

Chapter 3: Refuge Environment and Management



Algific slope on a preserve of The Nature Conservancy.

Physical Environment

The namesake of the Refuge, the Driftless Area, is a region characterized by a near absence of glacial deposits, or glacial drift, causing it to be named the 'Driftless Area' by early geologists. Its rugged, dissected terrain resulted from weathering and stream erosion of Paleozoic age limestone bedrock (Prior 1991). The karst topography with caves, coldwater springs and streams, hardwood forests, and the Upper Mississippi River valley set northeast Iowa apart from the rest of the state. Karst is a type of topography that is formed on limestone and other soluble rocks, primarily by dissolution

from water. The Driftless Area also includes southeast Minnesota, southwest Wisconsin, and extreme northwest Illinois. Some portions of the Wisconsin Driftless Area are truly unglaciated. This area is one of the ecotypes identified in the U.S. Fish and Wildlife Service's Upper Mississippi River/Tallgrass Prairie ecosystem. Streams cutting into bedrock have created many cliffs and algal talus slopes which constitute habitat for a large number of plant species that are either unique to this area or well out of their normal ranges.

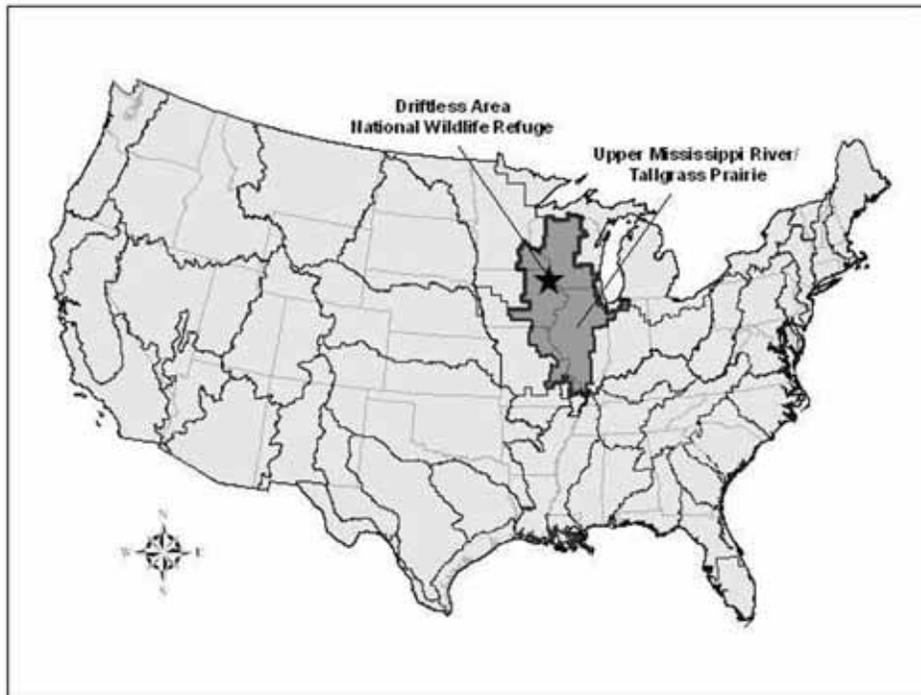
The Refuge currently includes nine scattered tracts that amount to 781 acres (Table 1). Habitat types found on the Refuge include hardwood forests, grassland, streams, and riparian habitats. The Driftless Area is within the eastern broadleaf forest (continental) province identified by Bailey (1995). The Refuge lies within the Mississippi flyway.

Upper Mississippi River/Tallgrass Prairie Ecosystem

The U.S. Fish and Wildlife Service has implemented an ecosystem approach to fish and wildlife conservation. Under this approach the Service's goal is to contribute to the effective conservation of natural biological diversity through perpetuation of dynamic, healthy ecosystems by using an interdisciplinary, coordinated strategy to integrate the expertise and resources of all stakeholders.

Driftless Area NWR lies within the Upper Mississippi River/Tallgrass Prairie Ecosystem (Figure 2). The Upper Mississippi River/Tallgrass Prairie Ecosystem is one of eight ecosystems that comprise the Great Lakes-Big Rivers Region (Region 3) of the U.S. Fish and Wildlife Service. The Upper Mississippi River/Tallgrass Prairie Ecosystem is a large and ecologically diverse area that encompasses land in the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The

Figure 2: Upper Mississippi River/Tallgrass Prairie Ecosystem



Mississippi River bisects the Ecosystem east and west. Major rivers in the Ecosystem include the Minnesota, Chippewa, Black, Wisconsin, Iowa, Rock, Skunk, Des Moines, Illinois, and Kaskaskia (Figure 3).

Migratory Bird Conservation Initiatives

U.S. Fish and Wildlife Service and other conservation plan priorities for migratory birds, such as Partners in Flight, are used to develop management guidelines for birds. The Refuge is within the Upper Great Lakes Plain physiographic area 16 as identified by the Partners in Flight Bird Conservation Plan (Knutson et al. 2001) and Bird Conservation Region 23 (Prairie Hardwoods Transition) identified by the North American Bird Conservation Initiative (Figure 4).

Iowa, Minnesota, Wisconsin, and Illinois are currently writing state wildlife conservation plans. Wisconsin has a Bird Conservation Plan, and Minnesota is working towards one. The Refuge will incorporate elements of these plans into management when possible.

Region 3 Fish and Wildlife Resource Conservation Priorities

The Government Performance and Results Act (GPRA) required the U.S. Fish and Wildlife Service to identify its most important functions and to direct its limited fiscal resources toward those functions. From 1997 to 1999 within Region 3, a group looked at how best to identify the most important functions of the Service within the region. The group recognized that the Service has a complex array of responsibilities specified by treaties, laws, executive orders, and judicial opinions that dwarf the agency's budget. The group recognized that at least two approaches are possible in identifying conservation priorities – habitats and species. The group chose to focus on species because 1) species represent biological and genetic resources that cannot be replaced; 2) a focus on species conservation requires a concurrent focus on habitat; and 3) by focusing on species

Figure 3: Watersheds Surrounding Driftless Area NWR

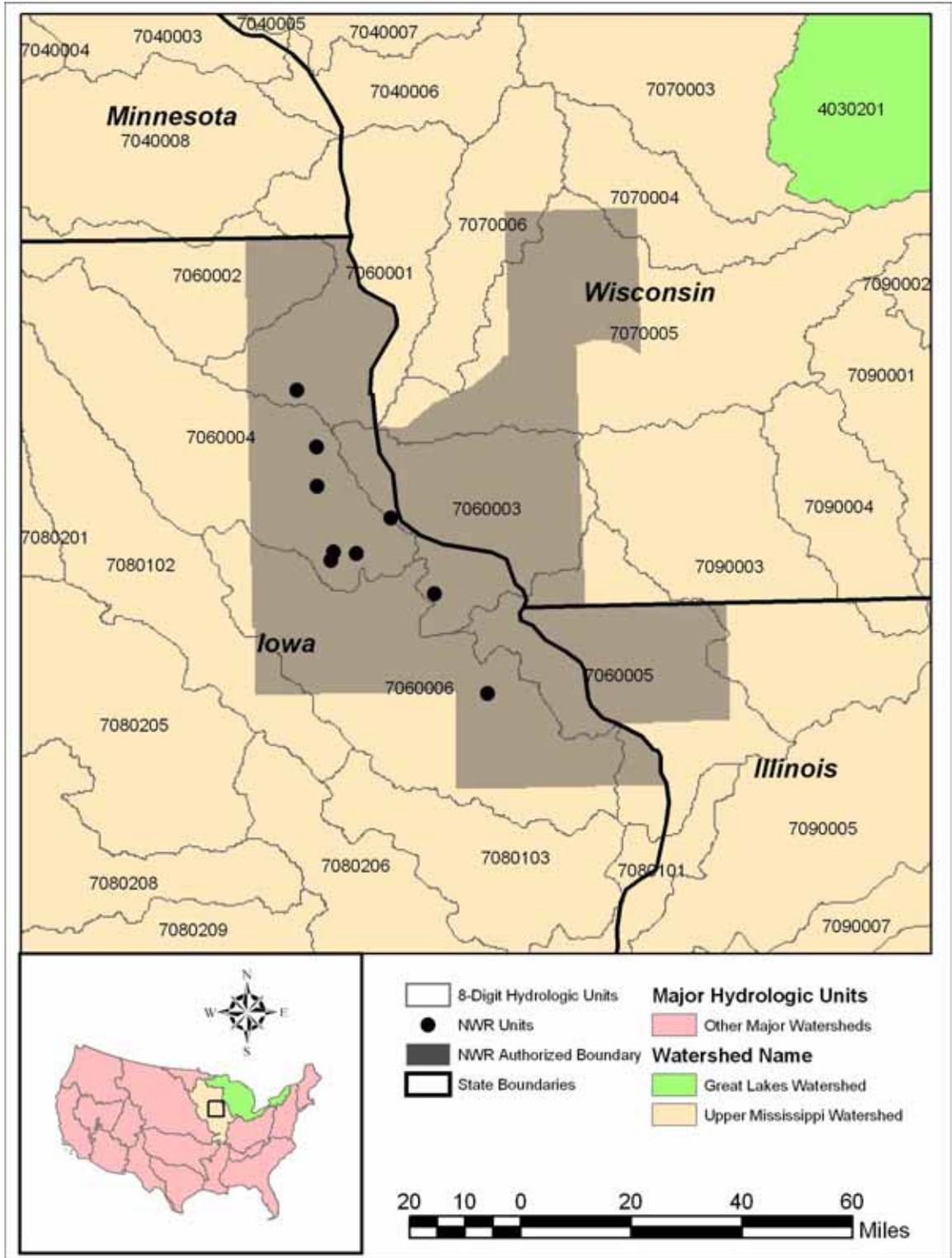
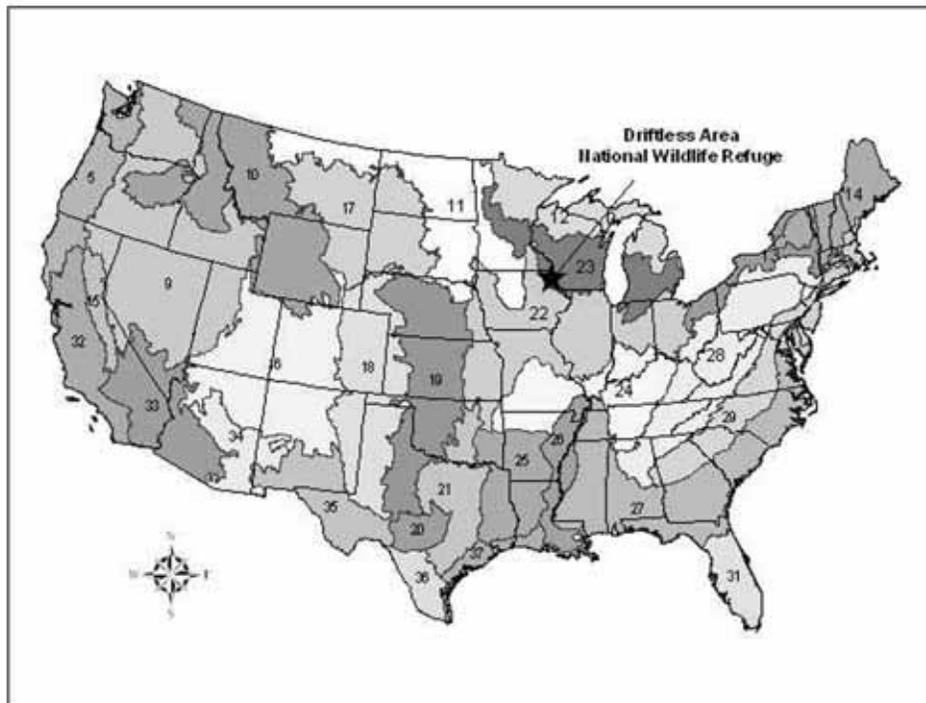


Figure 4: Bird Conservation Regions, Region 3 of the USFWS



assemblages and identifying areas where ecological needs come together the Service can select the few key places where limited efforts will have the greatest impact. Representatives of the migratory bird, endangered species, and fisheries programs in Region 3 identified the species that require the utmost attention given our current level of knowledge. Representatives prioritized the species based on biological status (endangered or threatened, for example), rare or declining levels, recreational or economic value, or “nuisance” level. The group pointed out that species not on the prioritized list are important too. But, when faced with the needs of several species, the Service should emphasize the species on the priority list. The Iowa Pleistocene snail, Northern monkshood, Leedy’s roseroot, and glacial relict snails are among the Regional Resource Conservation Priorities.

Climate

Climate conditions across the driftless region can vary greatly. Rainfall amounts are 32 to 34 inches annually with a growing season ranging from 135 to 155 days. In LaCrosse, Wisconsin, near the middle of the driftless area, the annual average temperature is 46.3 degrees Fahrenheit. The average minimum temperature is 36.6 degrees Fahrenheit and the average maximum temperature is 56.2 degrees Fahrenheit. Temperatures can range from well below zero in winter to 100 degrees in summer. The average relative humidity is 76 percent.

Soil and Water

Soils vary because Refuge units are scattered over a large area. Most of the soils are forest derived. Some savanna and prairie soils occur, mainly on the Howard Creek unit. All of the units contain some rock outcroppings or cliffs, and rocky soils. Soils are generally erodible. Water sources are from springs and streams on, or adjacent to, the Refuge units. The primary contaminant sources are from nonpoint source runoff from adjacent agricultural fields that could contain excess nutrients and

pesticides. Runoff may contaminate sinkholes and groundwater in addition to surface water. Water quality on the Refuge has not been tested. A contaminant assessment of the Refuge has been completed by the Service's Division of Ecological Services.

Fire

Wildfires in northeast Iowa are primarily from human caused road ditch fires that escape. Prescribed fire is used regularly on the Refuge as a habitat management tool. Periodic burning of grasslands reduces encroaching woody vegetation such as box elder. Fire also encourages the growth of desirable species such as native, warm-season grasses and forbs. Prescribed fires on the Refuge have only occurred on the Howard Creek unit and range from 10 to 60 acres depending on the goal of the burn. Burning does not occur every year. Prescribed fire may be used on other units in the future.

Socioeconomic Environment

The economy of communities near the Refuge lands are primarily based on farming with some industry and tourism jobs. Crops are mainly corn and soybean with beef and dairy cattle operations occurring in the area. Some timber harvest also occurs. Most communities in the area are under 10,000 people. The largest community is Dubuque, Iowa with a population of about 70,000.

Refuge Resources

Habitat/Vegetation

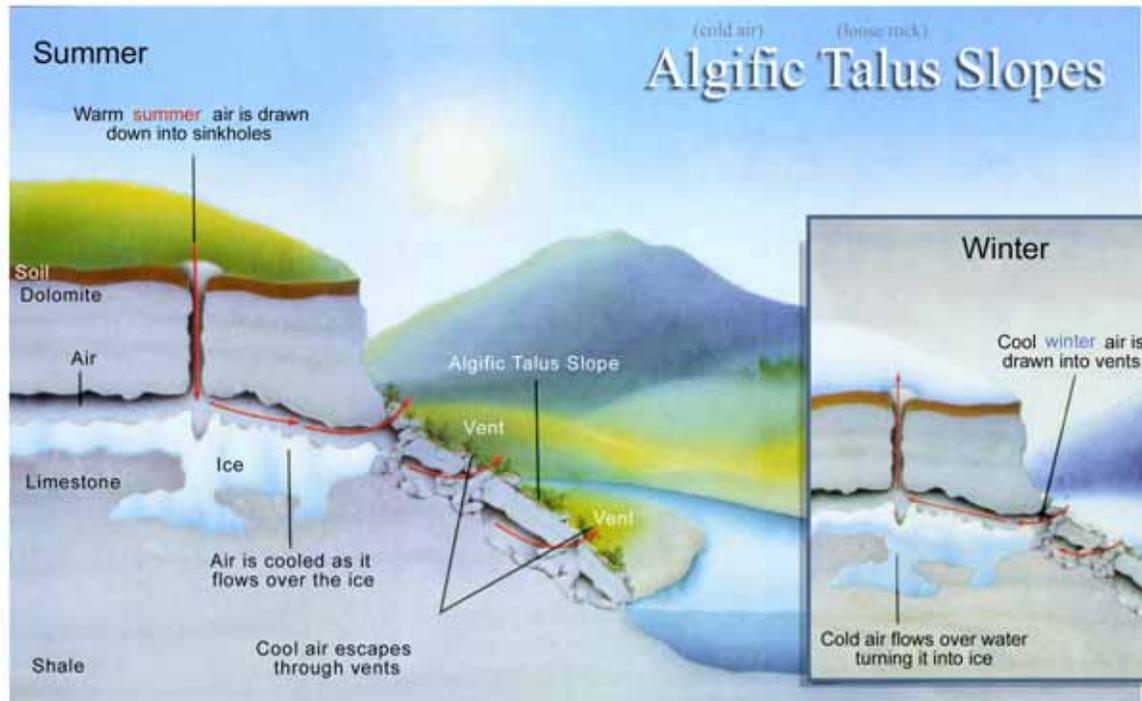


Cold air vent on an algalic talus slope with the rare plant golden saxifrage growing near it. USFWS

The Refuge contains upland hardwood forests, grassland, stream and riparian habitat (Figures 6-14). The Refuge provides wildlife habitat similar to that in the remainder of the region where lands are not farmed. The driftless region is a transition zone between eastern hardwood forests and midwestern tall grass prairies. Vegetation classifications for northeast Iowa vary (Cahayla-Wynn and Glenn-Lewin 1978). Glenn-Lewin et al. (1984) describe it as a dynamic area where vegetation probably never has been in a climax state. Historic habitats range from tallgrass prairie and savanna to maple/basswood and oak/hickory forest and riparian areas (Kemperman 1983, Glenn-Lewin et al. 1984). The presettlement forest was primarily oak (Glenn-Lewin et al. 1984). Fire was a natural part of the Driftless Area ecosystem, maintaining prairie and savanna. Because of the karst geology, wetland habitats are not predominant except along streams and rivers. _

Currently, despite the terrain, row crop and livestock agriculture is common. Prairie and savanna areas were converted to row crop or pasture and few unaltered native vegetation remnants exist. Patches of forest were cleared for agriculture, but the more rugged areas still support hardwood forest. Logging, grazing, development, and fire

Figure 5: Algific Talus Slope Diagram¹



1. Courtesy of The Nature Conservancy

suppression have impacted the remaining fragmented forests (Hemesath and Norris 1998). All forests on Refuge units were selectively logged at some time in the past; most within the last 30 years. Most Refuge forests were also subject to grazing. Invasive species occurring on the Refuge include garlic mustard, multiflora rose, leafy spurge, wild parsnip, Canada thistle, European buckthorn, and honeysuckle.

Algific Talus Slopes

The habitat of the Iowa Pleistocene snail and Northern monkshood and other rare species is the algific talus slope. This habitat, usually north facing, occurs where air circulation over underground ice produces a constant stream of moist cool air through vents onto the adjacent hillsides (Figure 5). These cold air vents are typically covered with a loose talus layer and a thin plant and litter cover. Some of these species, like Leedy's roseroot, occur on moderate cliffs. This is a similar habitat, where the overlying talus layer does not exist, generally because of removal by past erosive forces. Only the (now exposed) rock formation remains. Cool subsurface air flows out from the cliff face. Algific talus slopes and moderate cliffs vary in size from a few yards to one-half-mile in length. Sinkholes above the slope are important to the function of the habitat as a source of air and water flow and are included in Refuge protection when possible. Several sinkholes are usually associated with algific talus slopes and can be up to one-half mile away. Air flowing from surface vents ranges from 30 degrees F to 55 degrees F spring to fall (U.S. Fish and Wildlife Service 1984).

The vegetative community on algific talus slopes is different than the surrounding forest and typically contains ferns, mosses, liverworts, evergreen species such as Canada yew and balsam fir, birch, basswood, and sugar maple, and boreal disjunct herbs and ferns (Glenn-Lewin et al. 1984). The algific talus slopes also harbor state threatened and endangered plants and animals (Appendix

C) and in general support an entire community of rare or disjunct species. Algific talus slopes are ranked by NatureServe as a G2 community meaning that they are imperiled globally because of rarity. Service species of concern that occur on algific slopes include eight species of glacial relict snails: *Vertigo meramecensis*, *V. brierensis*, *V. iowensis*, *V. hubrichti*, *V. occulta*, *Catinella gelida*, *Novisuccinea Sp A* and *Sp B*. Some or all of these species are also listed by state law as threatened or endangered in Iowa, Illinois, Wisconsin, and Minnesota (Appendix C). Golden saxifrage (*Chrysosplenium iowense*) is a plant associated with algific slopes that is listed as threatened by Iowa and Minnesota and is included in the Service's draft species of concern list.

Most of the original inventories of algific talus slopes were done by Frest (1982, 1983, 1985, 1986, 1987). There are nearly 400 known algific slopes/moderate cliffs in the Driftless Area (Figure 6). Not every site contains the above species. Some sites have never been thoroughly surveyed for these species, particularly for snails. Although original surveys to locate this habitat type were systematic and comprehensive, some sites likely remain undiscovered.

Wildlife

U.S. Fish and Wildlife Service Region 3 migratory non-game birds of management concern that may occur on the Refuge are:

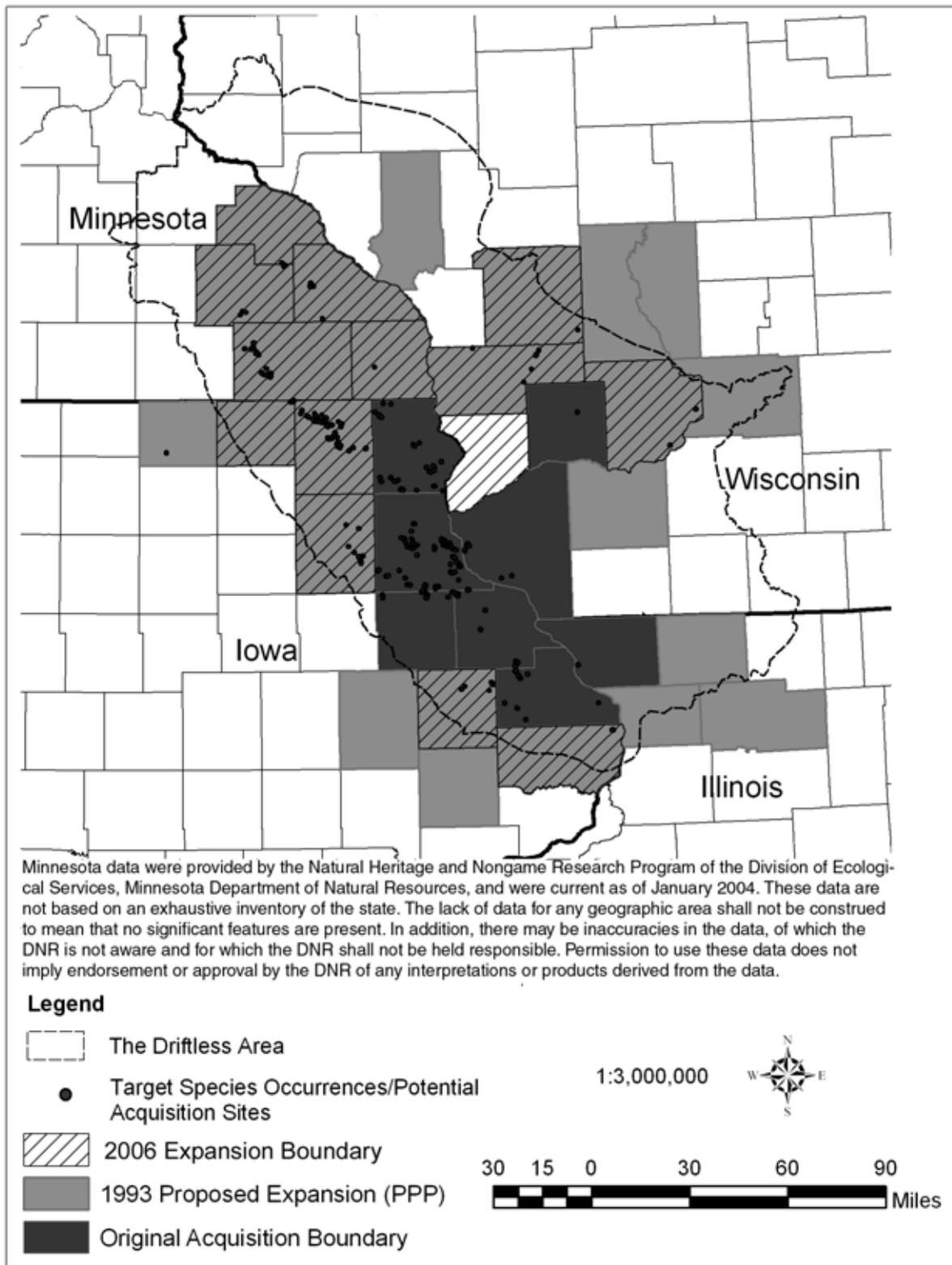
- # Northern harrier
- # Red-shouldered Hawk
- # Yellow-billed Cuckoo
- # Red-headed Woodpecker
- # Northern Flicker
- # Sedge Wren
- # Veery
- # Wood Thrush
- # Loggerhead Shrike
- # Blue-winged Warbler
- # Golden-winged Warbler
- # Chestnut-sided Warbler
- # Cerulean Warbler
- # Dickcissel
- # Field Sparrow
- # Grasshopper Sparrow
- # Bobolink
- # Eastern Meadowlark.

In addition to most of the above, Region 3 resource conservation priority bird species¹ that occur in northeast Iowa, and likely on the Refuge, are:

- # Wood Duck
- # Mallard
- # Blue-winged Teal
- # American Woodcock
- # Black-billed Cuckoo
- # Whip-poor-will
- # Louisiana Waterthrush
- # Kentucky Warbler

1. U.S. Fish and Wildlife Service 2002

Figure 6: Algific Talus Slopes and Target Species Occurrences in the Driftless Area



Many other migratory birds occur on the Refuge, including:

- # Mourning Dove
- # American Robin
- # Eastern Bluebird
- # Red-bellied Woodpecker
- # Pileated Woodpecker
- # Song Sparrow
- # Common Yellowthroat
- # Red-eyed Vireo
- # Brown Thrasher
- # Yellow Warbler
- # Common Grackle
- # Red-tailed Hawk

The Partners in Flight Bird Conservation Plan for the Upper Great Lakes Plain (Knutson et al. 2001) identifies priority bird populations and habitats. Some of the following priority species do occur, or likely occur, on the Refuge²:

- # Dickcissel
- # Bobolink
- # Red-headed Woodpecker
- # Blue-winged Warbler
- # Field Sparrow
- # Black-billed Cuckoo
- # Cerulean Warbler
- # Acadian Flycatcher
- # Kentucky Warbler
- # Prothonotary Warbler



Iowa Pleistocene snail. Bob Clearwater

Notable resident wildlife include white-tailed deer, Wild Turkeys, Ruffed Grouse, Ring-necked Pheasant, coyotes, numerous small mammals, and timber rattlesnakes. Predators may be important in the context of impacting breeding birds on the Refuge. Trout species occurrence on the Refuge is currently limited. Declines in timber rattlesnakes are of concern to some state agencies and they are listed as threatened by the State of Minnesota and are a Resource Conservation Priority species for the Service. Although they have not been seen on the Refuge, they likely occur and may occur on lands acquired in the future.

Threatened and Endangered Species

Fossil records show that the Iowa Pleistocene snail existed 400,000 years ago and was widespread in the Midwestern United States. It was thought to be extinct until discovered in Iowa in 1928. It was listed as federally endangered in 1977. It is also listed by state law as endangered in Iowa and Illinois. The Iowa Pleistocene snail is a relict species that has survived on these small areas of suitable habitat and is currently known to exist at 36 locations in Iowa and one in Illinois. The snail has narrow temperature, moisture and food requirements found only on algific talus slopes (Frest 1984). Adult shell diameter is 5-7 mm. Populations on each of the known sites vary from 500 to 10,000

2. *Hemesath and Norris 1998*

individuals. Each snail colony is a separate population as migration between algific slopes is unlikely, though could occur with flood events or transport by other animals (Ross 1999). Other glacial relict snails also appear to be restricted to algific talus slope or moderate cliff habitat and presumably cannot withstand even moderate changes in their environment (Frest 1991).

Northern monkshood was listed as federally threatened in 1973. It is also state listed as threatened in Iowa, Wisconsin, and New York, and endangered in Ohio. It does not occur in any other states, and the majority of the known populations occur in Iowa. There are 83 known sites in Iowa, 18 in Wisconsin, two in New York, and one in Ohio. Population sizes range from a few individuals to 10,000 plants. Most sites have a few hundred to 1,000 plants. Northern monkshood is a member of the buttercup family (Ranunculaceae) and grows on cool moist habitat including algific talus slopes and sandstone cliffs. Currently all monkshood sites on the Refuge are algific talus slopes. The plant requires specific temperature and moisture regimes (U.S. Fish and Wildlife Service 1983). Its hood shaped flower is adapted for bumblebee pollination and is typically purple in color, but can vary from white to blue and purple.

Leedy's roseroot does not currently occur on the Refuge, but future additions to the Refuge may be for the purpose of protecting this species. Leedy's roseroot was listed as threatened in 1992 and is a member of the stonecrop family (Crassulaceae). It grows on cool cliff habitats only in southeast Minnesota and New York. The four Minnesota populations each contain a few hundred plants. It has waxy, succulent leaves with small dark red to yellow flowers arranged in dense heads at the end of the stem. Male and female flowers occur on separate plants.

The only federally threatened or endangered bird occurring on the Refuge is the Bald Eagle, recently proposed for delisting. There are no known eagle nests on the Refuge.

Threats to Resources

Algific slopes and the plant and wildlife species that depend on them are fragile. Once damaged, or destroyed, this kind of habitat cannot be restored. Currently, threats to these sites are cattle grazing, logging, quarrying, building or development, invasive species, sinkhole filling, erosion, human traffic, pesticides, and natural landslides. Without some form of protection, populations of these species could be lost in a single event. The Refuge is focusing land acquisition efforts on protecting a specific type of endangered species habitat, but these efforts will also include forest, grassland, cropland, and streams surrounding the endangered species to protect sinkholes and provide buffer areas. The surrounding vegetation can influence temperature on the algific slopes, a required component of the habitat for these species.

Administrative Facilities

Driftless Area NWR shares Headquarter space with the McGregor District of Upper Mississippi River National Wildlife and Fish Refuge in McGregor, Iowa. In addition, the Refuge receives administrative support, law enforcement support and maintenance support from the McGregor District. Volunteers assist with some Refuge activities.

Cultural Resources

The uplands, floodplains, and tributaries of the driftless area offered a variety of resources to prehistoric populations. The area has a cultural history of 11,500 years with the Paleo-Indian peoples. Archeologists hypothesize that small family-groups of hunters-gatherers roamed widely in search of mega-fauna and other resources. The presence of these people is usually recognized through surface finds of their fluted spear points; none of these points have been identified within the Refuge.

People of the 6,000-year long Archaic tradition adapted their subsistence practices to changing environmental, habitat, and resources based changes including the 2,000-year very warm and dry altithermal that ended about 5,000 years ago. Extensive trade routes brought in exotic materials. People buried their dead in natural knolls. Archaic tradition cultural practices gradually evolved into the subsequent Woodland tradition.

Commencing around 3,000 years ago was the Woodland tradition. Archeological sites usually include pottery, arrowheads, and artificial mounds used for human burials and for other purposes. People exploited a wide range of habitats in an environment similar to that found in the early historic period. The people lived in larger, semi-permanent villages, practiced horticulture, and at some period participated in long distance trade. In some respects, Europeans coming into the Upper Mississippi River valley encountered people of the Woodland culture, some of whom may have been the ancestors of the Eastern Dakota Indians.

The Mississippian period started in the Saint Louis area about 1,000 years ago and moved up the Mississippi River. A related cultural group known as the Oneota, which may have developed from the Late Woodland culture, is more evident in the archeological record. Late Oneota people probably were the ancestors of the Ioway, Oto, Missouriia, and Winnebago Indian tribes.

Twenty-seven previously identified archaeological sites are located within one mile of the 17 units studied by Commonwealth Cultural Resources Group in 2002. These study units included current Refuge lands and areas of potential Refuge acquisitions. Twenty-two of these sites are prehistoric and one is a multi-component prehistoric and protohistoric site, one includes both prehistoric and historic components, and three are historic sites. The majority of prehistoric sites cannot be assigned to a specific period.

The following listed Indian tribes have been recognized by the federal government or self-identified by the tribe as having a potential concern for traditional cultural resources, sacred sites, and cultural hunting and gathering areas in the counties in which the Refuge is located.

- # Delaware Nation of Oklahoma
- # Flandreau Santee Sioux
- # Forest County Potawatomi Community
- # Hannahville Indian Community of Michigan (Potawatomi)
- # Ho-Chunk Nation of Wisconsin
- # Iowa Tribe of Kansas and Nebraska
- # Iowa Tribe of Oklahoma
- # Osage Nation of Oklahoma
- # Otoe-Missouria Tribe
- # Peoria Indian Tribe of Oklahoma
- # Sac & Fox Tribe of the Mississippi in Iowa
- # Sisseton-Wahpeton (Sioux) Oyate
- # Devils Lake Sioux Tribal Council
- # Upper Sioux Community of Minnesota
- # Winnebago Tribe of Nebraska
- # Wyandotte Tribe of Oklahoma

Although Indian tribes are generally understood to have concerns about traditional cultural properties, other organizations such as church congregations, civic groups, and county historical societies could have similar concerns.

A cultural resources overview and management study was prepared in 2002 as part of the Comprehensive Conservation Plan for the Refuge (Commonwealth Cultural Resources Group 2003). The document is available at the Refuge office, McGregor, Iowa. The report presents a cultural

history beginning 11,500 years ago through prehistoric and historic periods, ending in the 20th century. Current Refuge lands as well as potential acquisition areas were evaluated for the presence of archeological sites. Two historic sites were located on the Refuge units. The location of reported prehistorical and historic archeological sites within one mile of the Refuge units, and analysis of geomorphological data indicates high potential for unrecorded sites on most Refuge units. The document has a chapter about consultation processes identified in the National Historic Preservation Act of 1966 as amended, and a chapter that summarizes the responses to a letter sent to over 100 tribal communities, historical societies, and research groups who have potential interest in resources on the Refuge. The report concludes that a variety of cultural resources must be considered during any field projects associated with the Refuge. A comprehensive bibliography of cultural resources reports produced for studies performed within the vicinity of the Refuge is also included. Finally, a chapter on management of cultural resources under Section 106 of the National Historic Preservation Act is provided for use in Refuge management.

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

Public Use

Public use is currently minimal since most units are closed to protect endangered species or because access is limited. On two Refuge units that are open, most visitation is during the hunting season. Most users are bow hunting for deer. There were 2,741 visitors in FY 2003. This figure includes visitors to the McGregor District Visitor Contact Station.

Current Refuge Management Activities

Landcover for each of the Refuge's nine units is displayed in Table 1 on page 32 and the following figures:

- # Bankston Unit (Figure 7)
- # Cow Branch Unit (Figure 8)
- # Fern Ridge Unit (Figure 9)
- # Hickory Creek Unit (Figure 10)
- # Howard Creek Unit (Figure 11)
- # Kline Hunt Hollow Unit (Figure 12)
- # Lytle Creek Unit (Figure 13)
- # Pine Creek Unit (Figure 14)
- # Steeles Branch Unit (Figure 15)

The current management practice is to protect endangered species habitat, restore other habitats to presettlement vegetation when possible, control invasive species, and permit limited public use that is compatible with the purposes of the Refuge. Presentations and tours are given as requested and staff time allows. The Refuge office is co-located with the McGregor District of Upper Mississippi River NWR. An equipment storage warehouse and information kiosk were constructed in 2004 on the Howard Creek unit of the Refuge. Boundary fences and dirt surfaced roads are the only other constructed developments on the Refuge. One full-time Refuge Operations Specialist is assigned to the Refuge and supervised by the District Manager, McGregor District, Upper Mississippi River NWR.

Figure 7: Bankston Unit Landcover, Driftless Area NWR

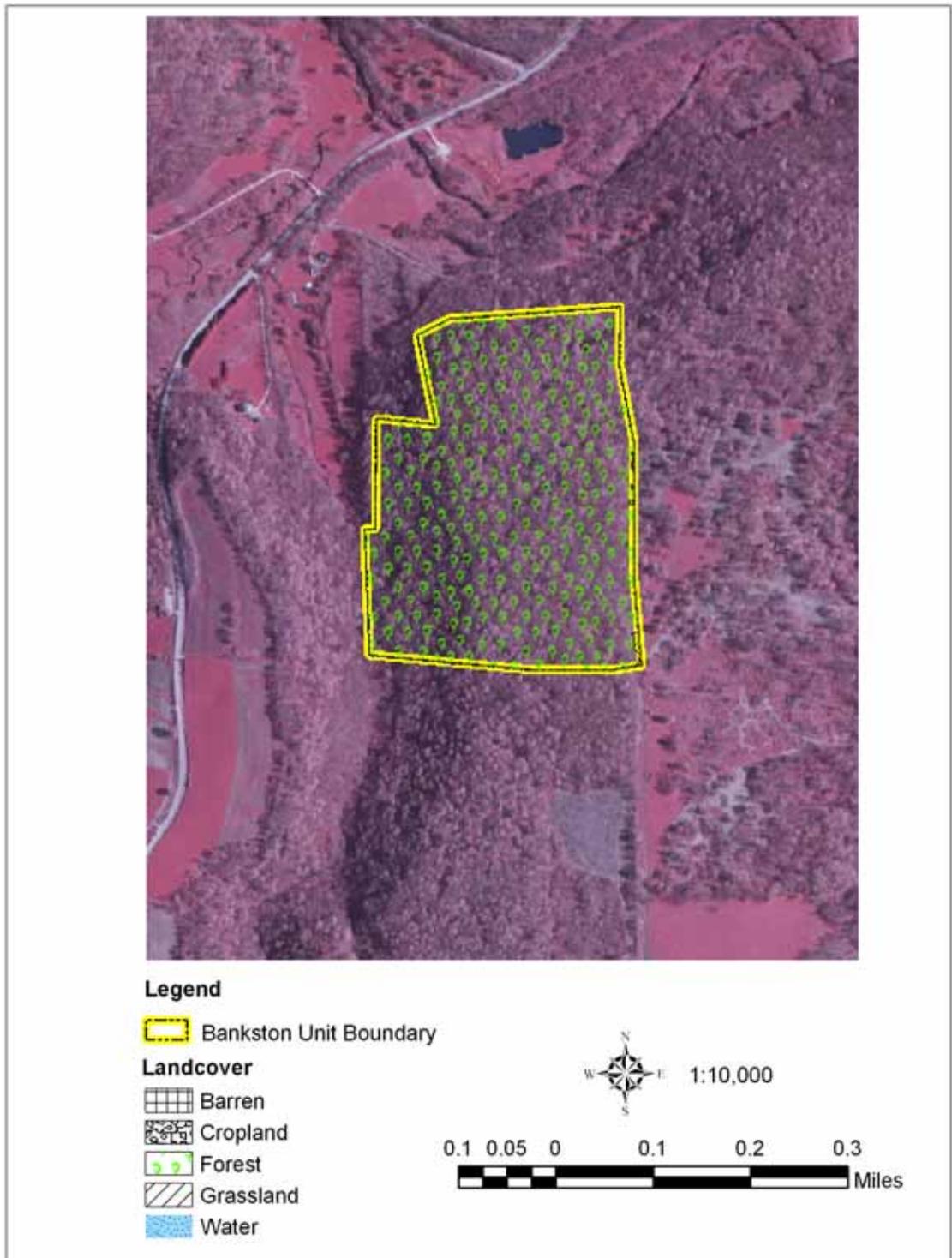


Figure 8: Cow Branch Unit Landcover, Driftless Area NWR

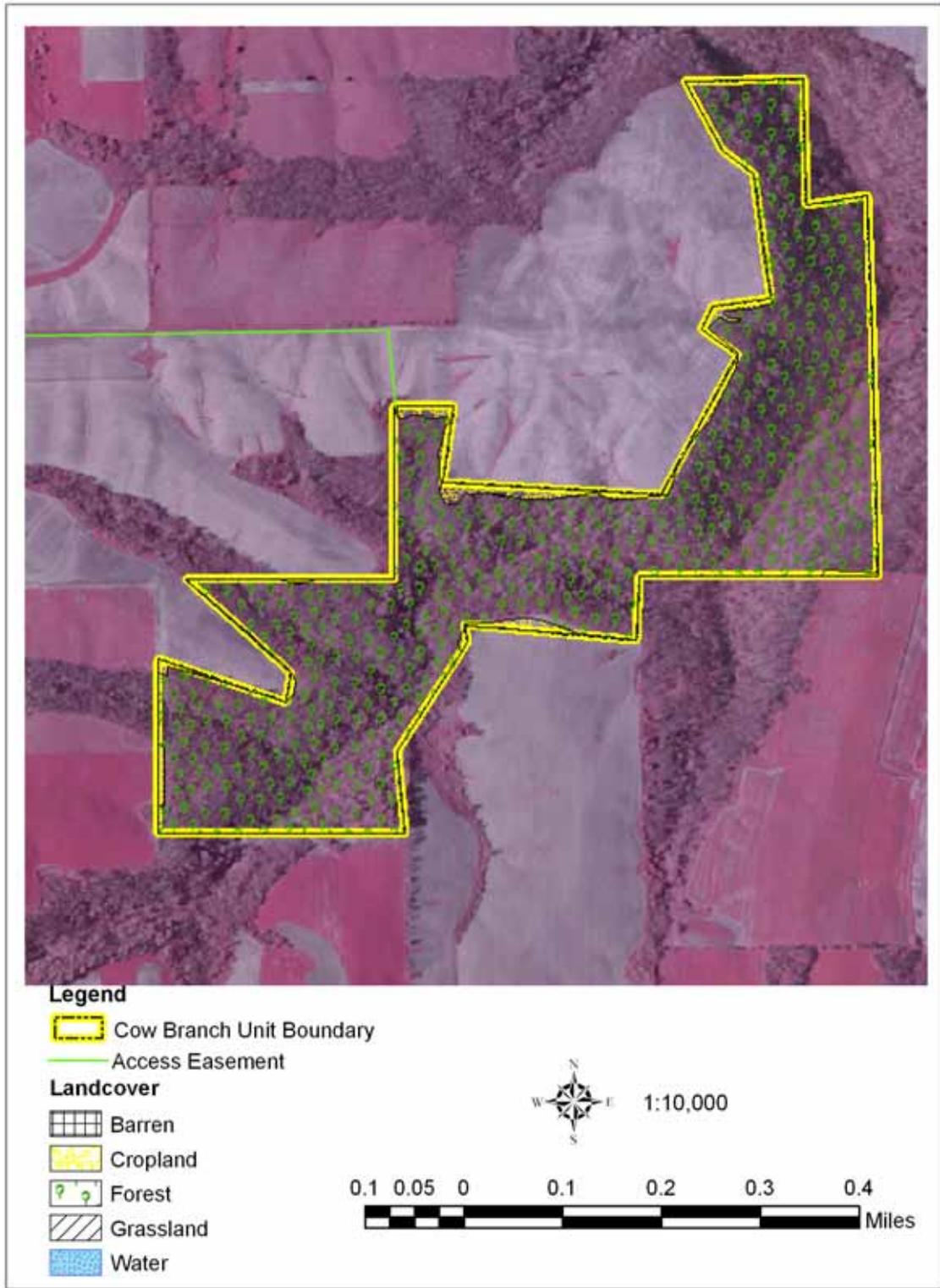


Figure 9: Fern Ridge Unit Landcover, Driftless Area NWR

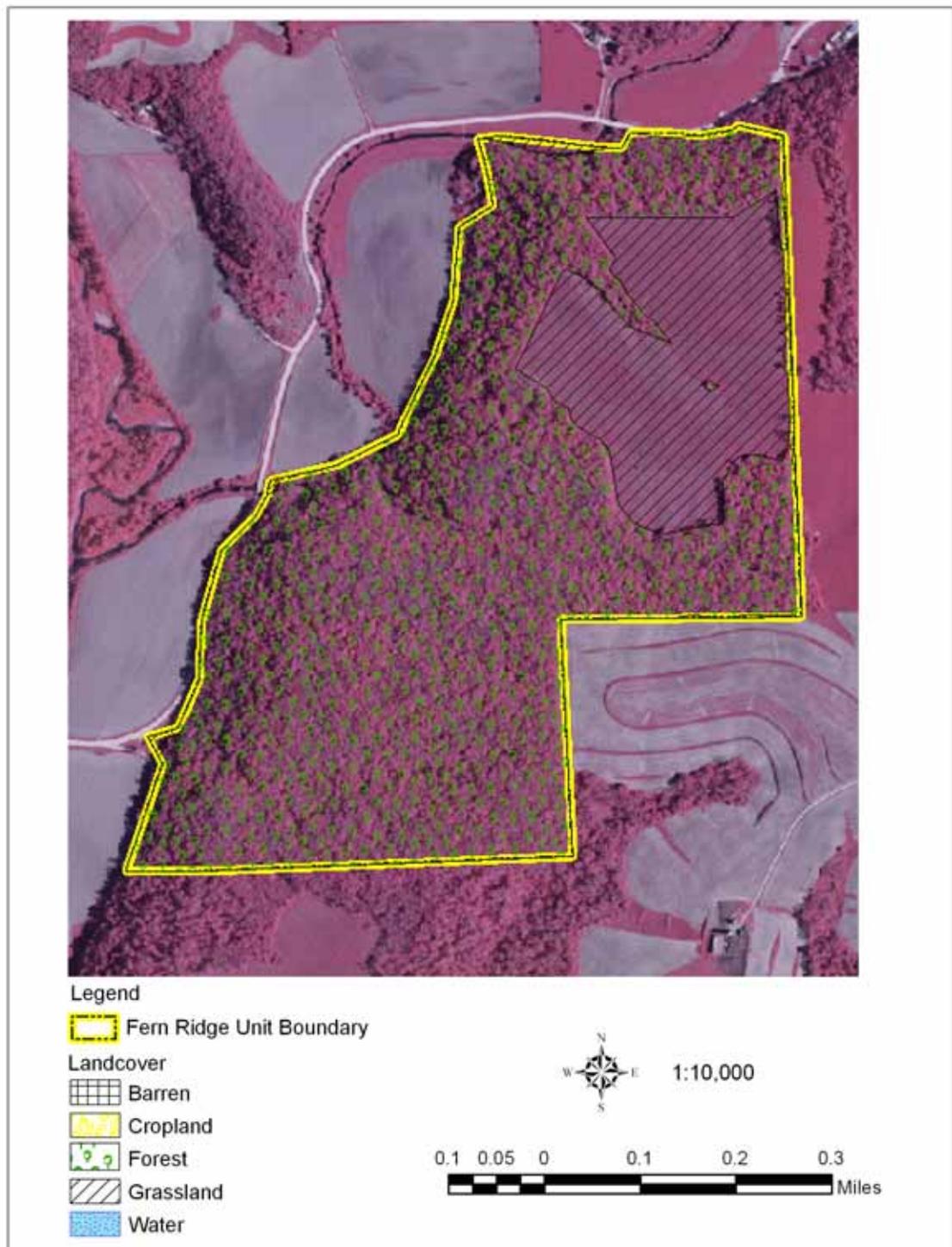


Figure 10: Hickory Creek Unit Landcover, Driftless Area NWR



Figure 11: Howard Creek Unit Landcover, Driftless Area NWR

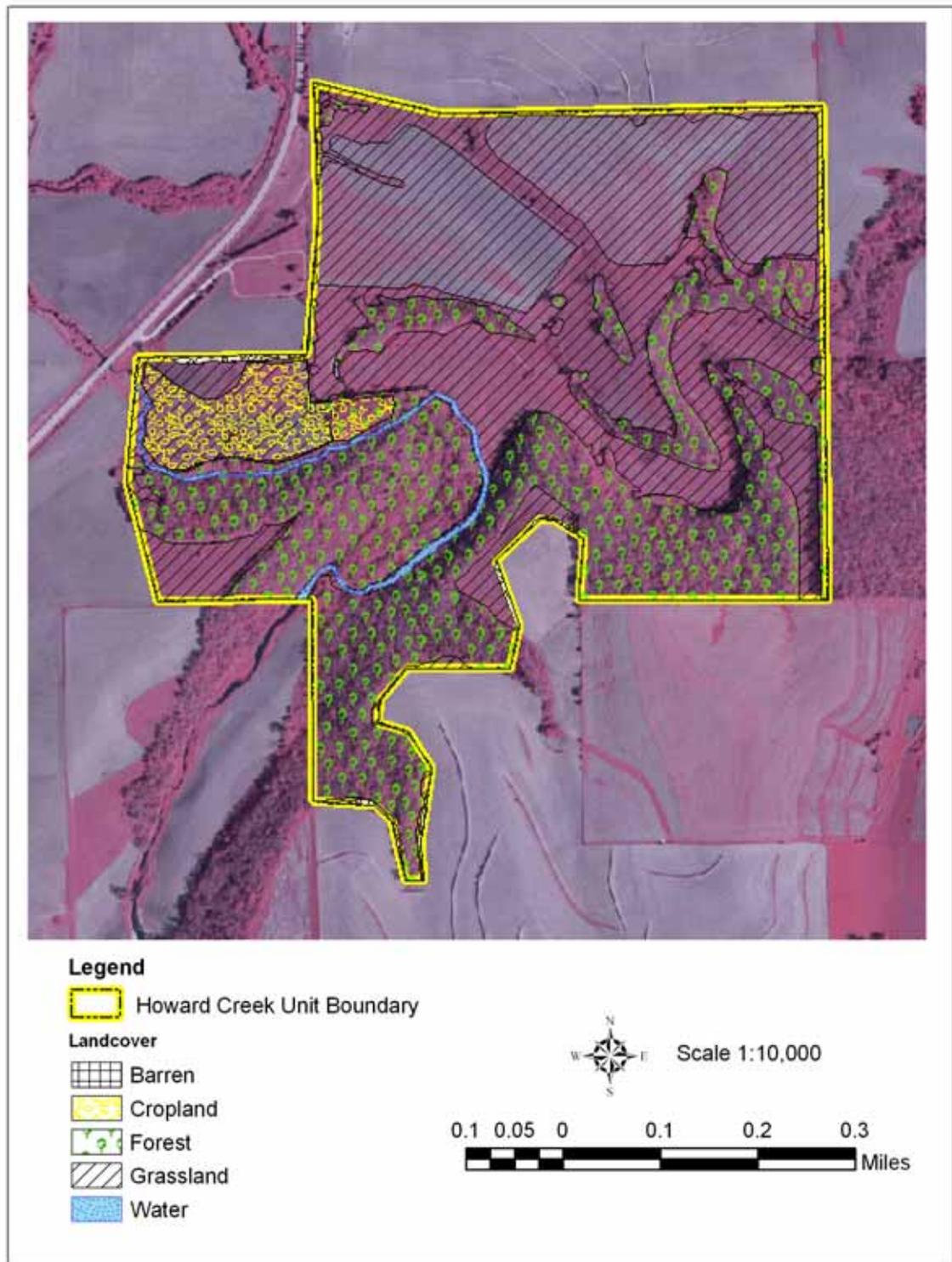


Figure 12: Kline Hunt Hollow Unit Landcover, Driftless Area NWR



Figure 13: Lytle Creek Unit Landcover, Driftless Area NWR

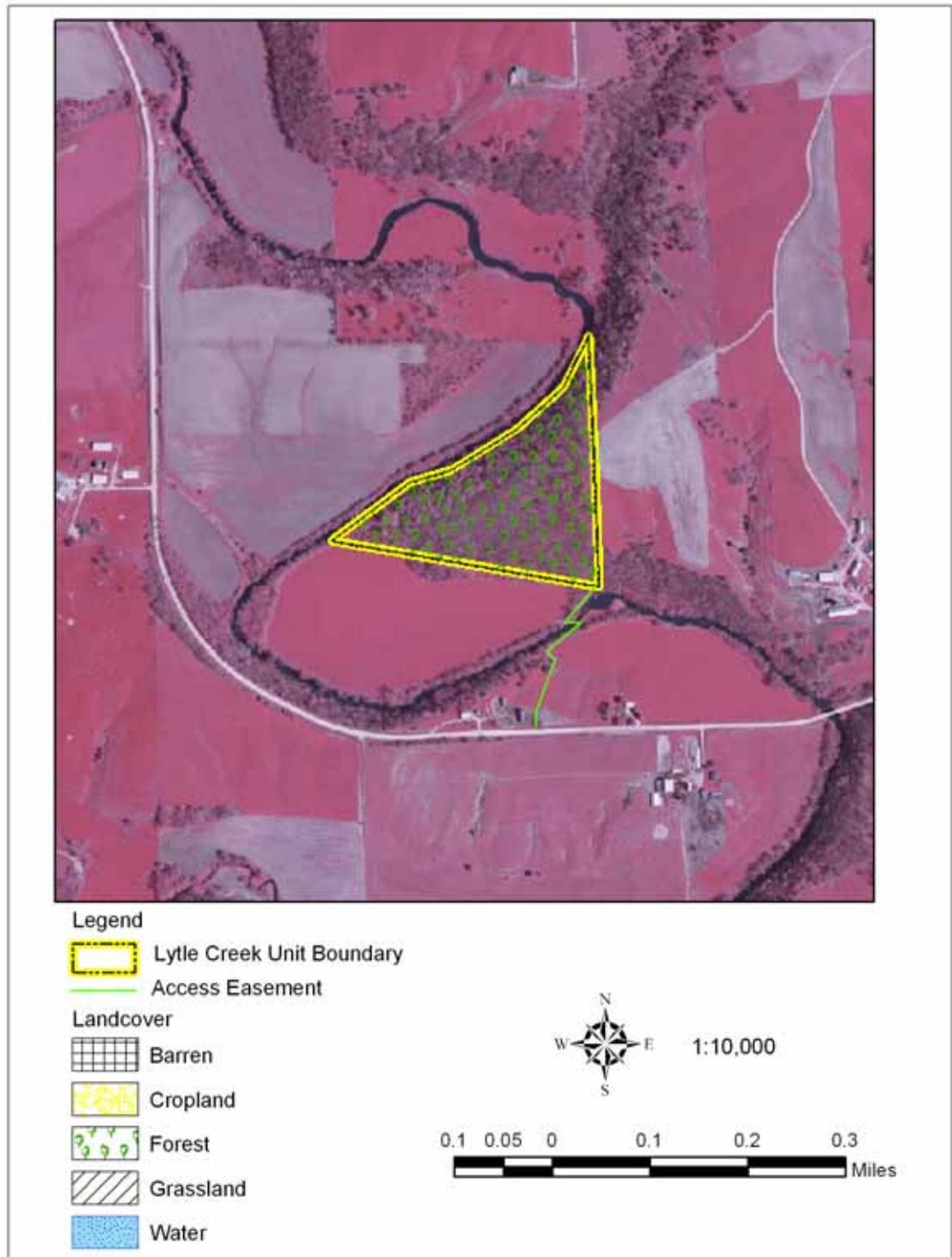


Figure 14: Pine Creek Unit Landcover, Driftless Area NWR

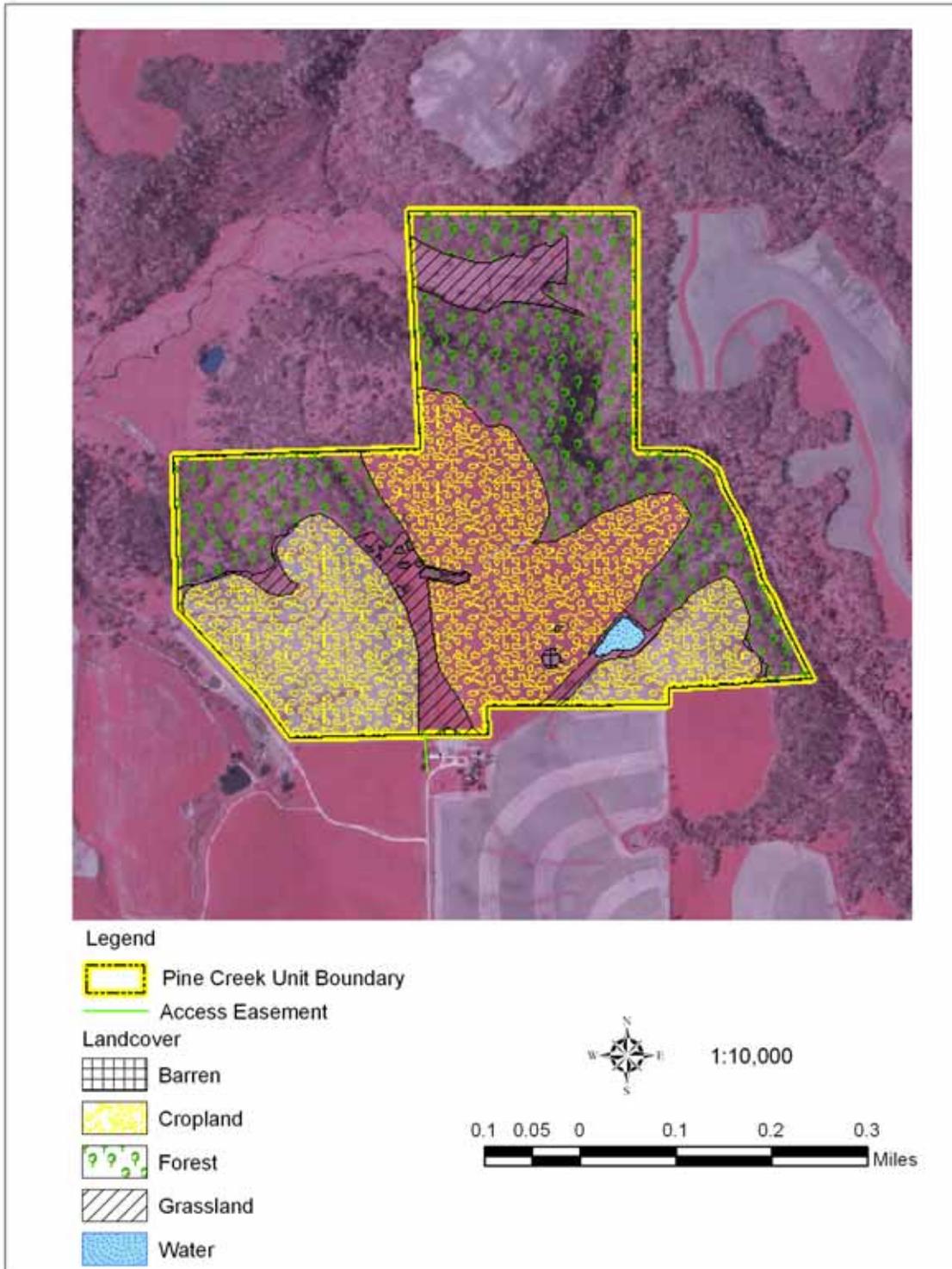


Figure 15: Steeles Branch Unit Landcover, Driftless Area NWR

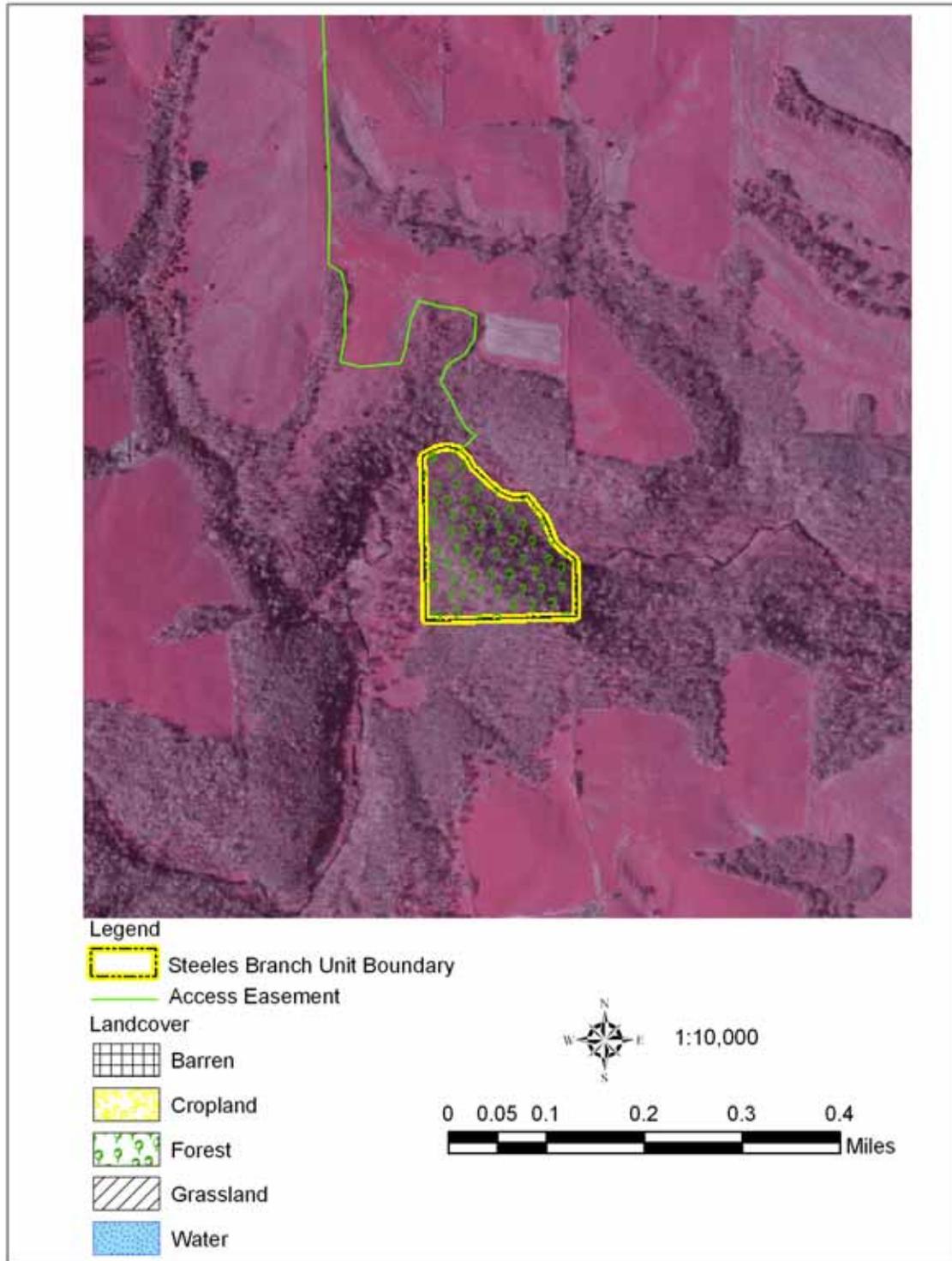


Table 1: Driftless Area NWR Units in Iowa (2004)

Unit Name	Acres	County	Year Acquired	Species present
Bankston	57	Dubuque	1991	Iowa Pleistocene snail
Cow Branch	110	Clayton	1996	Iowa Pleistocene snail Northern monkshood
Fern Ridge	207	Clayton	1991	Iowa Pleistocene snail
Hickory Creek	17	Allamakee	2001	Northern monkshood
Howard Creek	209	Clayton	1989/1990	Iowa Pleistocene snail Northern monkshood
Kline Hunt Hollow	6	Clayton	1991	Northern monkshood
Lytle Creek	20	Jackson	1991	Northern monkshood
Pine Creek	140	Clayton	2002	Northern monkshood
Steeles Branch	15	Clayton	1990	Northern monkshood

Grassland Habitat

There are 175.6 acres of grassland on the Refuge. The majority of grassland habitat exists on the Howard Creek unit (109.93 acres) and the Fern Ridge Unit (42.22 acres) (Figure 11 and Figure 9). Remnant native prairie exists on the Howard Creek unit (approximately 6 acres). The remainder of the grassland on Howard Creek unit is either cool season grasses or has been recently planted to native prairie species. The grassland on the Fern Ridge unit was cleared of trees by the previous owner for agriculture and is currently vegetated by cool season exotic grasses.

Prescribed burning has been used since 1996 to restore prairie remnants and control woody vegetation on the Howard Creek unit. Forty-eight acres of native prairie have been planted in former agricultural fields on the Howard Creek Unit. Cooperative farming has been used to prepare fields for planting. Currently, there are 81 acres in the cooperative farming program, primarily at the Pine Creek Unit. Invasive species control has taken place as staff time allows through the use of biological, mechanical and chemical control, mainly at the Howard Creek unit.

Forest Habitat

There are 535.32 acres of forest habitat on the Refuge. The majority of Refuge forests have been impacted by past grazing and logging. No restoration of forest habitats has been completed; however, tree seeds were collected in 2003 and sent to a nursery to grow trees for planting on the Refuge. Forest inventory and management plans are needed.

Streams

Cow Branch, Fern Ridge, Howard Creek, Pine Creek, and Steeles Branch units contain coldwater or warmwater streams with associated riparian areas. Lytle Creek, Hickory Creek, and Kline Hunt Hollow units have streams adjacent to the boundary. Spring fed streams on Pine Creek and Cow Branch units flow into designated trout streams off of the Refuge. Hickory Creek is a designated trout stream stocked with brown and brook trout by the Iowa DNR. Dry Mill Creek on the Fern Ridge unit is a put and grow trout stream that flows into the Turkey River. Steeles Branch creek was formerly stocked by the Iowa DNR but is no longer. Springs on the Refuge feed most of these streams. The Pine Creek unit also has a small manmade pond about one acre in size. Bankston unit does not contain any streams.

Endangered Species

The primary goal of Refuge management for endangered species is preventing disturbance to their habitat. Endangered species habitat is closed to all public entry because the species and their habitat are fragile. Algific slopes are typically steep, with a loose talus rock layer on the surface. Seven of the nine Refuge units are closed to all public entry because there is inadequate buffer around the algific talus slopes to allow human activity and there is not sufficient public access. Entry to several units is via an easement granted across private land. The two largest units, Howard Creek and Fern Ridge, are open to hunting, fishing, and wildlife observation. These units lie adjacent to public roads from which there is public access. The algific talus slopes are posted as closed to public entry on these open units. All units are periodically inspected by Refuge staff and law enforcement officers.

Most of the Refuge units are fenced to keep cattle from entering Refuge lands and to delineate boundaries. Refuge personnel maintain regular contact with neighboring landowners.

The invasive species, garlic mustard (*Alliaria petiolata*) has invaded some algific slopes. There is concern about its competition with Northern monkshood and other rare plants as well as possible effects on snail food sources. Garlic mustard is abundant on two slopes and has been hand removed from them during the last three years to begin control. Removal will likely be a continual effort until the seed bank is depleted. The forest surrounding these algific slopes also has abundant garlic mustard.

The recovery plans for both species require population monitoring to determine population status. A monitoring plan for Northern monkshood was developed cooperatively with the Iowa Department of Natural Resources and TNC in 1991. This monitoring has been conducted on Refuge sites as well as Iowa Department of Natural Resources preserves, The Nature Conservancy preserves, and private lands since 1991. A protocol for Iowa Pleistocene snail monitoring was developed in 2001 (Henry et al. 2003) and has been carried out each year since. Monitoring for both species occurs on a subset of the total number of known sites.

Refuge staff maintain contact with private landowners who have endangered species on their land in order to educate them about the fragile area on their land and inquire about possible acquisition or other forms of permanent protection. Some sites have been fenced through the Service's Endangered Species Landowner Incentive Program to prevent damage from cattle. The Nature Conservancy, Iowa DNR, and the Iowa Natural Heritage Foundation have been partners in landowner contact and land acquisition. The Refuge recently acquired Hickory Creek and Pine Creek units through land trades involving Upper Mississippi River NWFR lands. But, acquisition is currently limited by available funds and the need for additional Service authorization for Refuge expansion.

Recreation

Currently, the Howard Creek and Fern Ridge units of the Refuge are open for deer and upland game hunting. Special regulations regarding hunting dates and weapons are in place. Specifically, deer hunting is allowed only with archery and muzzleloader. Hunting dates are restricted to November 1 to January 15. Upland game hunting is allowed with approved non toxic shot. Spring turkey hunting is prohibited. These two units are also open for wildlife observation and photography. Fern Ridge and Steeles Branch units are open for fishing. All algific slopes are posted closed areas with no public entry. There are no public use trails. Educational programs and tours are occasionally given as requested by local groups or photographers.

Volunteers have assisted with habitat restoration at the Howard Creek unit. The Nature Conservancy has provided a summer intern for several years to work at the Refuge. Interns have assisted with endangered species monitoring, landowner contacts, invasive species removal, and other Refuge and TNC activities.

Cultural Resources

Reviews for threats to cultural resources on Refuge units are currently completed and submitted to the Regional Historic Preservation Officer as management activities arise. Recent examples of management activities include stabilizing a stream bank, building a warehouse, and burying debris from tree clearing.

Refuge Staff and Budget

The annual Refuge operations budget for fiscal year 2004 was \$92,285 which includes salary for one Refuge Operations Specialist (GS 9). The Refuge receives administrative, law enforcement, and maintenance support from the McGregor District of Upper Mississippi River National Wildlife and Fish Refuge. Volunteers also assist with Refuge activities.

Partnerships

Partners have been important players in Refuge activities over the years. The Nature Conservancy helped establish the Refuge and has worked extensively with the Refuge since then. TNC owns several preserves on which algific talus slopes occur and works to preserve the biodiversity of the Driftless Area. They have conducted algific slope inventory and research, contacted landowners, provided summer interns, and worked on acquisitions in a cooperative effort to protect the unique resources of the area. The Iowa Natural Heritage Foundation has also been a valuable partner in landowner contacts and land acquisition. Other agencies and individuals have assisted with prairie restoration at the Howard Creek unit. The Iowa DNR also owns preserves that protect algific talus slopes and federally listed species and has been an important partner in land protection and management.