspens and allow for the resurgence of oaks. The Refuge issues firewood-cutting permits to remove aspen and balsam poplar. Another technique is girdling aspen. Girdling trees involves cutting through the living cambium layer just beneath the bark, at about chest height. Girdling occurs in the spring, just after the sap has risen and before carbohydrate supplies are sent down to the roots. This is a short window of opportunity and the work is labor-intensive. Trees die slowly, taking at least 2 years to succumb. Firewood cutting is then permitted to remove dead trees. The advantage of this method is that it minimizes suckering and sprouting, unlike firewood cutting of live trees and various prescribed burning methods. Results continue to be evaluated. Staff is also experimenting with particularly hot prescribed burns as a means of restoring and maintaining oak savanna.

Efforts are also under way to restore native prairie grasslands on the Refuge. This typically involves treatment of degraded grasslands, those that have become dominated by non-native, invasive, or woody species like willows. A recent effort has involved two plots of 4 and 6 acres, respectively, in the John's Field area. These sites had been invaded and became dominated by reed canary grass. Although native to North America, this plant has hybridized with introduced European strains to create a highly aggressive and invasive strain that is spreading at the expense of other native species. Reed canary grass is flood-tolerant, it is resistant to burning, it is a prolific seed producer, it spreads rapidly through rhizomes, and it quickly forms virtual monocultures in wet meadows by shading out native grasses and forbs. Its control requires aggressive measures. The John's Field plots were plowed up in June 2001, summer fallowed, then planted to winter wheat, providing browse for migrating geese. An approved herbicide like Roundup®, prescribed fire or both would typically be used on this site and others prior to an early summer planting and the seeding of native grasses and local forbs in order to get ahead of reed canary grass. This is a form of adaptive management, and in the spirit of adaptive management, we are always experimenting with different methods to enhance native grasslands.

Habitat Restoration on the Management District

The federal Conservation Reserve Program (CRP), administered by the USDA Farm Services Agency, pays farmers to keep marginal croplands out of production. Often these are sites with poor natural drainage that were wetlands prior to conversion to agriculture fields. Such areas are plentiful in flat northwestern Minnesota and readily lend themselves to being restored into wetlands, simply by plugging drainage ditches. For a number of years, Agassiz NWR staff have been engaged with numerous wetland restoration projects within the RMD. The year 2000 was an exceptionally active year in this regard. The Mississippi Headwaters/Tallgrass Prairie Ecosystem and Regional Office Refuges and Private Lands Offices had recognized the need to make CRP sign-ups with wetland restorations a priority in Marshall County and other areas within 20 miles of Agassiz NWR. In a monumental undertaking that came to be known as "The Agassiz Adventure," 20 Service employees – including biological and engineering technicians, heavy equipment operators, biologists, Refuge operation specialists, and maintenance mechanics from 10 field stations – working over a period of 472 days, contacted 186 landowners, checked 1,031 wetlands, and restored 832 wetlands. This resulted in a total of 2,722 wetland acres restored. The following year, 45

Service employees assisted with the effort, surveying 924 basins on 548 properties and contributing to the restoration of 4,200 acres of wetlands.

Little upland habitat restoration is requested off-Refuge, since these private farmlands are generally being used for agricultural production.

Habitat Management

As our knowledge and understanding of wildlife ecology evolve over time, and as circumstances and values "on the ground" change, the direction of wildlife management tends to change as well. Two examples of changing philosophies and approaches are evident at Agassiz NWR and many other national wildlife refuges, with regard to the "edge effect" and the value of croplands for wildlife. At the time of Agassiz NWR's Master Plan publication in 1978, the conventional wisdom among wildlife managers was that it was valuable to maximize edges between different vegetation communities. The justification was that since wildlife species that depend on both adjoining habitats could occur near the edge between the two habitats, these edges tend to have higher species diversity than locations set deep within any one habitat type. Thus, increasing the length of edges was deemed desirable.

Twenty-five years later, however, as more information became available from long-term studies, biologists now believe that the advance of civilization has whittled away large contiguous blocks of habitat, and the species that depend on them are in jeopardy. Biological diversity is best served by reducing fragmentation and increasing the areas of habitat blocks, as well as by increasing the connectivity between blocks of similar habitat, so that organisms may move along these corridors and maintain genetic fitness and population viability.

Similarly, for decades wildlife biologists (particularly waterfowl managers) encouraged the cultivation of crops, particularly grains, as a nutritious food source both for upland game and migrating ducks and geese. When national wildlife refuges were established, agricultural lands were acquired and often maintained to produce food for wildlife. However, by the 1980s, wildlife biologists generally and the U.S. Fish and Wildlife Service specifically were adopting more holistic approaches to wildlife management. They realized that artificial food production often had undesirable outcomes even among those species targeted to benefit, such as overpopulation or overcrowding and thus susceptibility to disease and other problems (e.g., outbreaks of botulism or avian cholerea).
At the same time, croplands often came at the expense of more robust, sustainable, and diverse natural communities and the non-game organisms that inhabit them. In recent years, the Service and wildlife biologists in other agencies have tended to discourage grain and crop cultivation. Yet croplands are still considered to have value in some places and under some circumstances. Agassiz NWR's 1978 Master Plan reflected the traditional approach of the past and indicated that "at least 1,200 acres of cropland will be needed to supplement the waterfowl foods available in the marsh during the spring and fall migrations," principally to reduce crop depredation on surrounding private farmlands. Management efforts over the last 15 years have reflected the current management philosophy resulting in only 170 acres of cropland, or one-seventh the amount recommended as a minimum in 1978. This acreage is performing a useful function, especially for wildlife viewing purposes, but staff do not believe more acreage is needed, and even this amount may be reduced.

In recent years, the management philosophy at Agassiz NWR, paralleling that of other refuges around the country, has become more oriented toward fostering or simulating natural processes (like wildland fire) to achieve desired landscapes and to restore scarce habitats that were prevalent prior to Euro-American settlement in the region. Given the highly manipulated environments in which Agassiz NWR and most other refuges occur, this often means actively intervening in natural plant community succession and hydrologic processes rather than passively allowing nature to "run its course." In order for the Refuge to effectively pursue its purpose and meet the expectations of the American public, we actively manage the various habitats through a variety of techniques and procedures discussed in the following paragraphs.

The following discussion is organized by management tool, rather than habitat type, since management tools are often used on more than one type of habitat. Mowing can be used in grasslands and forests, for example, and prescribed fire on forests, shrublands, grasslands, and marshes.

Managing Water Levels and Moist Soil Units

Agassiz NWR's water management program is very complex and involves 26 impoundments. Pools are frozen for about 5 months of the year, November to April. During periods of "ice-out," May to October, water management not only must balance competing considerations of wildlife and habitats on the Refuge itself, but it must deal with the requests of off-Refuge neighbors upstream and downstream as well as other township, county, state, watershed, and flood control agencies. Regulating water levels – whether at maximum pool levels or in drawdown (emptying pools almost entirely of water) – is a vital management tool for waterfowl, shorebirds, and wading birds. Over the years, water management has been further complicated by increased land clearing, drainage and stream channelization on private lands upstream of the Refuge, which increase flood flows and sediment transport onto the Refuge. In addition, over the last 10 years the area has experienced an extremely wet cycle causing repeated severe flooding, which results in rapid pool level increase, or "bounce," of 2-3 feet. Bounces during the breeding season negatively affect nesting efforts of many species. For instance, the June 11, 2002, event essentially wiped out a production year for many species. Managers must be cognizant of conditions throughout the watershed, exercise good judgment, and at times be willing to deviate temporarily from Refuge objectives when downstream cities and towns are experiencing extreme flooding events.

Agassiz NWR's Marsh and Water Management Plan (1987) guides management of the Refuge's marshes, open water, water levels and discharges. The plan states that production and maintenance of waterfowl are the primary objectives at Agassiz NWR, and that to fully achieve these objectives, a diversity of habitats must be provided to meet the life history requirements of waterfowl for nesting, brood rearing, and migration. The presence or absence of water, its depth, and the seasonal timing of water depth fluctuations are all manipulated to produce various stages of marsh habitats on which different water-dependent birds rely.

An annual marsh and water management plan is written every winter. This plan summarizes operations during the previous year, describes major water management problems, and documents construction and rehabilitation projects. It also identifies proposed pool elevations for the upcoming years along with stated objectives for each management unit. Agassiz Pool, by far the largest on the Refuge, serves as an example. Its spillway elevation is 1,141 ft. above mean sea level (MSL), its drawdown elevation is 1,136, it was last drawn down in 2000, and the next planned drawdown is in 2010. Objectives in 2001 were to maintain and reestablish hardstem bulrush and limit the increase of cattails by flooding out new plants

Refuge management is continually adjusting scheduled water manipulation in response to the vagaries of the weather or maintenance of water control structures. For instance, in 2002, spring runoff was insufficient to recharge eight pools that were in drawdown in 2001. Therefore, it was decided to keep the same pools in drawdown and continue to hold water in the six pools originally scheduled for a 2002 drawdown. Continual maintenance and repair of aging water control facilities such as gates, pilings, gauges, dikes, bridges, riprap, and channels are necessary to keep facilities and controls operable, and thus to meet water and marsh habitat management objectives.

In the early 1980s, five impoundments were developed in the Golden Valley and Goose Pen farm fields as moist soil units, which are valuable habitat for both waterfowl and shorebirds. Difficulties with managing water in these units led to their neglect from the late 1980s to the late 1990s, but in 1998 staff began a concerted new effort to manage them with frequent drawdowns timed to coincide with shorebird migration. All water control structures were replaced in 1999 and 2000 and burning and discing can be used when the units are dry enough to run a tractor across them.

Annual outflows have a wide range of fluctuation at Agassiz NWR, depending on precipitation. Outflow can range from virtually zero discharge from the Refuge into the Thief River during dry years to over 300,000 acre-feet in wet years with one or more large storms. The largest annual outflow, since record keeping began in 1965, was 414,147 acre-feet in 1999.

There have been persistent flooding problems within the watershed, both upstream and downstream of the Refuge, and on the Refuge itself. Possible solutions have been investigated and explored for a number of years. One possibility, developed under the state-mandated flood reduction mitigation process, is construction of a diversion ditch leading from the southern boundary of the Refuge to the Thief River, along with upstream and off-channel storage. In conjunction with the diversion ditch located off Refuge,

several water control structures would be enlarged or new ones installed on the Refuge from Agassiz to Headquarters pools, Headquarters to South pools, and South to Farmes pools. During flood events water from Refuge pools could theoretically be discharged faster after the flood peak, to the benefit of the Refuge and its marsh habitats and agricultural areas immediately downstream of the Refuge. It would also allow more flexibility in managing water on the southern half of the Refuge. At present, this proposal has not advanced beyond the concept stage, and it is not being considered in this CCP; however, the Refuge will participate in this process if it is reactivated.

Mowing

Mowing is used in grasslands and certain wetlands like sedge meadow to cut willows and prevent their encroachment. If left alone, hardy, aggressive willows would invade and dominate nearly all wetland areas on the Refuge except for the cattail marsh areas. Mowing maintains a mosaic of willow age classes, ensuring winter browse for both moose and deer. It also reduces the willow canopy layer and improves the understory of sedges and grasses that foster deeper penetration of fire into willow stands. Increased willow control and better cover for nesting marsh and upland birds that use these areas are the ultimate result of this mowing. Several hundred acres a year are typically mowed on the Refuge.

Mowing is also used as a form of mechanical treatment within the Wildland Urban Interface. In 2002, for example, 185 acres on 34 sites were hydroaxed. Sites included dikes that had not been mowed for several years and that border private property.

Farming

The Refuge has a small farming program with three benefits:

Help reduce depredation in neighboring farm fields, which improves relationships with nearby landowners when migratory birds feed on private crops.
It provides food for both resident and migratory wildlife.
It attracts large, visually impressive animals like deer, bear, Sandhill Cranes, and

concentrations of waterfowl to areas where they can be observed by the public.

In a typical year, winter wheat, barley, oats, sunflowers, corn, and new seeded winter wheat are left in seven farm units in various locations around the Refuge.

Prescribed Fire

Fires are a natural ecosystem function in this part of the world. Fire is an agent of abrupt change and renewal in the composition and structure of vegetation communities that over the millennia many native plants and animals have not only adapted to but come to depend upon. Natural and human-caused peat fires created wetland depressions that dot the Refuge. The dynamic and shifting interface between prairie, aspen parkland, hardwood forest and boreal forest is maintained by fire.

Today, prescribed fire is one of the Refuge’s most useful tools for maintaining wetlands, grasslands and shrublands for nesting birds as well as to provide habitat for moose and deer. This human intervention in natural succession at the landscape scale helps maintain a mosaic of grasslands, shrublands, forestlands and sedge meadows needed by native wildlife species.

Agassiz NWR has a Fire Management Plan that includes a very active prescribed fire program with burning seasons in the fall and spring. In Fiscal Year 2002, prescribed fire was used on 7,564 acres of habitat, including marshes and pools. Annual prescribed burning varies from 500 to 14,000 acres. Burns are scheduled on a 3- to 6-year rotation and coordinated with drawdown pools identified in the annual Marsh and Water Management Plan. Post-fire monitoring is done to measure whether prescribed burn objectives were met. With the National Fire Plan providing increased emphasis on fire planning, management, and suppression at the national level, Refuge fire staff expanded from one to four positions and new equipment has been added since 2001.

Controlling Invasive Plants

Every year, Agassiz NWR submits a Weed Inventory/ Survey Report to the Regional Office documenting the status of plant pests on the Refuge and efforts to control their spread. The report lists the top five weedy species and the extent of their infestation on the Refuge: Canada thistle (1,600 acres), common sowthistle (100 acres), leafy spurge (3 acres), quackgrass (1,000 acres) and hybrid cattail (10,000 acres).

Canada thistle (*Cirsium arvense*), originally from the temperate regions of Eurasia, is an herbaceous perennial in the aster family that threatens prairie grasslands by crowding out and replacing native plants. Highly invasive, it eliminates other plant species through shading, competition for soil nutrients, and possibly through producing toxins poisonous to other plants. In so doing, it changes the structure and species composition of natural plant communities and reduces plant and animal diversity. Agassiz NWR has tried chemical, mechanical, and biological methods to control Canada thistle. The approved herbicide mixture of 2-4-D and Banvil has been used successfully. Releases of the Canada thistle stem mining weevil

(*Ceutorhynchus litura*), seed head weevil (*Larinus planus*), and stem gall fly (*Urophora cardui*) in two locations have shown promise.

Common sowthistle (*Sonchus oleraceus*), native to Europe, is a frequent invader of disturbed sites on grasslands and has spread throughout virtually the entire United States. Agassiz NWR uses a mixture of 2-4-D and Banvil to control common sowthistle.

Leafy spurge (*Euphorbia esula*) is an aggressive, exotic, perennial weed that is especially pernicious in western grasslands. It out-competes desirable native vegetation, growing in dense clumps with one or more shoots emerging from a woody root crown. This weed contains irritating chemicals that many animals avoid eating. Herbicides have been used on leafy spurge, but often, infested acreage is so extensive that chemical controls are prohibitively expensive and not practical. Furthermore, the weed is resistant to chemical control. It has a pervasive root system and appears able to block the downward movement of herbicides. Still another problem with chemicals is that herbicides sprayed to kill spurge also kill desirable broadleaved plants. Chemical control by spot application of Tordon 22K® has kept the leafy spurge infestation in check on the Refuge for the last 20 years. It should be noted that prescribed fire does not control leafy spurge. Biological control is being attempted at Agassiz NWR, but with disappointing results to date: of 120,000 leafy spurge beetles (*Aphthona nigriscutis* and *A. lacertosa*) released in June 2000 on 20 sites and 10,000 released in July 2001 on two sites, there was no survival of the beetles observed on five of the drier sites monitored in June 2002. Perhaps the stands of spurge are too small to support the beetles

Quackgrass (*Agropyron repens*) is a noxious weed from Europe that has spread quickly in North America, infesting grasslands, pastures, cultivated fields, waste areas and disturbed sites. It develops a dense mat of underground rhizomes, which form a heavy sod. Quackgrass reaches 1-3 feet in height with bright green leaves. The Refuge uses Roundup® and Rodeo® (Glyphosate) to control this weed with good to excellent results.

Hybrid cattail (*Typha X glauca*) is an invasive hybrid of two native cattails – broad-leafed cattail (*T. latifolia*) and narrow-leafed cattail (*T. angustifolia*) – that can grow up to 10 feet high with the familiar velvety brown spike of flowers at the tip. It flourishes in a variety of wetland and marshy habitats, including disturbed sites, spreading by rhizomes and thick quantities of seed. Hybrid cattail out-competes other native plants and forms dense monocultures of limited value to waterfowl and other wildlife. It may also be allelopathic, that is, producing chemicals that inhibit the growth of other plant species. At Agassiz NWR, hybrid cattail dominates or infests some 10,000 acres of marsh habitat. The Refuge has used the approved herbicide Rodeo to create openings in solid stands of cattail to create access for nesting waterfowl. Prescribed fire and raising water levels are also used to suppress cattails.

Other species: There are several other plant species, both on and off the Refuge, that threaten the vegetative integrity of the Refuge. On the Refuge the spread of reed canary grass (*Phalaris arundinacea*) and common reed or phragmities (*Phragmites australis*) is of concern. The use of fire on both species and reclaiming reed canary stands to native plant species are methods of control being explored. Purple loosestrife (*Lythrum salicaria L.*), an extremely invasive species in wetlands, exists outside the western border of the Refuge. Sites are being monitored and biological control agents have been introduced by the state. Also, spotted knapweed (*Centaurea maculosa*), an aggressive, non-native invader of grasslands, grows on roadsides near the Refuge.

Habitat Monitoring

Aerial Infrared – GIS Technology: Agassiz NWR has had aerial infrared photography taken in 1982, 1983, 1985, 1986 and annually since 1991. The 1997 photos were digitized into a vegetation classification. The primary purpose of the photos is monitoring habitat changes that occur either naturally or due to management. In the past, visual comparisons of photos between years were done to make these evaluations. In 1999, Agassiz NWR began investigating the use of Geographic Information Systems (GIS) to make quantitative evaluations. GIS technology is used to compare infrared photos taken in different years to determine the changes in habitat that are taking place due to management activities such as water level manipulation and prescribed burning. Through a cooperative agreement with the Geography Department at Bemidji State University, three or four units have been compared each year since 2001.

Photo Stations: Forty photo stations were established in 1970 to provide a photographic record of changes in habitat. Photos were taken annually during the 1970s and early 1980s and less frequently since then. Recently the old photos have been digitized, making comparisons to recent photos easy to display, compare and store.

Wildlife Monitoring and Research

Two basics types of inventories and investigations are conducted at Agassiz NWR – 1) surveys and censuses of selected species or species groups, which are typically made on an annual basis, and 2) basic research into wildlife biology and ecology, which have no specific schedule. The surveys and censuses are generally made by staff and volunteers, and consist of organized surveys and/or censuses, or a compilation of observations and recorded sightings made over the course of the year. Research studies are usually undertaken in cooperation with university professors and their students or other agencies, often with the direct participation and cooperation of Refuge staff and assisted by volunteers.

Surveys and Censuses

Surveys and censuses at Agassiz NWR are guided by a 1989 Wildlife Inventory Plan revised in 1991.
Endangered and/or Threatened Species – Two federally listed threatened species are found on the Refuge, the gray wolf and the Bald Eagle. Visual observations of wolves are recorded, as is other evidence of wolf presence, notably scat and tracks. Howling surveys are conducted every 5 years. The wolf population has been the subject of a recent radio-telemetry study. Two wolf packs utilize portions of the Refuge and the wolf population has been more or less stable since the early 1990s. Bald Eagle nests are surveyed annually. In 2002, four nests were active; all were in tall aspens or cottonwoods.

Amphibians – Since 1994 Marshall County Central High School has conducted amphibian surveys on the Refuge as part of an Environmental Science class. Every September they set pit fall traps, check them and report results. Five species have been recorded: wood frog, western chorus frog, tiger salamander, leopard frog, and American toad. Agassiz NWR staff have also participated in the statewide Minnesota Frog and Toad Survey since 2000. This program is administered by Hamline University in St. Paul. Eight species of frogs and toads have been identified by their calls on the Refuge: wood frog, western chorus frog, spring peeper, northern leopard frog, American toad, Canadian toad, gray treefrog, and Copes gray treefrog. Off Refuge, two survey routes were established in Steiner and Old Mill, Marshall County, in 2001.

Raptors – Staff compile observations of rare and uncommon raptors at the Refuge, including the formerly listed Peregrine Falcon, the Prairie Falcon, and the Snowy Owl.

Waterfowl – Breeding waterfowl, including Trumpeter Swans, Canada Geese, and ducks are inventoried every spring and summer. Trumpeter Swans began appearing on the Refuge in 1997. The first record of them nesting on the Refuge was in 2003. Several types of data are obtained for geese, including the date of first return to the Refuge in early spring, the date of first brood observed, and a gosling count. Over the last 30 years, an estimated 700 goslings have been produced annually on the Refuge. Ducks and duck production are estimated at Agassiz NWR by using brood surveys conducted by aerial and ground surveys. Both dabbling and diving ducks are inventoried. Total, long-term duck production on the Refuge has averaged approximately 13,100 ducklings. Numbers of several species of waterfowl are also estimated during the fall migration, including Canada and Snow Geese, and Mallard, Scaup and Ring-necked Ducks.

Bird banding has been a tool of wildlife managers for decades. Banding enables biologists to identify and track movement and timing patterns of migratory bird populations. Metal bands or rings with identification information are affixed to the leg of the bird. The bird must be recaptured or killed and held in hand to record the information on the band. Agassiz NWR has an annual banding quota of 1,200 Mallard Ducks. In 2001 and 2002 the Refuge surpassed this with a total of 1,313 and 1,364 Mallards banded. Other ducks that are banded include Black Ducks, Blue-winged Teal, and Pintails. The record high for Pintails banded was 254 in 1996. Fifty-three were banded in 2002. The record of 74 for Blue-winged Teal was set in 2001. The American Bittern research project at Agassiz NWR has banded these birds on the Refuge in recent years.

Marsh Birds, Shorebirds, Gulls and other Migratory Birds – Agassiz NWR conducts censuses and observations of many water-dependent avian species. Estimates of nest numbers are obtained for the three predominant colonial nesting birds (i.e., birds that nest in colonies) on the Refuge: Franklin's Gull, Black-crowned Night-heron, and Eared Grebe. Over the years, averages of 25,000 pairs of Franklin's Gulls, 500 pairs of Black-crowned Night-herons, and 50 to 500 pairs of eared grebe have nested at Agassiz NWR. Five species of marsh birds – American Bittern, Least Bittern, Pied-billed Grebe, Sora and Virginia Rail – are typically surveyed several times a year using passive call and call playback techniques. Two survey routes are run in May for American Woodcock. Point counts are also made of migratory songbirds during the breeding season.
During years when management activities create extensive mudflats and moist soil units, Agassiz NWR is a popular stop over area for shorebirds. These are often counted in the spring and/or summer by volunteer birding enthusiasts. Fifteen to 20 species of shorebirds and thousands of individual birds have been counted in these surveys.

Surveys of waterfowl and marsh birds have been conducted on newly restored wetlands on private lands within the Refuge Management District since 2001. Staff is assisting and developing the North American Marsh Bird Monitoring Protocol. Most of these wetlands are seasonal and shallow. The most common waterfowl species recorded are Mallards, Blue-winged Teal, and Shoveler. The most abundant shorebirds are Killdeer, Least Sandpiper, and Lesser Yellowlegs.

Resident Wildlife – An aerial deer census is conducted every winter. The February 2002 deer population was estimated at 1,600, for a population density of approximately 12 per square mile. An early winter and mid-winter census for moose is carried out annually, using either the quadrat survey or aerial transect techniques. The lowest estimate for the quadrat count was 40 in 1998. As of 2002 both survey techniques show a population that continues to recover very slowly. Figure 10 graphs deer and moose population trends over the last three decades on the Refuge.

Since 2001, Marshall County Central High School ecology students have cooperated in surveys of small mammals along a survey route established in cooperation with Minnesota DNR and the 1854 Authority. The trap stations have yielded meadow voles, deer mice, red-backed voles, short-tailed shrews, and masked shrews. Black bears are not surveyed per se, but sightings are recorded and compiled. Observations indicate that the Agassiz NWR population has been increasing since 1980, paralleling an increase in Northern Minnesota's population. Scent post surveys for furbearers are conducted every fall. These reveal the relative abundance of red fox, coyote, wolf, skunk, raccoon, bobcat, mink, and fisher on the Refuge. In addition, Refuge staff record visual observations of infrequently observed furbearers like bobcats and fishers. Drumming surveys of Ruffed Grouse have been done for 35 years at Agassiz NWR. Dancing Sharp-tailed Grouse are also surveyed, but unfortunately dancing grounds have not been located on the Refuge in 9 years. Some monitoring of invertebrates takes place, including pest insects like tent caterpillars, gypsy moth and mosquitoes, and aquatic invertebrates like mussels by staff and various agencies.

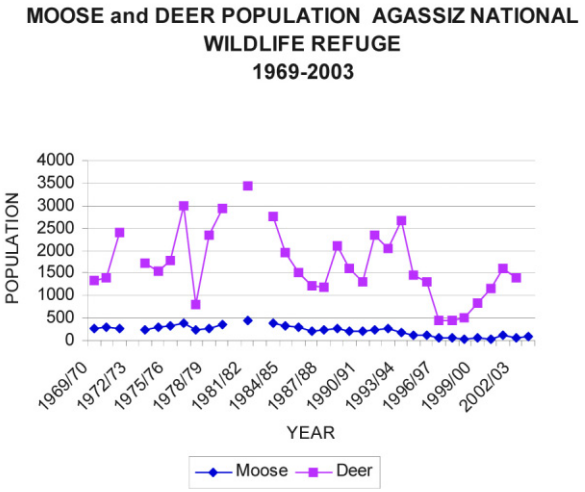
Studies and Investigations

The Refuge is the site of a variety of wildlife research studies, ranging from life history studies to environmental contaminant effects. Agassiz NWR initiates, encourages and cooperates with these studies in a number of ways, including the use of housing, equipment and other facilities by guest researchers, by subsidizing volunteers, and by direct collaboration in the field. Recent and ongoing studies include the following:

A Study of the Life History and Ecology and Management of the American Bittern – Initiated in 1994, this ongoing three-phase study has involved cooperators from the

Society Tympanuchus Cupido Pinnatus (Dr. John Toepfer), St. Cloud University (Wayne Brininger-MS), the University of North Dakota (Dave Azure-MS, Dr. Christopher Austin, Casey Armor), the Univeristy of Missouri-Columbia (Tammy Laney-MS, Soch Lor-PhD), the Red Lake Band of Chippewa and Agassiz and Big Stone national wildlife refuges, as well as numerous field volunteers. This species was selected for study due to declining populations nationwide, and especially in the Upper Midwest, contaminant concerns and little knowledge of basic life history. Capture techniques and radio collaring methods were developed to study the American

Figure 10: Moose and Deer Population 1969-2003, Agassiz NWR



Bittern on the breeding grounds. Satellite telemetry was used to track migration. Bitterns captured in Minnesota wintered in the Florida Everglades and coastal Louisiana using agricultural ditches, saw grass and cypress dome habitat in the former and coastal marshes and Phragmites in the latter.

Moose Reproduction and Survival in Northwestern Minnesota – Initiated in 1995 at a time of rapid decline in moose numbers, the field work for this study was undertaken by Eric Cox, PhD candidate, University of Idaho on behalf of Agassiz NWR and the Red Lake WMA (of Minnesota DNR) and was completed in 2000. This study included the use of radio marked moose to track their movements. The results are currently being written up and are not yet available.

Wolf-Livestock Relationships in Northwestern Minnesota – Initiated in 1996, the objective of this Masters Degree study by Andreas Chavez, Utah State University, was to obtain baseline information about the wolves on the Refuge prior to possible delisting of this species by determining the number of wolves and packs utilizing the Refuge and wolf interactions and impacts with nearby agricultural operations. This investigation made many interesting findings, including the diet of the local wolf population during a time when deer numbers were very low and frequency of wolf movements through pasturelands.

Nesting Ecology of Grebes at Agassiz NWR – Initiated in 1996, this study by Dr. Bruce Eichhorst, University of Nebraska-Kearney, is investigating grebe incubation data, nesting locations, and the effects water management may have on nesting grebes. Study continues as time and funds permit.

Exposure and Effects of Metal Accumulations by Wildlife on Agassiz NWR – Initiated in 1998 by the Twin Cities Ecological Services Field Office and the Upper Midwest Environmental Sciences Center (Drs. Tom and Christine Custer, USGS/BRD), this study is utilizing colonial water birds, tree swallows, and moose to determine the exposure to and effects of metals on these species at Agassiz NWR.

Diet of the Nesting Tree Swallow as Related to Insect Diversity and Abundance – This study was a subpart of the metal accumulation study. Jean Mengelkoch, MS, 2000, University of Minnesota, Duluth. Objectives were to determine the percentage of invertebrates in the diet of nestling swallows, identify them taxonomically, chick age realtionship to diet and whether adults selected nest sites based on invertebrate species and abundance.

Least Bittern Ecology: Nest Success, Philopatry, and Habitat Selection on a Landscape Scale – Initiated in 2001 by Dr. Leigh Fredrickson, Gaylord Memorial Laboratory, Puxico, MO, this study aims to determine and compare nest timing, breeding behavior, nest sites, growth rates, spatial and temporal effects between breeding populations of Least Bitterns at Agassiz, Mingo, and Squaw Creek national wildlife refuges. MS student Karen Arnold, South Dakota State University, has one more field year left in this study. Heavy flooding in June 2002 wiped out virtually all nests and provided a dramatic example of the resilience of wildlife in adapting to extreme weather.

The Effects of Climate Variability and Geomorphic Setting on Shorebird Habitat Use in Northwest Minnesota – MS student Kari Odefey, South Dakota State University, finalized this 2-year study in 2003 to determine how climatic variability and geomorphic setting influence habitat conditions within wetland complexes both on the Refuge and off (restored wetlands located on private land) and to describe shorebird response to these varying habitat conditions. Results are being analyzed.

Habitat Monitoring Using GIS & Aerial Infra-red Photos for Agassiz NWR – Dr. Charles Parson, Department of Geography, Bemidji State University, is cooperating with Agassiz NWR in the application of GIS, specifically the Spatial Analyst and Image Analyst extensions of Arcview, to monitor changes in vegetative cover at the Refuge over time due to fire and water management or natural conditions such as drought and flood.

Relationship of Water Table Level to Peatland Tree Growth – Initiated in the fall of 2002 by MS candidate Rhett Johnson, University of Minnesota, Duluth, this research is examining the effects of high water levels in managed impoundments on black spruce and tamarack within the Refuge's Wilderness Area. The study is also looking into the possible effects a road/dike and associated ditches that cut the Wilderness Area in half may have on water flows, which in turn can effect vegetation.

Nutrient Reserve Dynamics of Lesser Scaup During Spring Migration in the Mississippi Flyway – This MS study conducted by Michael Anteau, Louisiana State University, is investigating the hypothesis that declining Scaup populations in the Mississippi Flyway may be due to reduced reproductive success because females are arriving on breeding grounds in poorer physical condition than historically. The MS portion was completed and further study is ongoing.

Wetland Invertebrate Response to Three Different Wetland Management Treatments (drawdown, prescribed fire, and drawdown and prescribed fire) at Agassiz NWR – This study is being conducted by Ned (Chip) Euliss, USGS Northern Prairie Wildlife Research Center, Jamestown, ND; Leigh H. Fredrickson, Gaylord Memorial Laboratory, Puxico, MO; and Soch Lor, Agassiz NWR. Agassiz NWR is one of the largest and most important refuges in Region 3 for a wide range of breeding and migrant waterbirds, including several of concern. The most active management programs on the Refuge are water level management and prescribed fire. These programs are implemented to manage habitats for migratory birds and resident mammals (namely moose, deer and muskrat). Because invertebrates are the primary source of food for many wetland-dependent birds and are a crucial factor in wetlands dynamics, knowledge about them is a critical link for effective management of Refuge wetlands. This study aims to evaluate the effects of drawdown and prescribed fire treatments on the invertebrate communities and to correlate these treatments and invertebrate information to shorebird and waterbird use of the wetlands.

Wildlife Management

Wildlife management activities at Agassiz NWR are directed by the Refuge's establishing purposes and general mandate to conserve trust resources. This is accomplished primarily through habitat manipulation rather than by direct manipulation of wildlife species and populations. See the sections on habitat restoration and management above. However, the following activities do pertain directly to increasing or decreasing wildlife numbers through management, conservation, and where necessary, control, of wildlife populations.

Disease Monitoring and Control

Staff is continually monitoring the health and condition of wildlife populations on the Refuge and staying abreast of the regional status of diseases that affect the health of wildlife, humans, or both. Through monitoring and preventive measures, it is possible to prevent isolated cases from triggering major outbreaks of disastrous epidemics. West Nile Virus appeared in northwestern Minnesota in 2002, reported first in horses. Spread by mosquitoes, this exotic virus infects mammals, including humans, and birds. Members of the Corvidae family (crows and jays) seem to be especially vulnerable.

In August 2002, an unusual number of dead birds were found on the Refuge. Several dead specimens were collected and sent to the Wildlife Health Lab in Madison, Wisconsin, including one white pelican, one double-crested cormorant, one mallard and two pied-billed grebes. The pelican and one of the grebes tested positive for West Nile Virus. The cormorant tested positive for botulism C and avian cholera. The mallard tested positive for botulism C. Fortunately, none of these diseases became a major outbreak. There have been no major botulism outbreaks in recent years.

Nest Structures

The Refuge has about 100 goose and duck nesting baskets that have been checked and maintained periodically. However, goose nesting structures are being removed gradually since the statewide recovery program has met its goals for the Giant Canada Goose. Seven nesting structures were provided for cormorant nesting on Agassiz Pool dating to the 1960s. They were not used, became severely rusted and were removed in 2001.

In the late 1990s, 250 swallow boxes were erected at water inflow, outflow, and interior sites of several pools and ditches for a contaminant study. With fieldwork for the study completed in 2001, students from the Wildlife Resources class at Lincoln High School in Thief River Falls removed the boxes in 2001-2002.

Predator and Exotic Wildlife Control

Agassiz NWR has a trapping program, the primary purpose of which is to control predators of ground-nesting birds. These predators include fox, mink, skunk, otter and raccoon. Trapping also helps control the numbers of muskrat and beaver, which cause damage to dikes and water control structures.

The Refuge is divided into eight units and special use permits for trapping are issued through a bid system. However, low fur prices in recent years have reduced interest in trapping on the Refuge.

The trapping season typically runs from late October through the end of February, with the season for beaver continuing through April. Leghold traps are used mostly for terrestrial mammals such as mink, raccoon, red fox, and striped skunk, but also for muskrat, while conibear traps are used

Table 2: Trapping Statistics, Agassiz NWR

Species	10-Year Average	Number Trapped in 2002
Mink	25	36
Raccoon	19	21
Red Fox	5	0
Striped Skunk	7	6
Muskrat	1,263	1,770
River Otter	41	4
Beaver	47	41

1.This is a 9-year average due to trapping not allowed in 1993 and 1994 because of low population levels.

primarily for river otter and beaver. In the 2001-02 trapping season, there were 181 trapper visits totaling 566 trapper hours. Trap days for all species were 4,565 for leghold traps and 624 for conibear traps. Table 2 shows trapping data for a 10-year average and 2002.

Crop Depredation Relief

The Refuge maintains about 28 propane exploders that are loaned out to local farmers to prevent bird and deer depredation of their crops. The Minnesota DNR has also borrowed these exploders for use in the Park Rapids and Appleton areas. Exploders are loaned out at no cost, but people borrowing the equipment must purchase propane. We provide this service to assist neighbors.

Coordination Activities

Agassiz NWR staff invests a significant amount of energy and time representing the Refuge in its role as a partner with other government and resource agencies and as a neighbor and large landowner in the community. Staff participates as team members of various committees and groups ranging from watershed districts to northwestern Minnesota tourism promotion efforts.

Interagency Coordination

Refuge Staff work extensively with conservationists from the Natural Resources Conservation Service (NRCS) on the evaluation and implementation of habitat restoration projects on private lands within the seven-county Refuge Management District as part of the Wetland Reserve Program, Emergency Wetland Program and Conservation Reserve Program.

Refuge staff also participate in Red River mediation activities. In 2000, the Red River Watershed Management Board, which is the designated organization overseeing water management of the nine sub-watersheds that flow into the Red River of the North, initiated a mediation process to help solve flooding problems within the watershed. Agassiz NWR is involved with three of the sub-watershed mediation processes: Red Lake Watershed (Thief River portion), Snake River/Middle River Watershed; and Two River Watershed.

In 2002, there were seven meetings of the Red Lake Watershed group alone. The largest of the U.S. sub-watersheds of the Red River of the North, it contributes one-third of all waters that flow into the river from the United States. It has hundreds of miles of drainage ditches that carry floodwater to downstream landowners. Refuge management has in the past, and will continue to, participate in interagency coordination to accommodate floodwaters during extreme flooding events. These decisions are made by refuge managers on a case by case basis, weighing several factors, as listed below:

Biological parameters: time of year in relation to nesting season, quality of nesting cover after flooding, and anticipated length of inundation of cover.
Inflows and length of inundation.
Infrastructure integrity.
Downstream implications.
Daily communications and coordination with the MnDNR and Red Lake Watershed District

With regard to solutions, the preference of many local landowners is to store floodwaters on state and federal lands like the Refuge. Of course, this would enact an unacceptable price on Refuge habitat and wildlife. Another possible solution advanced by the flood reduction mediation team is to construct a diversion ditch that would bypass a major bottleneck in the Thief River and provide some upstream storage.

Refuge staff frequently furnish technical assistance to other agencies and organizations on wildlife matters. For example, in 2001 Agassiz NWR assisted members from a number of agencies, including the Minnesota Waterfowl Association, Ducks Unlimited, Minnesota DNR Section of Wildlife and Section of Fisheries, Bureau of Indian Affairs, Minnesota Deer Hunters Association, National Wild Turkey Federation, Minnesota Land Trust, U.S. Forest Service, NRCS, Minnesota Board of Water & Soil Resources and The Nature Conservancy on a grant proposal to the Legislative Commission on Minnesota Resources by identifying important habitat corridors in northwestern Minnesota at a gathering in Detroit Lakes. This led to approved funding of more than $20 million for wildlife corridor projects.

The Beltrami Island State Forest and Red Lake Wildlife Management Area include approximately 81,700 acres of Land Utilization Project lands owned by the Service. These lands are managed by the Minnesota DNR Division of Wildlife under a Lease Agreement with the Service. Trespass, right-ofways, access for in-holdings, and forestry management practices on these Land Utilization Project lands necessitate Agassiz NWR staff involvement. In addition, equipment and staff are shared on management projects.

Refuge staff also coordinate a wide variety of surveys and studies on the Refuge by outside parties including the U.S. Forest Service, Minnesota DNR, and USGS. One of the more unusual recent examples was providing housing and support for 5 months in 2002 to a Japanese graduate student conducting an anthropological study on conservation and management of wolves in agricultural communities in a number of countries.

Tribal Coordination

Agassiz NWR works cooperatively with the Red Lake Band of the Chippewa Indians on various projects, including habitat and water level management, as well as research studies. The band's wildlife biologist is participating in the Refuge's long-term study on the American Bittern. Another study assesses the population status for non-waterfowl marsh birds by implementing a monitoring program at the Good Lake impoundment, a 4,000-acre facility owned and managed by the Red Lake Band of the Chippewa to benefit wildlife and provide flood control. Good Lake is located within 50 miles of Agassiz NWR.

In 2001 the Red Lake Band of the Chippewa hosted a meeting of the Service's Region 3 Headwaters/ Tallgrass Ecosystem team at the Seven Clans Casino in Thief River Falls. In 2003 the Band hosted a Russian delegation of wildlife biologists sponsored by the Service highlighting prescribed fire, walleye fishery recovery and cooperative research programs on tribal lands.

Private Land Activities

Agassiz NWR has been actively engaged for several years in habitat restoration activities on private lands within the Refuge Management District, mostly related to CRP sign-ups. In cooperation with county NRCS offices, Agassiz NWR and Service teams surveyed hundreds of properties, checked thousands of acres, and restored thousands of acres of wetlands.

Partners, Volunteers and Cooperating Organizations

Agassiz NWR partners with several organizations on efforts of mutual interest. The Refuge Manager has participated in the Northwest Regional Agricultural and Natural Resources Sustainable Development Partnership, a joint effort between the University of Minnesota and citizens of the state. Funded by the State Legislature, the partnership looks to sustain Minnesota's natural resource based industries by addressing community-identified issues on an ongoing and long-term basis. The Northwest Region includes 11 counties and the partnership's board is diverse, with representatives from the White Earth Tribe, Hispanic community, Chambers of Commerce, University of Minnesota, County Extension, farmers, and the Minnesota Department of Natural Resources (Minnesota DNR).

Agassiz NWR staff were involved with Minnesota DNR and the Minnesota Office of Tourism, other refuges, and several Convention and Visitors Bureaus within northwest Minnesota on promotion of the Pine to Prairie Birding Trail. Several staff members have served on the Minnesota Chapter of the Wildlife Society board. We cooperate with the Tamarac Interpretive Association in managing the Agassiz NWR Bookshop, located in the visitor center. The bookshop opened in 1997 and annually sells several thousand

dollars worth of T-shirts, caps, wildlife and nature-themed books including guidebooks, and miscellaneous wildlife items. The bookshop was opened not to earn a profit but to provide visitors with souvenirs of the Refuge and educational materials.

An increasing number of volunteers have contributed an enormous amount of time to Agassiz NWR's research and operations. In 1995, 20 volunteers contributed approximately 2,000 hours to the Refuge. By 1999, this had grown to 26 volunteers contributing some 20,000 hours. Agassiz NWR's volunteers hail from a number of states – including Minnesota, Kentucky, New York, Wisconsin, Indiana, Arizona, New Hampshire, North Dakota, and Michigan in recent years – as well as from Canada. Volunteers have worked on wolf, moose, and grebe research projects, on airboat engine maintenance and a variety of other assignments. There is a modest amount of funding to cover expenses associated with the volunteer program.

Temporary lodging is available on the Refuge for out-of-state volunteers, researchers staying for short or extended periods, and for natural resources classes. Training is also provided in some instances. For example, volunteers on the wolf and moose projects several years ago were on station year round. Because of the training time involved in teaching radio telemetry, research volunteers were required to stay a minimum of 3 months. Research volunteers have been required to contribute 1 day every 2 weeks to Refuge operations in order to introduce them to all Refuge operations and programs.

Refuge staff members coordinate, cooperate and partner on a regular basis with other federal, tribal, state, and local agencies. We work with FSA, Minnesota DNR, and Soil and Water Conservation District staff on inventories, easement reviews and recommendations related to wetlands and the CRP. Agassiz NWR also cooperates on wildlife studies and wildlife management with the Red Lake Band of the Chippewa. In addition, staff members participate in local, regional and state water management efforts, attend meetings of the Marshall County Water Board, Fish, Wildlife, and Outdoor Recreation Subcommittee of the Red River Basin Board, the Red Lake River Watershed District, and serve as team members on several Flood Reduction Mediation workgroups. The Refuge currently has three categories of museum property. These include a collection of 104 zoological specimens, an undetermined number of historical photographs (especially from the CCC), and an archeological collection of 184 artifacts. This museum property is managed under the Region-wide Scope of Collections Statement dated October 31, 1994. The zoology and photography collections are housed at the Refuge headquarters. In 2001 the Refuge contracted to have the historic photographs, slides, records, and annual narratives scanned into a database that includes an index and cross-reference. The archeological collection is accessioned, cataloged, and stored at the Minnesota Historical Society under terms of cooperative agreement 14-16-003-91-991 dated May 13, 1992.

Law Enforcement

Agassiz NWR is dedicated to safeguarding the resources under its jurisdiction, including its facilities, National Wilderness Area and cultural resources. Resource management on the Refuge includes both protective and preventive functions. Protection is safeguarding the visiting public, staff, facilities and natural and cultural resources from criminal action, accidents, negligence and acts of nature such as wildfires. Preventing incidents from occurring is the best form of protection and requires a known and visible law enforcement presence as well as other proactive steps to address potential threats and natural hazards.

A full-time Law Enforcement officer from Detroit Lakes WMD has also been assigned to cover Agassiz NWR and Rydell NWR. Fortunately, the Refuge is in an area of relatively low criminal activity. Still, violations and investigations of those violations do occur, and notices of violations are written. Recent examples of violations include the killing of a Tundra Swan and a Bald Eagle in 2002, the killing of radio-marked wolves in 2000 and 2001, and incidents of trespassing and dumping. Waterfowl hunting takes place on adjoining state-run wildlife management areas (mainly Elm Lake and Eckvoll) and requires the presence and participation of Refuge law enforcement officers.

Wildfire Preparedness

There have been several wildfires in the last few years and all were deemed to be arson. The Refuge is prepared both in terms of staff training and equipment for wildfire activity.

Most summers, the Refuge dispatches qualified personnel to western wildfire assignments, to assist other federal firefighters in national parks and forests. These assignments can last days or weeks.

Archeological and Cultural Values

Cultural resources management in the Service is the responsibility of the Regional Director and is not delegated for the Section 106 process when historic properties could be affected by Service undertakings, for issuing archeological permits, and for Indian tribal involvement. The Regional Historic Preservation Officer (RHPO) advises the Regional Director about procedures, compliance, and implementation of cultural resources laws. The Refuge Manager assists the RHPO by informing the RHPO about Service undertakings, by protecting archeological sites and historic properties on Service managed and administered lands, by monitoring archeological investigations by contractors and permittees, and by reporting violations.

In September 2002, a *Cultural Resources Management Plan* for Agassiz NWR, prepared under contract, was completed. It provided background information on 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 provided overview of management goals and the legislative framework (both federal and state mandates) for cultural resources on the Refuge.

The *Cultural Resources Management Plan* is incorporated into this CCP by reference. It identifies management measures for cultural resources on Agassiz NWR that are needed 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 the establishment of internal processes and the identification of key personnel for the coordination and implementation of the measures, archeology, architectural history, and Traditional Cultural Properties, and the associated processes of setting up a Programmatic Agreement, identifying interested parties, consulting with interested parties, dealing with inadvertent discoveries, and establishing systems of records management.

A Traditional Cultural Property is generally defined as a property that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining its historical identity. Locations, landscapes, buildings, and neighborhoods with unique attributes may all qualify as Traditional Cultural Properties.

Wilderness Area and Wilderness Review

In 1976, Congress designated 4,000 acres in the north-central portion of Agassiz NWR as Wilderness. The 4,000 acres include one of the most northwesterly communities of black spruce-tamarack bog in Minnesota, as well as two lakes, Whiskey and Kuriko, that may have been formed by deep peat fires prior to settlement of the area. The Wilderness Area is managed under the provisions of the 1964 Wilderness Act as a unit of the National Wilderness Preservation System. That is, it is "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain" (The Wilderness Act, September 3, 1964; (16 U.S.C. 1121 (note), 1131-1136)). Staff carries out no active management in the Agassiz NWR Wilderness Area. Only the minimum amount of activity would be allowed if management actions are proposed in the future. Exploration on foot and hunting by the public are permitted, but due to the area's limited access and boggy condition, these pursuits are undertaken only by hardier souls.

Since 1994 both spruce and tamarack along the western boundary of the northern half of the Wilderness Area have been dying. While the exact cause is unknown, higher water levels in Thief Bay Pool have been suggested as possibilities. This hypothesis is now being investigated in a study initiated in 2002. Also, water flow effects of the road and associated ditches that bisects the Wilderness Area into a north and south half are being studied. This road was excluded from Wilderness Area designation for water management purposes.

As part of the CCP process, we reviewed other lands within the legislative boundaries of Agassiz NWR for wilderness suitability. No lands were found suitable for designation as defined by the Wilderness Act of 1964. The Refuge does not contain 5,000 contiguous roadless acres nor does it have any units of sufficient size to make their preservation practicable as Wilderness. Lands acquired for the Refuge have been substantially altered by humans, both before and after the Refuge's establishment, particularly from agriculture, roads, and flood control and hydrological infrastructure. Manmade facilities like dikes, ditches, water control structures, roads, and other facilities are spread throughout the Refuge, while artificial impoundments and manipulated wetlands dominate the landscape.

Public Education and Recreation

The 1997 National Wildlife Refuge System Improvement Act emphasizes wildlife management and that all prospective public uses on any given refuge must be found to be compatible with the wildlife-related refuge purposes before they can be allowed. The Refuge System Improvement Act also identifies six priority uses of national wildlife refuges that in most cases will be considered compatible uses:

Table 3: Visitation and Off-site Environmental Education, 2001 and 2002, Agassiz NWR

Activity	2001	2002
Interpretation and Nature Observation	17,300	20,780
Environmental Education (On Refuge)	470	235
Recreation (deer hunting)	165	250
Wilderness Area (deer hunting)	35[1]	30[2]
Environmental Education (off Refuge)	1,010	170
Environmental Outreach (Off Refuge)	10,610	14,210

1.This number is part of the deer hunting figures.
2.This number is part of deer hunting figures.

Wildlife observation
Wildlife photography
Hunting
Fishing
Environmental education
Environmental interpretation.

Agassiz NWR supports all but one of these uses. Fishing is not available on the Refuge due to unsuitable conditions, primarily shallow waters and the virtual absence of sport fish.

The Refuge has an Interpretation and Recreation Plan, prepared in 1980, that provides general guidance for Refuge management and staff on matters related to public use of Agassiz NWR. The plan provides interpretive methods and concepts, specifies permissible recreational pursuits, and identifies existing and proposed recreational facilities.

The use of Off Road Vehicles such as snowmobiles, ATVs, motorized boats, etc. by the public for recreational purposes has never been permitted on Agassiz NWR's lands and waters. The CCP maintains this policy over the next 15 years.

In 2002, Region 3 of the U.S. Fish & Wildlife Service prepared a Visitor Services Review Report on Agassiz NWR. The report lists 10 general minimum visitor service requirements that apply to all national wildlife refuges and discusses their relevance to Agassiz NWR's circumstances. The report also makes a number of recommendations on how to improve visitor services on the Refuge.

Provide Visitor Services

Agassiz NWR furnishes various facilities and opportunities for visitors:
Wildlife displays in the Headquarters Visitor Center
Maakstad Hiking Trail – a one-quarter mile, non-interpreted trail
Headquarters Hiking Trail – one-half mile, accessible, interpreted
Lost Bay Habitat Drive – 4-mile gravel road, interpreted auto drive
Deer Hunting
Environmental Education
Wildlife Interpretation

Open Houses
Three Visitor Kiosks
Two Overlooks

Total estimated visits to the Refuge were 17,935 in 2001 and 21,265 in 2002. Table 3 shows the breakdown of this visitation by activity and the additional off-Refuge Environmental Education and Outreach.

Wildlife Observation/Photography

One of the most popular visitor activities at Agassiz NWR is observing wildlife. The Refuge is nationally recognized by bird watchers. The Minnesota Pine to Prairie Birding Trail brochure and the Detroit Lakes Birding Festival also attract bird enthusiasts to the Refuge. The best viewing times vary by species and group: for Franklin's Gulls, it is May 1-July 14; for warblers, May 15-25; for Sandhill Cranes, April 25-May 5 and September 25-October 10; for sparrows, May 15-25; and for shorebirds, May 20-30 and August

15-September 15.

In spite of the recent declines in the moose population, this majestic animal is still one of the most popular species of wildlife for viewing. They are best observed in willow thickets during September and October. Gray wolves are seen infrequently, but most visitors are thrilled with the possibility of seeing one.

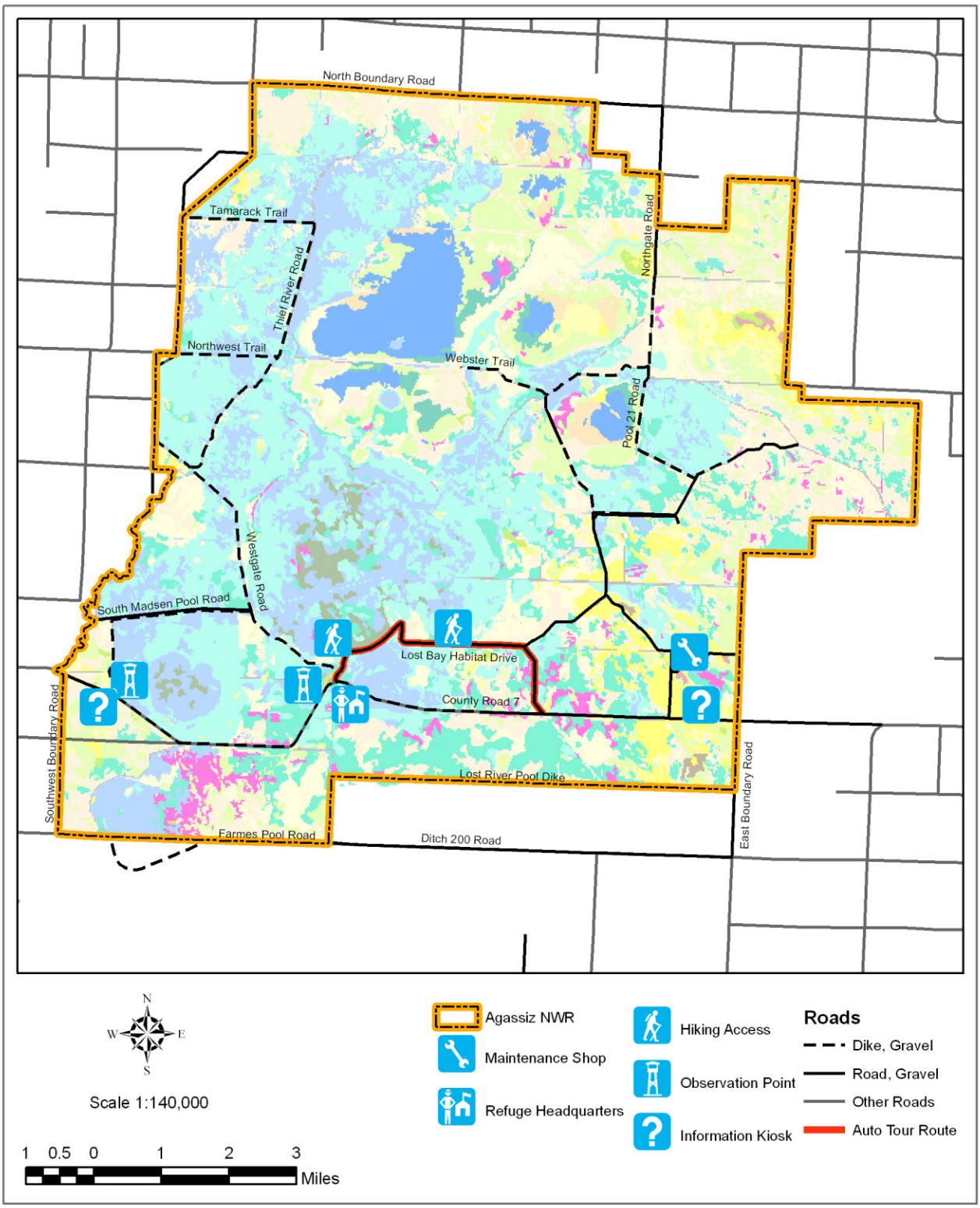
The habitat auto drive and foot trails provide opportunities for nature study, wildlife photography and observation, which are among the six priority uses of national wildlife refuges (Figure 11). The drive and trails are open from May through October during daylight hours. Hiking is permitted only on the drive and designated trails. A 100foot observation tower near the visitor center and a 14-foot observation platform along County Rd. 7 are available to view the landscape and its wildlife from an elevated perspective. The 100-foot tower is closed at present and for the indefinite future because of liability concerns.

Hunting

Deer and moose hunting are the only hunts authorized on the Refuge. Seasons are held in conjunction with state hunting seasons and regulations. The Refuge and adjoining State-owned Wildlife Management Areas are designated as one management unit for hunting regulations. Refuge staff confers with local Minnesota DNR managers to set harvest goals each year. Deer hunting is used as management tool to keep the population from exceeding the carrying capacity. This maintains a healthy herd with adequate food supplies during most winters and provides the base food supply for the two wolf packs that occupy this area. The record harvest was 755 deer in 1992. During low population levels harvest is restricted to bucks only. During high population levels harvest of does and fawns is encouraged with extra antlerless tags available to hunters.

Moose harvest has been conservative to maintain the population at high levels to increase public viewing opportunities and yet maintain a check on population growth. During times when the population exceeded the goal of approximately 300, less than 25 moose tags were issued on an every-other-year basis. The season has been closed since 1993 due to the decrease in population.

Figure 11: Visitor Service Facilities, Agassiz NWR


North Boundary Road
Tamarack Trail
Thief River Road
Northwest Trail
Webster Trail
Northgate Road
Pool 21 Road
Westgate Road
South Madsen Pool Road
Lost Bay Habitat Drive
County Road 7
Southwest Boundary Road
Lost River Pool Dike
Farmes Pool Road
Ditch 200 Road
East Boundary Road
N
W
E
S
Scale 1:140,000
1 0.5 0 1 2 3
Miles
Agassiz NWR
Maintenance Shop
Refuge Headquarters
Hiking Access
Observation Point
Information Kiosk
Roads
Dike, Gravel
Road, Gravel
Other Roads
Auto Tour Route

Environmental Education/Interpretation

Beginning in 2000, Agassiz NWR's visitor center has been open on Sunday afternoons from 1 to 5 p.m. during the summer months. The purpose of this opening is to encourage local visitation for the working population, as opposed to out-of-town visitation. The Thief River Falls Convention and Visitor's Bureau ran local cable television coverage promoting the Refuge among local residents. This opportunity is currently being evaluated as to whether or not to continue.

The Refuge hosts various special events every year. During the past few years, we have held two Open Houses, one in the spring to celebrate Migratory Bird Day and one in the fall for National Wildlife Refuge Week. Attendance ranges from 60 to 400 depending on the event and the weather. Past events have included the following activities: a local citizen role-playing Theodore Roosevelt, local artists displaying arts and crafts, firefighting equipment demonstrations, birding, Refuge and fire tower tours, waterfowl capture and banding techniques, presentations by wildlife experts and students conducting research, hunting skills demonstrations, and games for adults and children. During the September 22, 2001, celebration of National Wildlife Refuge Week, we dedicated the new Headquarters Hiking Trail, which is accessible and was constructed with the assistance of local Girl and Boy Scouts.

Local businesses are very generous at these events and donate prizes, food and refreshments. Prior to these events staff and volunteers advertise in a variety of ways – fliers and posters may be distributed to schools in nine counties, staff air information on local radio and TV stations, and news releases are distributed widely.

Public Banding Night is a very popular annual event that typically takes place in mid-September with about 100 people attending. Adults and children can help band ducks. The "Mud Lakers" used to live on the Refuge prior to Refuge establishment or are descendants of these homesteaders. In 1999, the annual Mud Laker Reunion was held on the Refuge for the first time in the new headquarters, with 25 people attending. This was a watershed event, because for decades many Mud Lakers resented the Refuge, since they were moved off their land and out of their homes by the state government to make way for the establishment of a waterfowl sanctuary in the 1930s. It was fascinating for staff to listen to these folks describe life on their frontier homesteads and look at photo albums and maps. It was also an outstanding opportunity for the Refuge to improve its historical files and contribute to cultural

resources management at Agassiz NWR. During the 2002 Mud Laker Reunion at the Refuge office, descendent Warren Sagstuen donated a beautiful, polished granite memorial bench to Agassiz NWR, inscribed with the dedication “In Honor of the Mud Lake Pioneers.” The bench sits beside the headquarters and visitor center, at the start of the Headquarters Trail with a peaceful view of Headquarters Pool.

The Refuge has also cooperated with the Goodridge Area Historical Society in developing and conducting a historical tour of state and federal wildlife areas in the region that had settlement pioneers, CCC camps, and other structures representing local history. Tours in 2001 and 2002 were not well attended, but attendees all enjoyed them, and the whole venture may still have a future.

Agassiz NWR has an agreement with the Northwest Service Cooperative to distribute Refuge and special events posters to 52 schools in nine counties at no cost. The cooperative now includes the Service’s Wetland and Prairie Educational Trunks available for teachers to check out in a nine-county area in northwest Minnesota. In September 2002 staff gave a 3-hour workshop to 10 teachers on the use of the exhibits and materials in these two trunks.

Agassiz NWR has made several visitor service improvements in the last few years that are worth noting. Since 2000, we upgraded and produced new Refuge, bird, mammal, and hunting brochures to Service standards. New wildlife display cabinets were added in the office visitor contact area and two 20-power telescopes were installed on the Parker Observation Deck and Headquarters deck. Also, the Refuge headquarters and visitor center were landscaped with native shrubs, trees and grasses and major rehabilitation was completed on the 100-foot observation tower.

Outreach

Agassiz NWR has an active outreach program that disseminates information on Refuge activities, the Refuge System, and wildlife conservation far beyond the Refuge boundaries. Our efforts include involvement in the Northwest Gateway Birding Festival, Minnesota Moose Mystery/Adopt-a-Moose website, two bulk mailings to several neighboring towns on the moose research project, slide talks, lectures, classroom visits, radio and newspaper interviews, field trips, media contacts, and even participation in town parades and county fairs. The National Wildlife Refuge System mascot “Puddles” (a Service employee wearning a big blue goose costume) visits the Refuge often and was a hit with children when he rode the new airboat in the Middle River Goose Fest Parade. The Agassiz NWR float won the Mayor’s Choice Award in 2002. In 2001 staff attended bi-monthly meetings on the Minnesota Pine to Prairie Birding Trail with five Convention & Visitors Bureaus, Minnesota DNR, Service, and the Audubon Society.

From 1994 to 1997 Agassiz NWR sent out a newsletter, A Wild Note, to 35 Refuge neighbors. The newsletter informed them about activities on the Refuge and about wetland restoration projects on private lands in the RMD. The newsletter was greatly appreciated by the neighbors. Refuge staff realizes the value of this important communication, however, since the floods of 1996-97 and subsequent recovery years, this practice has been discontinued in favor of other priorities.

Other recent outreach activities include organizing, writing grants, and assisting in developing a prairie and wetland learning area on 10 acres at Challenger Elementary School Outdoor Nature Center, assisting the City of Badger in enhancing an area for wildlife and public use facilities, participation in the Timber Wolf Alliance, providing information on Agassiz NWR to the author of a new guidebook on America’s national wildlife Refuges being published to honor the Centennial of the Refuge System, newspaper interviews, displays in Pennington and Marshall county fairs, presentations and instruction in firearms safety for hunters, teaching fire courses to students at the University of Minnesota/Crookston, and providing information and photographs on the Refuge to various businesses, surveys, websites, and guidebooks.

Future Management Direction: Tomorrow’s Vision

Refuge Vision

Agassiz NWR lies within the shallow depressional lake plains formed by the pre-historic Glacial Lake Agassiz. The Refuge is located within the aspen parkland transitional zone between the tallgrass prairie to the west and northern forest to the east. Agassiz NWR comprises a diversity of plant and animal species, typical of ecotonal communities. Since the beginning of the 20th century, the lands within this area have been manipulated for agricultural purposes, which highly modified natural landscapes and ecosystem functions. Since its establishment, the Refuge has been intensively managed for the benefit of migratory birds and other wildlife through the construction of dikes and water control structures.

Agassiz NWR and the surrounding area will be the premier natural resource of Marshall County and northwestern Minnesota. The Refuge and its seven-county management district, working with partners, will take a landscape approach to promote functional watersheds and connect to natural areas. Refuge management programs and activities will emulate natural functions and processes, of the different native habitats for optimal wildlife use. The resulting benefits will be showcased to demonstrate the compatibility of biological diversity, integrity, natural ecological processes and sustainable agriculture.

People will be attracted to the Refuge and northwestern Minnesota to view and enjoy the wonders of natural ecosystems. Visitors will have quality, wildlife-dependent experiences that provide personal and societal benefits, such as a sense of peace and tranquility and support of a strong conservation ethic. Refuge staff, visitors, and the community will understand and appreciate a well-functioning landscape and the cultural history of the area. This vision will be the catalyst to further strengthen a positive community-Refuge relationship.

Goals, Objectives and Strategies

The planning team developed goals and objectives for three management alternatives at Agassiz NWR and its Refuge Management District. Private citizens, cooperating agencies, conservation organizations, and Refuge staff all participated in this endeavor. Alternative A is the Current Management Direction or No Action Alternative. Alternative B is Minimal Upland Habitat Management Alternative, and Alternative C is the Open Landscape/ Natural Watercourses Alternative. The Environmental Assessment, published with the Draft CCP, describes and evaluates each alternative. The preferred alternative is C (Open Landscape/Natural Watercourses), and this forms the basis for the Agassiz NWR CCP and the goals, objectives and strategies presented on the following pages. The planning team established goals for major management areas, objectives for achieving those goals, and the specific strategies that will be employed by Refuge staff. The goals are organized into the broad categories of wildlife, habitat, and people.

Goal 1: Wildlife

Protect, restore and maintain a natural diversity of wildlife native to northwestern Minnesota, with an emphasis on Service Resource Conservation Priority Species.

Discussion: This goal exemplifies the Refuge staff 's commitment to "thinking globally and acting locally." On the local and regional scales, it implements the broad mission of the National Wildlife Refuge System to conserve America's wildlife and enhance biodiversity. Agassiz NWR can most effectively do its share as part of the national conservation strategy by focusing on those migratory and resident species indigenous to the particular habitat types found in northwestern Minnesota. In emphasizing Conservation Priority Species in Region 3 of the Refuge System, Agassiz NWR is contributing to wildlife conservation at an appropriate regional scale by trying to assist those species in greatest need of attention. This goal expands the Refuge's original specific focus on waterfowl and symbolizes its commitment to a more holistic view of wildlife. In general, at Agassiz NWR, direct wildlife outcomes are effected primarily through habitat management.

Objective 1.1: **Breeding Ducks:** Maintain an annual average of 7,000 breeding pairs of ducks over a 5-year period by providing optimal breeding habitats via the Habitat and Marsh & Water Management Plans.

Rationale: Diving and dabbling duck breeding pairs are combined in this objective because ideal nesting conditions for either group fluctuate with water management activities and natural environmental events such as drought or flooding. In general, diving ducks nest above water in emergent vegetation and dabbling ducks nest in upland vegetation. In most impoundments, high water increases available over-water nesting sites for diving ducks and decreases available upland nesting sites for dabbling ducks. Conversely, lower water, including drawdowns or drought, increase upland sites and decreases over-water nesting sites. Therefore, a dewatered pool is never actually taken out of production, but merely utilized by different species with more terrestrial nest site preferences. The total number of breeding pairs of all ducks varies widely from year to year, having ranged from below 5,000 to about 13,000 since 1970, with a 30-year average of approximately 7,000.

In addition to availability of nesting habitats, we must also provide for brood rearing, post-breeding/molting, and migration. Optimal duck brood habitat offers abundant food and shelter from adverse weather and predators, all within close proximity. During molting season, ducks are flightless and vulnerable to both avian and mammalian predation. During this time they seek medium-density cover.

Strategies:

Conduct breeding bird pair surveys every spring to monitor the number of breeding pair of dabbling and diving ducks and monitor success in reaching the objective.

By means of the Annual Marsh & Water Plan, adjust water levels and carry out drawdowns in the Refuge's 26 managed impoundments or wetland units in such a manner that a variety of nesting habitats are available in any given year.

Maintain water control structures and dikes in good operating condition so that they can be relied upon to manipulate water levels according to the management plan.

Utilize prescribed fire, herbicides and drawdowns to maintain and improve marsh and adjacent upland shrub and grassland habitat for nesting waterfowl.

To encourage brood rearing of dabblers, seek to create emergent cover with numerous scattered openings that contain dense food-producing submergents.

To encourage brood rearing of divers, seek to create large open aquatic bed habitat that allows for escape from predators by diving and promote an abundant invertebrate food source.

For molting birds, promote medium-density cover that has a dense canopy but allows for unrestricted movement for feeding and escape from predators.

Develop a step-down Habitat Management Plan by 2006.

Objective 1.2: **Duck Production on Agassiz NWR:** Based on a 5-year average, maintain annual brood production above the long-term average of over 13,000 ducklings.

Rationale: A variety of habitats must be provided to produce ducks. Habitat for pairing, nesting and brood rearing must be available in close proximity. Fledged ducklings are the best measure of the suitability of waterfowl breeding habitat. Climatic factors that are beyond the control of management can influence habitat suitability so long-term averages are a better measurement of management effectiveness than just one year alone. Brood counts have been conducted on the Refuge for 45 years and the average production since 1981 has been between 13,000 and 14,000 ducklings.

Strategies:

Conduct the annual brood counts according to the Refuge Wildlife Inventory Plan. The annual brood counts include all classes of ducklings and are an index to the number of ducklings actually fledged.

Manage impoundments to provide a variety of breeding habitats in close proximity to each other.

Objective 1.3: **Duck Production on the Refuge Management District:** Maintain a recruitment rate (fledged ducklings per hen) of greater than 0.5 for five of the most abundant species (Mallard, Gadwall, Blue-winged Teal, Northern Shoveler and Northern Pintail) of dabbling ducks combined on the private lands in the District based on the 4-squaremile survey analysis.

Rationale: Recruitment rate analysis is a reflection of the number of pairs, wet ponds and available nesting cover. Management options for private lands in the Refuge Management District are different than for Agassiz NWR and duck production objectives should be separated. Staff workloads currently limit the amount of contact and management agreements the Refuge has with private landowners in the RMD. Changes in federal and state farm programs and the expiration of Conservation Reserve Program contracts will increase the need for the Service to develop agreements to maintain wildlife benefits in the Management District.

Strategies:

Fill the Refuge Operations Specialist GS-485-9 RMD position at Agassiz NWR to meet the potential for management and cooperative agreements on private lands in the Refuge Management District.

Assist landowners to work with existing state and federal programs to restore wetlands and increase grasslands on private land. These efforts will be concentrated in designated corridors, large grassland blocks, or flood prone areas.

Develop cooperative agreements between the Service and private landowners to assist with management of upland and wetland habitats to keep them in optimum condition for waterfowl nesting and brood rearing. Agreements can include the use of prescribed fire, mechanical treatments, chemical application and water level manipulation.

Objective 1.4: **Nesting Franklin's Gulls:** Maintain an annual average of 20,000 nesting Franklin's Gull pairs over a 5-year period by providing ideal nesting conditions in Agassiz Pool.

Rationale: Agassiz NWR supports the largest Franklin's Gull nesting colony in the United States. There are about eight nesting sites in the lower 48 states, but none as consistently large as the Refuge site. Since 1993, when aerial census of the nesting colony was initiated, the colony size has varied from 7,000 to 40,000 pairs; with the exception of the year 2000 when there were no nesting pairs because the pool was in drawdown.

Strategies:

Conduct breeding gull surveys annually with aerial photography and mapping acreage on the water to determine density.
Manipulate water levels to maintain bulrush and low-density cattail for nesting habitat.

Coordinate 10 to 15 year interval drawdown schedule of Agassiz Pool with Thief Lake WMA (Minnesota), Sand Lake NWR (South Dakota), and Lake Alice NWR (North Dakota), to ensure some nesting habitat is available regionally.

Objective 1.5: **Marsh and Grassland Bird Monitoring:** Annually, determine population trends and relative abundance of inconspicuous marsh birds and birds occupying grassland and oak savanna habitats.

Rationale: In 2000, annual monitoring of secretive marsh birds was initiated on the Refuge to test the national Marsh Bird Monitoring Protocol. This methodology is still being evaluated and may be modified. The Refuge started an inventory of nongame birds using the point count technique in 1994, covering all of the major habitats on the Refuge. The points delineated for this survey have been inventoried once and a second survey was initiated in 2003. Knowledge about the birds and the data from either of these techniques is not sufficient at this time to set Refuge population goals. However, relative abundance and trends may be determined and can be evaluated for sensitivity to population changes due to management practices.

Strategies:

Annually conduct the secretive marsh bird survey three times during the breeding season at the established survey points.

Increase the frequency of conducting point counts on grassland, sedge meadow and wetland birds to at least bi-annually.

Submit data to the respective national coordinators/data bases and make changes to protocol as determined by the national evaluation.

Analyze Refuge data to determine breeding bird response to management practices.

Objective 1.6: **Gray Wolves:** Maintain two gray wolf packs on the Refuge based on howling surveys.

Rationale: Agassiz NWR has supported two gray wolf packs for 12 years, and this number is considered viable and sustainable. Gray wolves prey on both large and small mammals, including moose, deer, muskrat, beaver, rabbit, and snowshoe hare. They also depredate and scavenge livestock in the area (off the Refuge), especially when natural prey is scarce. This reality has led to attitudes ranging from disregard to persecution by some in the agricultural community, which is passed on from generation to generation. It is not uncommon to find wolves shot or run down by snowmobiles in Minnesota. The Refuge can manage for wolves only indirectly, by fostering habitat conditions that are favorable to prey populations, and by maintaining populations of the wolves' preferred prey.

Strategies:

Manage for a Refuge deer herd at a density of 15-20 per square mile.

Continue to conduct howling surveys every 5 years.

Manage water levels in a manner consistent with maintaining beaver and muskrat populations.

Regulate trapping to maintain beaver and muskrat populations for wolf prey base.

Maintain a mix of wetland, brush, forest, and grassland habitats that is conducive to healthy deer populations.

Objective 1.7: **Deer Population:** Annually, maintain deer population for State Management Unit 203 at densities between 15-20 deer per square mile based on annual winter surveys for a wolf prey base and public hunting opportunities.

Rationale: Based on studies and long-term experience with deer herd management by Minnesota DNR, this is the optimal population density or carrying capacity of white-tailed deer in habitat characteristic of this region. At present, the Refuge's deer herd is healthy and increasing, at a density of approximately 12 per square mile.

Strategies:

Continue to utilize regulated firearms hunting every fall during the regular state deer-hunting season and in compliance with Refuge rules as a means of controlling the Refuge deer herd at a level commensurate with the population density objective.

Monitor the size and population density of the deer herd through an aerial census every winter.

Monitor for signs of habitat damage such as browse lines and crop depredation on adjoining private farmland that would indicate that carrying capacity has been surpassed.

Evaluate the health of individual animals and herds using standard techniques, as needed, and by cooperating with the Minnesota DNR.

Utilize mowing and prescribed burning techniques to create and maintain browse and cover.

Prepare a step-down management Refuge Hunting Plan to guide hunt decisions.

Objective 1.8: **Moose Population:** Maintain moose population for State Management Unit 2 at 200 to 350 individuals (if population recovers) based on annual winter surveys and carrying capacity for wildlife viewing and hunting opportunities.

Rationale: As with the white-tail deer population density objective, the target population for moose reflects what biologists believe local habitats can support. Beginning in 1993, the Agassiz NWR moose population crashed for unknown reasons, declining to a low of approximately 40 individuals in 1998 as determined by the quadrat census method. This sharp decline in numbers paralleled a wider collapse throughout northwest Minnesota, the causes for which are under investigation and still being determined. Since 1998, the Refuge's moose herd has been increasing slowly, but is still less than half the population objective.

Strategies:

Continue to monitor moose numbers by means of annual mid-winter aerial surveys using both the quadrat and transect survey techniques.

Re-open the moose hunting season when recovery of the moose herd exceeds the minimum objective of 200 individuals.

Utilize winter mowing and prescribed fire to maintain shrub/scrub habitats.

Prepare a step-down management Refuge Hunting Plan to guide hunt decisions.

Objective 1.9: **Outdoor Laboratory:** Continue serving as an outdoor laboratory for natural resource research.

Rationale: The large size of the Refuge makes it an ideal site to investigate habitat and population questions for even large mammals. The Refuge has a long history of supporting quality ecological research on a wide array of habitat, management practices and species from invertebrates to moose. Research has been aimed at applied management questions and natural history investigations.

Strategies:

Promote strong relationships with universities and USGS to conduct sound scientific investigations to answer natural resource questions.

Maintain bunk house availability for research technicians and volunteers working on projects.

Build a laboratory/environmental education center to accommodate lab work associated with field investigations and provide educational opportunities to local school groups that will stimulate and motivate students to enter the wildlife management and research fields.

Seek partners and funding for research projects.

Goal 2: Habitat

Restore and enhance a natural landscape within the Refuge and its seven-county Management District to emulate naturally functioning watersheds and habitats within the tallgrass prairie, prairie pothole, aspen parkland, and northern coniferous forest, including habitat corridors for wildlife.

Discussion: The Refuge has both inherited and further constructed a radically altered landscape and vegetation communities from those that existed during the pre-settlement era. The habitat goal seeks to restore natural landscapes and processes, to the extent feasible, within the constraints imposed by Agassiz NWR's establishing purposes, the altered landscape outside the Refuge, responsibility to the surrounding community, and wildlife aims.

Figure 12, Figure 13 and Figure 14 illustrate proposed habitat changes under the CCP.)

Objective 2: **Lowland Shrub and Grasslands Conversion:** Achieve an increase in grasslands by a net decrease of lowland shrub (alder, willow, dogwood) within the Focus Area by 115 acres over the next 10-15 years through conversion to grasslands to benefit wildlife species like the Bobolink, Sharp-tailed Grouse, Marbled Godwit, Western Meadowlark, and nesting dabbling ducks. (Figure 12, Figure 13 and Figure 14.)

Figure 12: Future Habitat Conditions, Agassiz NWR

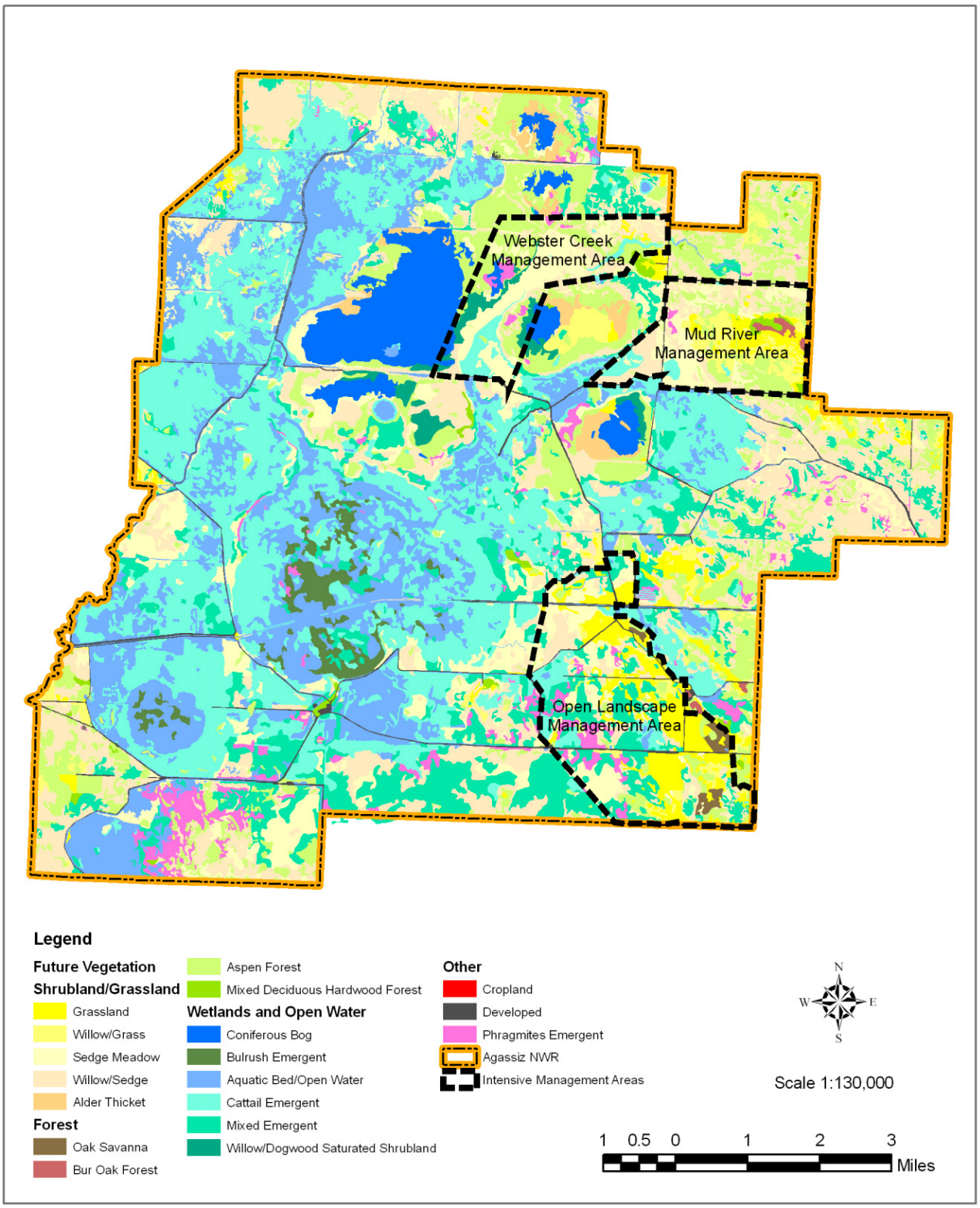


Figure 13: Current and Future Landcover on the Open Landscape Management Area, Agassiz NWR

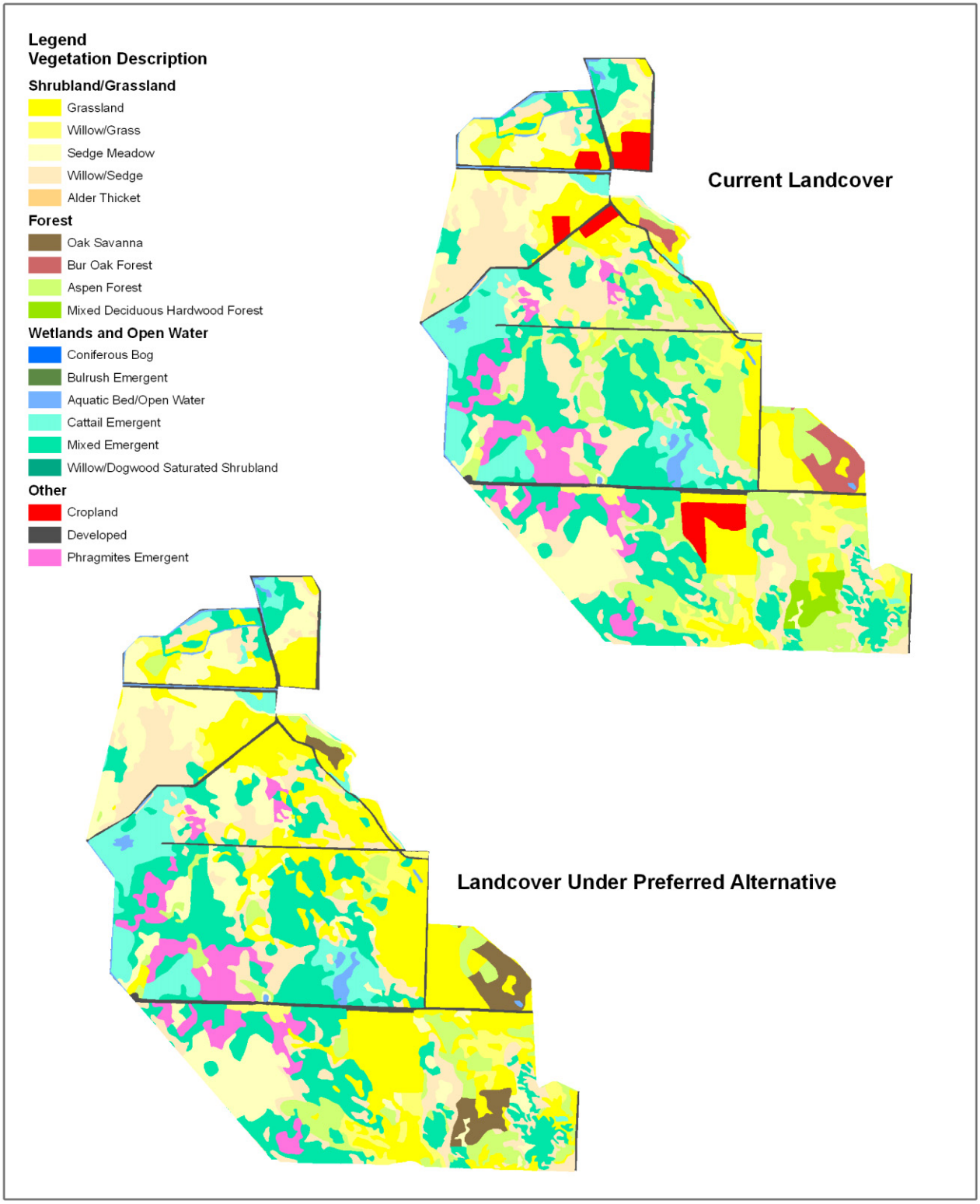
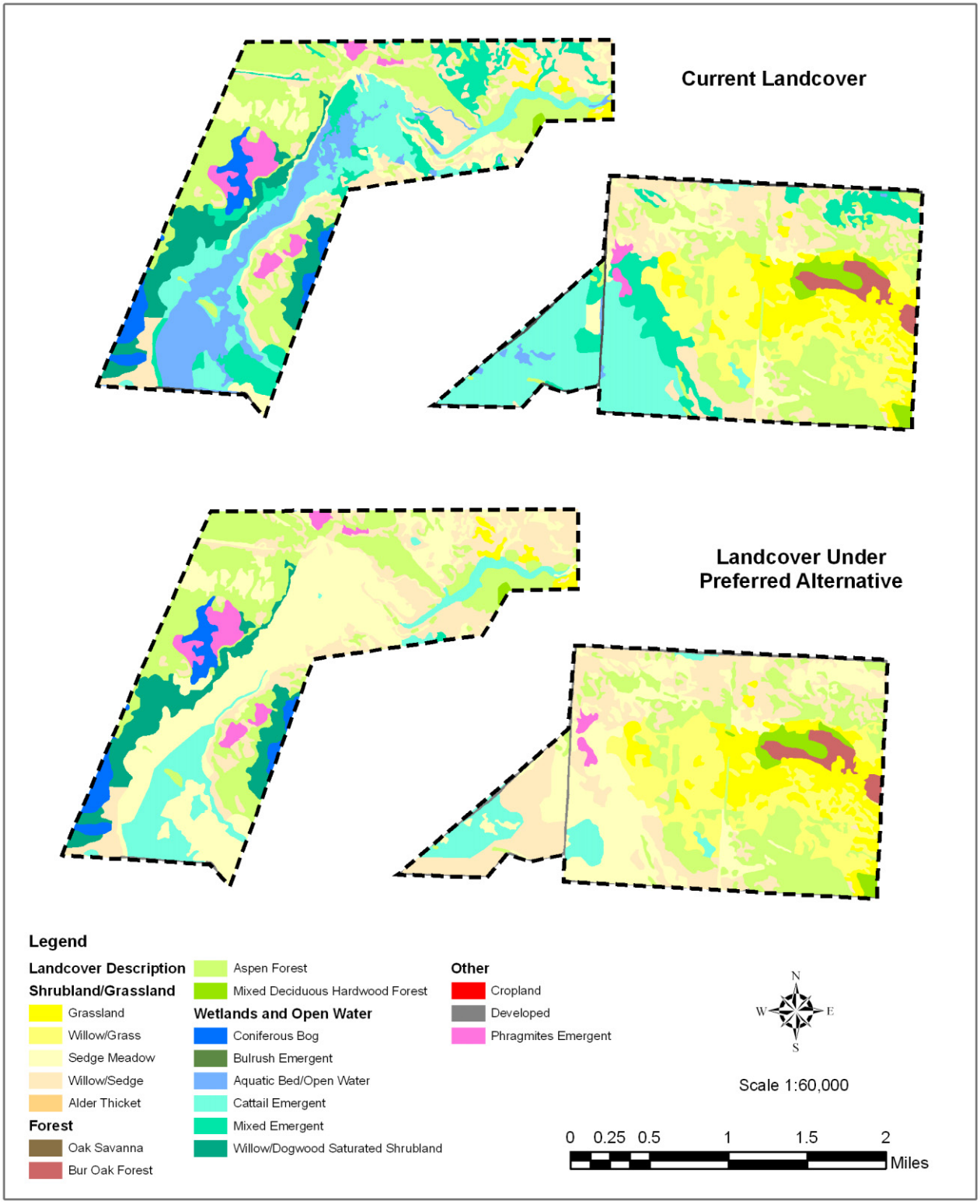


Figure 14: Current and Future Landcover on Webster Creek and Mud River Natural Watercourse Management Areas, Agassiz NWR



Rationale: Much of the Refuge's low-lying sites are succeeding to lowland shrub, which although it has value, is not a habitat that is regionally scarce like grasslands are becoming. This is an aggressive expanding plant community, which since the mid-1960s has contributed to reducing grasslands from 4,000 acres to 1,710 acres in 1997 under current management intensity. We hope to maintain an open landscape in a small portion

of the Refuge by focusing our management activities. Once conversion to grasslands is achieved, continual maintenance and intervention using mowing and/or prescribed fire will be necessary to maintain many of the sites in grasslands. Each of the beneficiary species cited in Objective 2.1 are Regional Conservation Priority species, species of State Special Concern, species of management concern on the Refuge, or all three.

Strategies:

Use prescribed fires, mowing, discing, or various combinations of these treatments to prepare a given site for conversion to grassland.

Use seed mixes from sources of prairie grasses, forbs, and herbs within 50 miles of the Refuge to reseed these sites.

Judicious use of herbicides may be necessary to help in the establishment of a grassland.

Use geo-referenced aerial photography and GIS spatial analyses to monitor long-term changes in this habitat and measure pursuit of the objective for grasslands.

Objective 2.2: **Aspen and Mixed Hardwood, Grasslands and Lowland Shrub Conversion:** Attain an increase in grasslands and shrublands by a net decrease of aspen and mixed hardwood forest within the Open Landscape Management Area by 300 acres, converting it to brushland and grassland for the benefit of wildlife species like Sharp-tailed Grouse, Marbled Godwits, and Bobolinks by 2009. (Figure 13)

Rationale: Although patches of aspen and mixed hardwood forests are valuable constituents of aspen parklands, they are not in short supply locally and regionally as are prairie grasslands. These forests have been aggressively expanding plant communities on the Refuge and have contributed to the reduction of grasslands. Hence, the emphasis is to increase open landscape grasslands at the expense of aspen/mixed hardwood acreage in a small focus on the Refuge.

Strategies:

Commercially harvest 647 acres of aspen/mixed hardwood forest within the management area within 5 years.

Maintain harvested areas through mowing and prescribed burning.

Continue using prescribed fire on a regular basis in stands of aspen and mixed hardwood and around their edges to consume seedlings and saplings and prevent restocking and recruitment by young trees while encouraging grasses.

Expand the use of girdling to kill trees in stands planned for conversion to grassland. Encourage the public to collect firewood in these sites.

Coordinate with the Minnesota DNR to manage the appropriate composition of brush and grasslands on adjoining WMAs.

Objective 2.3: **Open Water / Mudflat Conversion:** Beginning in 2005, experiment with decreasing open water / mudflat habitat by 400 acres in Webster, Kelly and Upper Mud River Pools by converting portions to sedge habitats and restoring streams to a more natural watercourse for species such as LeConte's Sparrow, Sedge Wren, Nelson's Sharp-tailed Sparrow and the Yellow Rail. (Figure 14)

Rationale: Open water and mudflat habitats are much more abundant on the Refuge than sedge meadow, hence the intent to augment sedge acreage. Sedge meadows constituted more than three-quarters of Minnesota's original wetlands and were indispensable habitat

for plants like lilies, irises and native orchids. Moreover, LeConte's Sparrow, Sedge Wren and Nelson's Sharp-tailed Sparrow are all Regional Conservation Priority species and the Yellow Rail is both a Regional Conservation Priority species as well as a species of State Special Concern.

Strategies:

Place Webster Creek, Kelly, and Upper Mud River Pools in drawdown to create conditions appropriate for sedge growth.

Monitor extent of sedge habitat annually by visual inspection, aerial overflights and GPS mapping. Use digitized geo-referenced aerial photography and GIS spatial analyses to track long-term trends.

Monitor for invasion by reed canary grass and Phragmities.

Stay abreast of research developments, experimental efforts, and pilot projects elsewhere in the state with regard to restoration of sedge meadow habitat.

Evaluate results after 5 years for success. If successful, explore removing water control structures and portions of dikes where feasible. If sedge establishment fails, management should return the pools to deep marsh habitat.

Objective 2.4: **Increasing Sedge Meadow:** Beginning in 2005, experiment with increasing sedge meadow by 1,250 acres to benefit wildlife species like the Yellow Rail, Sedge Wren, Nelson's Sharp-tailed Sparrow, and LeConte's Sparrow. (Figure 12, Figure 13 and Figure 14)

Rationale: See discussions above as to the value of sedge meadow habitat, its former abundance in Minnesota, its present scarcity, and the difficulty in restoring habitats around the state. Each of the four species mentioned are Regional Conservation Priority Species and species of management concern on the Refuge. This objective would draw on several different habitats, including open water, mudflat, willow scrub, bulrush, and cattail.

Strategies:

Conduct spring drawdowns followed by mid-summer burning and mowing in various pools for willow and cattail control.

Monitor for invasion of reed canary grass and Phragmities.

In Webster Creek and Mud River Natural Watercourse Management Areas, evaluate success after 5 years. If successful, consider removing water control structures and portions of dikes where feasible. If sedge establishment fails, management should return the pools to a deep marsh habitat.

Objective 2.5: **Reducing Cattail and Phragmites Infestation:** Experiment with decreasing cattail and phragmities vegetation by 840 acres, converting it to sedge habitat to benefit species like LeConte's Sparrow, Sedge Wren, Nelson's Sharp-tailed Sparrow and the Yellow Rail in the next 10 to 15 years.

Rationale: This objective may require increases in funding or advances in technology or control methods to be realized. Displacement of sedge meadow habitat by willow shrub-scrub, reed canary grass and cattails is an ongoing problem at Agassiz NWR (and elsewhere), and a solution has yet to be discovered or devised. Prolonged high water – all too common in recent years – contributes to invasion of the sedge zone by cattails. Present management is to lower water levels prior to fall burning of sedge meadow, as well as cutting 200-300 acres of willows in the winter. However, these practices are proving insufficient and net losses of sedge will continue to mount under the present

approach.

Strategies:

Utilize an adaptive management strategy that encourages experimentation with a variety of methods for maintaining and expanding sedge meadow acreage. For example solutions may involve spraying with chemicals (finding a herbicide with specificity for just willows/cattails may be impossible), extending dry periods for each pool, or implementing multiple burns over a short time period might improve success.

Experiment with multiple year pool drawdowns that would allow sedges to become better established and expand.

Experiment with back-to-back multiple burns of cattail-dominated areas.

Stay abreast of research developments, and experimental efforts on cattail management.

Explore cooperative research and restoration opportunities with the University of Minnesota, Minnesota DNR, and other institutions.

Continue to monitor habitat changes with aerial photo/GIS analysis and research advancements. Assess whether continuing to expend limited staff and funds to control cattail and willow encroachment on sedge meadow is a worthwhile cost.

Objective 2.6: **Maintaining Hardstem Bulrush Emergent Habitat:** Maintain 770 acres (1.3 percent of the Refuge) in hardstem bulrush emergent habitat for nesting Franklin's Gulls, Grebes, diving ducks, Black Terns and Black-crowned Night-herons during April - August.

Rationale: Bulrush emergent habitat, specifically in Agassiz Pool, benefits a number of water-related birds like those listed in the objective. Aggressive hybrid cattail tends to out-compete bulrush stands. Water level management is directed toward suppressing the spread of cattails into the bulrush emergent habitat.

Strategies:

Raise water levels to depths that will flood out cattails and favor bulrush emergent habitat.

Use drawdowns where indicated to maintain or re-establish bulrush where open water or mudflats occur.

Monitor extent of bulrush emergent habitat annually by visual inspection, aerial overflights, and GPS mapping. Use geo-referenced aerial photography and GIS spatial analyses to track long-term trends.

Monitor bird-nesting activities.

Objective 2.7: **Managing Water Impoundments:** Manage water impoundments as a complex of basins to provide wetland diversity and improve water quality for maximum benefits to migrating and breeding birds. Management will be within the capabilities of the wetland system as a whole and individual impoundments will be drawn down on a 3to 10-year rotation.

Rationale: Water level manipulation allows managers to simulate different stages of the natural flood/drought cycle at the same time in different impoundments. This increases the diversity of habitat types and food resources in the wetland complex that is available to migrating and nesting birds. The emphasis is on semi-permanent wetlands as these

wetlands can be the most productive type for marsh nesting birds. The larger impoundments on Agassiz NWR provide a wide diversity of habitats within each impoundment. Management can increase this diversity by varying the water regime in nearby impoundments. The outcome will be interspersion of cover and openings for dabbling duck and marsh bird pair and brood habitat, open bays and medium density cover for diving duck broods, and post breeding/molting habitat.

Strategies:

Agassiz Pool (9,350 surface acres) will be in drawdown once every 10 years. The emphasis is on maintaining the hardstem bulrush plant community which is the most desirable for the nesting colony of Franklin's Gulls.

The six small Golden Valley and Goose Pen impoundments (normal summer pool 25 to 52 surface acres in size; total 218 acres) will be in a drawdown cycle of 3 years with burning and mechanical treatments of mowing and discing.

Sixteen other impoundments totaling 16,276 acres will be staggered in a drawdown cycle of 4 to 6 years. The emphasis is on maintaining openings in cattail areas. Burning will be prescribed to occur during the drawdown phase. If the natural watercourse trial objective is not successful in establishing sedge meadow habitat in the 3 impoundments, they will be added to this strategy (total 1,300 acres).

Provide stable water levels from May 1 to July 15 in a variety of cover types for over-water nesting birds and to prevent flooding of upland nests.

Lower water levels 6 to 12 inches in some impoundments during the fall to provide shallow foraging sites for migrating waterfowl.

Maintain sufficient depth of water during the winter for minnow survival to maintain food resource for piscivorous (fish-eating) birds and for muskrat survival to increase openings in cattail.

Improve water quality on a watershed scale through input and coordination with other agencies, within the constraints of the biological parameters for providing habitat for breeding and migratory birds.

Assess status of siltation and nutrient buildup in the Refuge basins. Develop strategies to address these concerns.

Objective 2.8: **Increasing Bur Oak / Savanna Habitat:** Increase bur oak / savanna habitat by 50 acres in the Open Landscape Management Area by 2014 for the benefit of such wildlife as the Whippoorwill, black bear, and Northern Flicker. (Figure 13) *Rationale:* The Whip-poor-will, black bear, and Northern Flicker are all species of management concern at Agassiz NWR and the former two are Regional Conservation Priority species as well. The increase in bur oak / savanna habitat will come primarily from elimination of aspens from stands of mixed deciduous forest.

Strategies:

Utilize techniques previously described to eliminate aspens, especially selective girdling and later removal by firewood harvesters.

Objective 2.9: **Mature Aspen Stands:** Provide mature aspen stands for Bald Eagle, Hooded Merganser and Bufflehead nesting activity.

Rationale: Currently seven eagle nests are located in mature aspen or cottonwood. During the past 10 years cavity nesting Hooded Merganser and Bufflehead pairs/ broods

have increased, which coincides with aspen stands maturing beyond 70 years of age. Studies indicate that aspen need to reach the age of 70 before cavities will develop.

Strategies:

Develop a forest inventory through GIS and ground-truthing that identifies existing old growth aspen.

Identify areas that will be managed as old growth aspen.

Conduct prescribed burns in these areas under conditions that will not kill old growth aspen.

Consult experts in aspen management to develop a schedule of management practices that will ensure that mature aspen will be available as old growth areas decline.

Develop a Step-down Forest Management Plan.

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Objective 2.10: **Cropland Phase-out:** Beginning in 2005, phase out all cropland by converting to grassland and shrub to benefit species such as the Bobolink, Sharp-tailed Sparrow, Marbled Godwit, and LeConte's Sparrow.

Rationale: This phase-out will take place over the life of the CCP, 10-15 years. It has already begun, and will continue at a similar rate (60 acres since 1997). There are now 170 acres of cropland left. Croplands are generally being phased out at most national wildlife refuges in accordance with the Service's Ecological Integrity Policy, which emphasizes native vegetation and natural processes.

Strategies:

Fields are prepared for seeding and planting through a combination of discing, herbicides, and prescribed fire. It may be necessary for repeated treatments.

Conduct annual monitoring to ensure that weedy species and non-native plants do not become problematic.

Use GIS spatial analyses every 5-10 years to keep track of long-term changes.

Objective 2.11: **Coniferous Bog:** Maintain 2,380 acres (3.9 percent of the Refuge) in coniferous bog for the benefit of such species as the Olive-sided Flycatcher, Connecticut Warbler, orchids and ferns.
Rationale: This acreage is mostly within the designated Wilderness Area of Agassiz NWR, although about 10-15 percent is also located by the Middle CCC Pool and several other sites. Both the olive-sided flycatcher and the Connecticut warbler depend on these types of habitat for breeding and migration stop-over sites and are Regional Conservation Priority species.

Carnivorous pitcher plants and sundews also occur within the coniferous bog. No active vegetation management is conducted within the Agassiz Wilderness Area, though recent mortality of spruces and tamaracks along its western edge may be attributed to higher water levels in Thief Bay Pool, wetter conditions over the last 10 years, or water-flow pattern effects caused by the road/ditches that bisect the area. The causes of this mortality are currently under study and water level manipulation in Thief Bay and Webster Pools and portions of the road/ditches may be altered based on the results.

Strategies:

Continue investigating causes of recent mortality in spruces and tamaracks along the western edge of the coniferous bog in the Wilderness Area; complete by 2005.

Depending on results of ongoing research into tree mortality, it may be necessary to lower water in one or more pools and/or remove portions of the road/ditches that bisect the area into a north and south section.

Complete a plant inventory and determine fire history in black spruce/ tamarack bog habitat by 2006.

Objective 2.12: **Conservation Easements:** Annually, inspect or manage at least 2,000 acres of the 7,000 acres of Conservation Easements in the Refuge Management District to improve conservation of natural resources and increase wildlife benefits.

Rationale: Management options on private lands in the Refuge Management District are limited by the terms of each individual conservation easement. Staff workloads currently limit the amount of contact, inspections and management the Refuge can conduct on the easements in the Refuge Management District. Changes in federal and state farm programs and the expiration of Conservation Reserve Program contracts will increase the importance of the habitat conserved by Refuge Management District conservation easements.

Strategies:

Fill the Refuge Operations Specialist GS-485-9 RMD position at Agassiz NWR to meet the potential for management and cooperative agreements on private lands in the Refuge Management District.

Restore hydrology and naturally occurring habitat that can reasonably be maintained.

Set up wildlife inventories and habitat monitoring procedures (aerial photos, photo stations and ground inspections) for the conservation easements that can be conducted on a rotating 5-year basis. A variety of habitats are represented on easement lands and procedures will need to be tailored to each property.

Inspect at least 2,000 acres annually for trespass and compliance with the terms of the easements. Inspections will include aerial reconnaissance and ground visits.

Plan and conduct management activities such as prescribed burns, mowing, haying, grazing, tree cutting, and chemical applications to maintain hydrology and desired habitat on at least 1,000 acres annually.

Objective 2.13: **Off-Refuge Corridor Habitat:** Continue to restore corridor habitat off-Refuge through the Partners for Fish and Wildlife program with priority given to riparian habitats and to increase grassland block sizes within the seven-county Refuge Management District.

Rationale: As a result of extensive efforts over the last 5 years to restore thousands of acres of wetlands on hundreds of private parcels within the Refuge Management District through the CRP program and other programs, Refuge staff and the Service have built up good relations with private landowners and cooperating agencies. These relationships can be drawn upon to extend these efforts to develop wildlife corridors off the Refuge as well as improve water quality and reduce sedimentation off and on the Refuge.

Strategies:

Consult with partners and cooperating agencies like Minnesota DNR, the Tribes, NRCS, Ducks Unlimited, Minnesota Waterfowler Association, Legislative

Council on Minnesota Resources, Watershed Districts, and The Nature Conservancy to find the best opportunities for developing wildlife corridors on private lands in the Refuge Management District.

Consult with watershed districts on watershed projects.

Utilize existing state and federal programs like CRP enrollment and Legislative Council on Minnesota Resources corridor program to find and link together potential corridor lands.

Take advantage of remote sensing, aerial photography, GIS, and gap analysis to explore the landscape within Refuge Management District for the most feasible, productive corridor opportunities.

Work with willing sellers interested in federal easements/ownership within designated corridors, large grassland blocks or flood prone areas adjacent to the Refuge.

Build positive relationships with County Boards for acceptance of federal easements/ownership from willing sellers within designated corridors, large grassland blocks or flood prone areas adjacent to the Refuge.

Increase the budget for management of new acquisition/easements.

Goal 3: People

Provide visitors and the community with opportunities to experience quality wildlife-dependent recreation activities and to understand and appreciate a natural, functioning landscape.

Hunting

Objective 3.1: **Deer Hunt:** Provide annual firearms deer hunt that meets definition of "quality" in the FWS manual and is designed to maintain deer population density at 15-20 deer/ square mile.

Rationale: The deer population has finally recovered from the harsh winters of 1995/1996 and 1996/1997 and deer densities are at the desired Refuge goal. As a result, deer hunters have steadily increased over the last 3 years from 165 to 285 in 2003. This increasing trend in deer hunters should continue for several years unless detrimental factors (weather, disease) develop that would negatively impact the herd.

The Fish and Wildlife Service Manual defines a "quality hunting experience" at 605 FW 2.1 as one that:

Maximizes safety for hunters and other visitors # Encourages the highest standards of ethical behavior in taking or attempting to take wildlife

Is available to a broad spectrum of the hunting public

Contributes positively to or has no adverse effect on population management of resident or migratory species

Reflects positively on the individual refuge, the Refuge System, and the Service

Provides hunters uncrowded conditions by minimizing conflicts and competition among hunters

Provides reasonable challenges and opportunities for taking targeted species under

the described harvest objective established by the hunting program. It also minimizes the reliance on motorized vehicles and technology designed to increase the advantage of the hunter over wildlife

Minimizes habitat impacts
Creates minimal conflict with other priority wildlife-dependent recreational uses or refuge operations
Incorporates a message of stewardship and conservation in hunting opportunities.

Strategies:

Cooperate with Minnesota DNR to carry out the annual fall firearms deer hunt.
Contact and work with Minnesota DNR, schools, hunt clubs, 4-H, Boy and Girl Scouts, NRA, and/or other groups to implement youth hunt for deer on the Refuge.
Use the annual deer population estimates from the mid-winter census to decide whether to conduct antlered or antlerless hunts the following autumn.
Conduct informal survey /interact with hunters and listen to feedback on ways to improve hunt.
By 2006, update the Agassiz NWR step-down hunting plan outlining procedures and providing broad guidance for managing future hunts.

Objective 3.2: **Accessible Hunting Program:** Determine the need for and develop an accessible hunting program for disabled hunters by conducting surveys and feasibility study by 2010.

Rationale: At present, there is no accessible hunting program on the Refuge. There is one permanent, accessible deer stand available. There appears to be at least a modest demand for such a special hunt. A study would examine whether or not present access facilities on Refuge (roads, dikes, trails, blinds, tree stands) would be sufficient to allow for an accessible hunt, what deficiencies exist, and the cost of remedying these deficiencies.

Strategies:

Conduct a study on the demand for an accessible hunting program, the feasibility of carrying it out on the Refuge, and the best location or locations for doing so.
Conduct a pilot hunt if the study points towards its feasibility.
If an accessible hunt is recommended, incorporate it in the step-down Hunting Plan.

Objective 3.3: **Moose Hunting:** Provide moose hunting opportunities when the population recovers to above 200 moose.

Rationale: There has been a moose hunt at Agassiz NWR in the past, but the current moose population of fewer than 100 individuals does not allow for it. The Refuge conducts an annual moose census that observes population trends and estimates moose numbers. When the population exceeds 200 and remains on an upward trajectory, the Refuge, in conjunction with Minnesota DNR, can assess the situation and recommend reopening the moose hunt.

Strategies:

Continue to monitor the Refuge moose population annually and work closely with the Minnesota DNR on understanding the causes of the recent collapse as well as the current recovery and whether or not it is possible or desirable to mitigate such

declines.

Cooperate with the Minnesota DNR on eventually reopening the moose hunt on Refuge and/or adjacent WMAs.

Objective 3.4: **Archery and Muzzle-loader Deer and Ruffed Grouse Hunts:** Provide hunting opportunities for deer (archery and muzzle-loader) and Ruffed Grouse during and after the state deer firearms season following state seasons and regulations. Access will be primarily walk-in with strategically located parking lots. The open area will be the same as for the deer firearms season.

Rationale: There has never been a season for archery and muzzle-loader hunting at Agassiz NWR, however, muzzle-loaders may be used during the regular firearms season. These hunts are popular among some hunters who seek a more challenging and primitive hunting experience. Due to the late season, this hunt will not cause disturbance to migrating birds.

Strategies:

Update the Agassiz NWR Refuge Hunt Plan (a step-down management plan) that outlines all hunting opportunities, seasons and locations on the Refuge as well as identify rules, controls, and constraints by 2006.

Work with partners like Minnesota DNR and local hunting clubs to implement archery and muzzle-loader hunts on the Refuge.

Modify hunting brochures to incorporate changes.

Provide additional law enforcement presence.

Objective 3.5: **Youth Waterfowl Hunt:** Provide a quality youth waterfowl hunt on Farmes Pool in compliance with the state youth season and regulations. A future hunting plan would identify access boundaries.

Rationale: Agassiz NWR has always been treated as a sanctuary for waterfowl and has never permitted waterfowl hunting, under the rationale that numerous areas outside the Refuge boundaries are open to hunting for ducks and geese. Comments received during scoping indicated both support for this policy as well as some desire to open at least one part of the Refuge to hunting. The Robert E. Farmes Pool is located in the southwestern corner of the Refuge, contiguous with Minnesota DNR's Elm Lake Wildlife Management Area. Further, it is clearly demarcated by east-west County Route 7. Thus, it is well situated to be clearly identifiable and isolated from the rest of the Refuge. In cooperation with Minnesota DNR, it should be feasible to confine waterfowl hunting to this portion of the Refuge during the normal state youth-only season.

Strategies:

Explore possible access and boundaries of the specific area that might be open to waterfowl hunting with Minnesota DNR.

If portions of Farmes Pool are opened to waterfowl hunting, incorporate details in the step-down Refuge Hunting Plan plan to be developed.

Ensure sufficient Refuge law enforcement presence.

Wildlife Observation and Photography

Objective 3.6: **Wildlife Observation/Photography:** Provide year-round opportunities for 25,000

visitors annually to observe and photograph wildlife and habitat. Designate cross-country ski, snowshoe, and walking trails for year-round observation of wildlife.

Rationale: There were 20,780 visitors to Agassiz NWR in 2002, but visitation has ranged from 15,000 to 25,000 per year. Due to the rather remote location of the Refuge, it is unlikely that it will become a prime target for most eco-tourists or wildlife enthusiasts, except birders. Agassiz NWR has a long-standing track record as a destination point for birders. Birding is the fastest growing outdoor recreation sport, and with successful marketing efforts like the Pine to Prairie Birding Trail, the Refuge can expect to see increased visitation for this purpose. An annual average of 25,000 visitors is a realistic objective that would signify the Refuge is successfully engaging the public. The 2002 Visitor Services Review Report for the Refuge contains a number of recommendations that are summarized here as strategies.

Strategies:

Improve the Parker Pool observation platform by providing universal accessibility, benches, and interpretive panels.

Continue to allow for controlled access to the fire tower.

Improve Maakstad Trail by expanding it, adding trail information (including information on cultural resources and history) and improving the trailhead and parking lot.

Expand opportunities at Farmes Pool by allowing for seasonal foot traffic, a new trail, and a possible observation point or platform.

Environmental Education

Objective 3.7: **On-site Environmental Education:** On-site, provide for annual visitation of 400 students and 15-20 group visits.

Rationale: A limited amount of onsite environmental education occurs at the present time, although school budgetary problems have made maintaining even the existing level a serious challenge. Several college-level natural resource classes have spent several days onsite. The Refuge does not have a full-time staff person to promote and conduct environmental education and interpretation. Nonetheless, Agassiz NWR is in a position to provide environmental education to grade-level and college students and the general public in northwest Minnesota.

Strategies:

Work with local teachers to develop grade-specific curricula that meet local, state and national education standards and that keep focus on the Refuge.

Continue to conduct workshops for teachers.

If feasible, train volunteers to provide tours or lessons for classrooms.

Contact schools annually notifying them of the Refuge's facilities, resources and educational opportunities by means of fliers or letters to individual teachers. In the higher grades, science and history teachers should be targeted.

Devise and encourage additional opportunities for research, wildlife surveys, or bird banding within the ability of high school science or biology classes.

Improve facilities for extended field trips and research opportunities for college and high-school-level natural resource classes by improving bunkhouse by 2005.

Improve facilities for college and high school-level natural resource classes and researchers by building an Environmental Education Lab by 2010.

Objective 3.8: **Outreach:** Off-site, make visits to 1,000 students annually, conduct satellite classroom visits, respond to requests from educators, provide county fair exhibits, and improve the Agassiz NWR website.

Rationale: As described earlier in this chapter, the Refuge has an energetic outreach program to all segments of the wider community in northwest Minnesota, limited only by available staff.

Strategies:

Continue with each of the efforts described earlier in this chapter, including classroom visits, participation in county fairs and parades, radio and TV interviews, and so forth.

Train volunteers to give presentations on behalf of the Refuge to primary, middle, and high schools throughout the seven counties of the Refuge Management District.

On an annual basis, notify every elementary school teacher and all science, social studies, and history teachers in middle (junior high) and high schools of environmental education opportunities on the Refuge and opportunities for off-site environmental education.

Send a bi-annual newsletter, “The Wild Note,” to neighbors, county, watershed districts, media and schools.

Improve the website by 2006.

Continue to work with the Northwest Service Cooperative to distribute educational materials and exhibits on wildlife.

Interpretation

Objective 3.9: **Interpretation:** Provide interpretive auto tour route, hiking trails, visitor contact center and kiosks for 25,000 visitors annually.

Rationale: This objective overlaps a good deal with earlier objectives. The 2002 Agassiz NWR Visitor Services Review Report contained a number of recommendations on improving interpretation opportunities at the Refuge, which are listed here as strategies.

Strategies:

Update and upgrade Habitat Drive interpretive signing and ensure facilities are ADA-compliant (universally accessible) by 2006.

Continue the “Look and Listen” message throughout all stations on the auto tour route and enhance by adding a “sound post” with digital recordings of common wildlife sounds, calls, songs, and their sources.

Add interpretive panels on the Parker Pool scenic overlook on County Road 7. Add benches to the platform to accommodate the “Look and Listen” message.

Add interpretive panels to the fire observation tower cab. Add an “on-ground” accessible cab with interpretation.

Develop a simple interpretive brochure according to Service standards for the fully accessible Headquarters Trail by 2005. Interpretive signs, audio and tactile components should be developed for this short trail.

Develop several interpretive programs for the general public, starting from the visitor contact station. Some should be year-round while others are seasonal in nature. At least one cultural interpretation program should be offered.

Explore opportunities to develop volunteer-led interpretive programs and have volunteers to run the office on Sunday afternoons between May and September.

Interpret key resource issues.

Develop a Refuge plant list with plants categorized in associated habitat types.

Redesign and remodel the visitor contact area in the Visitor Center (which is the primary visitor contact for the Refuge outside of the entrance kiosks) to include information about the Refuge, the National Wildlife Refuge System, and the U.S. Fish and Wildlife Service.

Improve the website by 2005.

Involve volunteers and the future Friends Group with assisting in program development and implementation.

Hire a seasonal Park Ranger devoted solely to interpretation, outreach and environmental education.

Objective 3.10: **Archeological and Cultural Values:** Implement the measures and recommendations of the 2002 *Cultural Resources Management Plan.*

Rationale: Agassiz NWR's *Cultural Resources Management Plan*, completed in 2002, specifies a number of recommendations and measures to identify, preserve, and interpret the Refuge's cultural resources. At present, only historical resources have been found on the Refuge. While prehistoric resources certainly existed and likely persist in more undisturbed sites on the Refuge, the area's modern history – including widespread farming followed by extensive impoundment, dike and road construction – disturbed much of the Refuge grounds and may have obliterated certain cultural resources or rendered them inaccessible (e.g. inundated within the many pools that comprise most of the Refuge's acreage).

Strategies:

Conduct a Phase I archeological survey of the non-flooded areas of the Refuge, by qualified personnel, as a necessary first step in cultural resources management.

Follow procedures outlined in *Cultural Resources Management Plan* for consultation with RHPO, SHPO, and potentially interested American Indian tribes.

Follow procedures detailed in *Cultural Resources Management Plan* for inadvertent discoveries of human remains.

Continue to document the history of the area's settlers, known as the Mud Lakers, and the work of the Civilian Conservation Corps via written and oral media.

Ensure archeological and cultural values are described, identified, and taken into consideration prior to implementing undertakings.

Complete accessioning, cataloging, inventorying, and preserving the museum collection at the Refuge.