Final Regional and Property Analysis

Northern Kettle Moraine Region (NKMR)

Wildlife, Fishery and State Natural Areas

Wildlife Areas

Jackson Marsh (*Washington Co.*)
Allenton (*Washington Co.*)
Theresa (*Washington/Dodge Co.*)
Mullet Creek (*Fond du Lac Co.*)
Kiel Marsh (*Sheb/Calum/Manit Co.*)
Nichols Creek (*Sheboygan Co.*)

Fishery Areas (*Sheboygan County*)

La Budde Creek Fishery Area
Onion River Stream Bank Protection Area

State Natural Area

Cedarburg Bog (*Ozaukee Co.*)

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Nichols Creek Wildlife Area – Spring Pond

For your convenience, this document is available on the internet at *http:/dnr.wi.gov/ .* Enter *property master planning* in the Search and Keywords box or access the document from each property's web page.

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Introduction and Overview

Purpose of Regional and Property Analysis (RPA)

All Department of Natural Resources properties are required to have a Master Plan describing the scope, purpose, and management of the project. The plan will be developed within the parameters of Wisconsin Administrative Code, Chapter NR 44, which governs Master Planning for DNR properties. Most of the Northern Kettle Moraine Region fish and wildlife properties have approved Master Plans, but they date to the early to mid1980's. NR 44 requires the plans be reviewed and updated at 15-20 year intervals.

The Regional and Property Analysis is the first phase and foundation of the Master Planning Process. Functionally, it highlights those elements in a regional context that are most important to consider when planning the property and identifies the most suitable potential future roles or niches for a property.

Regional Analysis

The Regional Analysis component of this document describes the broader biological/ecological, cultural, economic, and recreational environment that affects the properties and their uses. It identifies significant ecological and recreational needs within the planning group region. It also defines existing and potential social demands or constraints that affect these properties and should be considered during the planning process.

Property Analysis

The Property Analysis component of this document describes the existing resources, uses, management opportunities, limitations, and needs on these properties. This section also describes surrounding and adjacent lands, indicating how the character of these lands may affect these properties or their uses.

Findings and Conclusions

The Findings and Conclusions component is the most important section of the RPA. Based on all the regional and property data in the body of the document, the Findings and Conclusions section outlines the best probable future role or niche for these properties. It helps focus the planning process and becomes the foundation for building the plan's vision and goals, and action strategies.

Introduction to Properties by Designation

The properties included in this planning group are six State Wildlife Areas, two State Fisheries Areas (including one in Stream Bank Protection) and two State Natural Areas. One State Natural Area is designated within the boundaries of a Wildlife Area. The scope of use and management of a state property is governed by its official designation.

Wildlife and Fishery Areas

Wildlife and Fishery Areas are acquired and managed under the authority of Sec. 23.09 (2) (d) 3 Wis. Statutes, and Administrative Code ch. NR 1.51. Wildlife Areas are designated to provide places where people can hunt, trap or fish. Wildlife and Fishery Areas are also open for traditional outdoor uses of walking, skiing, snow shoeing, nature study, berry picking, and other low-impact recreational activities. As directed by chs. NR 1.51 and NR 1.61, other recreational uses may be allowed by the Master Plan if those uses do not detract from the primary purpose of these properties.

Stream Bank Protection Areas

The Stream Bank Protection program was established to protect and restore riparian corridors along streams, rivers and lakes, to improve water quality and provide public access. Section 23.09 (2) (d) 13 and Section 23.094, Wis. Statutes, provides legislative authority and direction for acquisition and management of these areas. This program is meant to reduce erosion and run-off, improve habitat and fishing opportunities, and protect watersheds. In addition to providing quality angling opportunities, these properties also provide for compatible recreational uses such as hunting, hiking, bird watching, nature study, and cross-country skiing.

State Natural Areas

Natural Areas are defined and authorized in Wisconsin Statute 23.27-23.29 and Administrative Code ch. NR 1.32 as “an area of land or water which has educational or scientific value or is important as a reservoir of the state’s genetic or biological diversity and includes any buffer area necessary to protect the area’s natural value”. Section 23.27(1) defines natural areas as "reserves for native biotic communities...habitat[s] for endangered, threatened, or critical species...or areas with highly significant geological or archaeological features". Section 23.28(1) provides authority to designate areas as State Natural Areas and Section 23.29 provides authority to legally dedicate and protect State Natural Areas in perpetuity. While the intent of the Natural Areas program is to preserve the best examples of the state’s diverse natural communities, other recreational uses may be allowed, if they do not threaten the site's natural values.

Overview of the Northern Kettle Moraine Region Wildlife, Fishery & Natural Areas

The project area is located in seven Wisconsin counties: Washington, Dodge, Fond du Lac, Calumet, Manitowoc, Sheboygan and Ozaukee. The Northern Kettle Moraine Region Wildlife, Fishery and Natural Areas (NKMR) properties contain about 15,807 acres of state owned land. The Department has obtained easements on an additional 592 acres and leases on 309 acres for public use or management access. Over the years, the Department has accommodated a variety of other uses (e.g., highways, powerlines, etc.) and provided conveyed easements on over 760 acres.

Approximately 12,698 acres are State Wildlife Areas and 1,446 acres are Fishery Areas. Approximately 2,160 acres are designated as State Natural Areas with Cedarburg Bog being the largest. Except for Cedarburg Bog, these properties have similar attributes and are all located in the Northern Kettle Moraine Region. For purposes of developing a property Master Plan, they will be collectively referred to as the NKMR properties. These properties are identified among regional landmarks on Map A**.**

Property	Acreage
Jackson Marsh	2,518
Allenton	1,160
Theresa	5,309
Mullet Creek	2,217
Kiel Marsh	843
Nichols Creek	651
La Budde Creek	401
Onion River SBP	1,045
Cedarburg Bog	1,663
Total	**15,807**

Nine Northern Kettle Moraine Region properties are included in this planning group:

Jackson Marsh Wildlife Area (incl. Jackson Marsh State Natural Area)

Allenton Wildlife Area

Theresa Wildlife Area

Mullet Creek Wildlife Area

Kiel Marsh Wildlife Area

Nichols Creek Wildlife Area

La Budde Creek Fishery Area

Onion River Stream Bank Protection (SBP) Area

Cedarburg Bog State Natural Area

Water & Wetland Resources

Numerous significant waterways are located on these properties:

- North Branch Milwaukee River (outstanding resource waterway)
- La Budde Creek (exceptional resource waterway) and (Class 1 and 2 trout stream)
- Onion River (exceptional resource waterway)
- Nichols Creek (Class I trout stream)
- Allenton Creek (Class I trout Stream)
- East Branch Rock River
- Sheboygan River

Cedarburg Bog State Natural Area is the largest, least disturbed peatland complex in southeast Wisconsin. It contains an extensive conifer swamp forest and a patterned peatland (characterized by ridges and swales running perpendicular to water flow). This is the southernmost example of a patterned peatland in North America and one of only four known in Wisconsin.

Analysis of the Regional Context

RECREATION RESOURCES: USES AND POTENTIAL

The primary recreational activities on these properties, except Cedarburg Bog, are hunting, trapping and/or fishing. Cedarburg Bog has some duck hunting, but has significant bird watching, nature study and ecological research, especially at the adjacent UW-Milwaukee field station. Several properties host multiple recreational activities such as LaBudde Creek Fishery Area which has a Class 2 dog training area, class 1 and 2 trout stream segments and hosts a portion of the Ice Age Trail.

Hunting, fishing, trapping and nature enjoyment are popular activities in the region. Resident license sales in Sheboygan, Washington and Ozaukee counties for 2011 had the following tallies:

- Deer hunting licenses sales included nearly 28,500 gun licenses and 12,000 archery licenses;
- over 8,200 small game licenses, 7,600 turkey licenses, 3,200 pheasant stamps and 9,200 goose permits;
- over 900 trapping licenses; and
- over 56,000 fishing licenses including 6,600 inland trout stamps.

Other popular activities include hiking, wildlife watching, dog walking, canoeing/kayaking, berry picking, snow shoeing and cross-country skiing (DNR, 2011b). These other activities are encouraged, but no to only limited management action is taken by Department staff to promote them (e.g., groomed ski trails are not provided).

Hunting and Trapping

Hunting is the most popular of the traditional activities on the NKMR properties with opportunities for waterfowl, white-tail deer, wild turkey, mourning dove, and small game. Excellent waterfowl hunting opportunities exist on the natural and restored wetlands and flowages at Theresa, Mullet Creek, Kiel Marsh and Mud Lake at Cedarburg Bog. Small game hunting, pheasant hunting in particular, is very popular on the grasslands of the region. The DNR supplements the wild pheasant population with stocking of captive-raised pheasants on some public lands. Public lands are heavily used for hunting and competition and crowding can be an issue, especially for deer, waterfowl, and pheasant hunting.

These properties have appeal for hunters beyond Sheboygan, Ozaukee and Washington Counties. About 24% of the deer harvested on the public lands in these three counties are taken by hunters who live outside these counties. Data from 2011 indicates deer hunters from 24 counties harvested deer in Ozaukee County and from 33 counties in both Washington and Sheboygan Counties.

An assessment of deer harvest data over the 2009-2011 time period indicates the harvest from public lands ranges from about 10% of the total harvest in Ozaukee County to as high as 22% in Sheboygan County and for the NKMR as a whole it averages about 15%. This harvest rate contrasts with the amount of state public hunting land in these counties which ranges from 3% in Ozaukee County to 8% in Sheboygan County and averages about 6% for the NKMR. This data indicates the public hunting lands yield more deer per acre than private lands in these counties.

Trapping is popular on several properties with Kiel Marsh having a long history as a popular location.

Fishing and Water Based Activities

Fishing is a major recreational activity in the NKMR region. About 42,000 resident fishing licenses were sold in Sheboygan, Washington and Ozaukee counties and almost 108,000 resident fishing licenses were sold in 2011 in the seven counties of the broader NKMR. Trout fishing in the Onion River, one of the premier trout waters in southeastern Wisconsin, is significant with substantial support from local trout anglers to assist with stream restoration activities.

Canoeing and kayaking are popular along the Kiel Marsh (Sheboygan River) and at Theresa Wildlife Area (Rock River).

Wildlife Viewing, Research and Outdoor Education

Bird watching is a very popular and growing activity, both in Wisconsin and nationally. The Great Wisconsin Birding and Nature Trail, a mapped auto trail that reaches into every area of the state, is a project of the Wisconsin Bird Conservation Initiative (a collaborative effort that includes the DNR). Dodge and Washington County are included in the Southern Savanna Region of the trail, and three NKMR properties (Allenton, Theresa, and Jackson Marshes) are identified as exceptional birding areas. In addition, Cedarburg Bog, in Ozaukee County, is designated as a Wisconsin Important Bird Area (WDNR, 2007). Many novice hunters participate in Learn to Hunt Turkey hunts and statewide youth hunts for deer, turkey and waterfowl on the NKMR properties. The properties also are used for Eagle Scout projects, school field trips and class projects.

The Cedarburg Bog State Natural Area is unique compared to the other properties because of the strong emphasis on research and education. The UW - Milwaukee Field Station, about 270 acres, is dedicated to research and outdoor education at the Cedarburg Bog SNA. The Field Station staff and the Friends of Cedarburg Bog collaborate to provide an extensive series of public classes and workshops that focus on natural history topics via hands-on field and laboratory investigations in ecology and evolution. This property is also listed as a National Natural Landmark by the US National Park Service.

Activities occurring at the Field Station and within the SNA include:

- Long-term ecological and bird surveys conducted on-site (25-30 years of continuous data)
- Dozens of research projects conducted annually on the property complex
- Average ~11,000 student hours of instruction and group use/year
- Eight to nine workshops/year on natural history
- Fifteen educational events/year sponsored by the Friends of Cedarburg Bog and the UW-Milwaukee.
- Volunteers contribute about 800 hours/year toward land management, boardwalk maintenance, raising funds, etc.

Camp Y-Koda Outdoor Skills and Education (a branch of the Sheboygan County YMCA) is located on 80 acres near the Sheboygan River and operates outdoor and nature-based youth camp activities. For over 30 years it has provided hands-on educational programs to over 4,700 kindergarten through 12th grade students every year. The Outdoor Skills ‘signature program’ is their Wetland Ecology Program. Since the early 1990s, they have led over 18,000 students out of classrooms and into Sheboygan Marsh and Kiel Marsh Wildlife Areas to “get their feet wet” in a wetland ecosystem

Trails

The NKMR properties offer numerous informal hiking, cross country skiing and snow shoeing opportunities on non-groomed paths and along service roads and lanes. The La Budde Creek Fishery Area portion of the Ice Age Trail, constructed in 2010, hosts a 3.5 miles segment of the Ice Age Trail.

Snowmobiling is a popular winter pursuit in the region with groomed trails maintained by local snowmobile clubs. These trails cross both private and public land. Snowmobile trails provide access to most portions of the NKMR counties, and provide links to cities and village amenities.

Numerous hiking and trail opportunities exist in the region. The Kettle Moraine State Forest--Northern Unit has more than 132 miles of trails including 31 of the Ice Age National Scenic Trail (IAT). The IAT runs nearly the entire length of the region and receives tremendous use. Completing the trail is a high priority project (Map B). The Kettle Moraine State Forest--Northern Unit also provides 41 miles of bridle trails and 14.5 miles of mountain bike trails.

The county parks, land trusts, and Fish and Wildlife Service properties also offer opportunities for a variety of hiking, skiing and snow shoeing experiences.

The Rock River Water Trail begins on the Theresa Wildlife Area and continues downstream toward the Horicon Marsh.

Shooting Sports

Shooting ranges with target shooting and related activities are complementary to game and waterfowl hunting, but they are often enjoyed as separate sports. There are no shooting ranges on the NKMR properties and the closest DNR property is McMillar Shooting Range in Waukesha County. In the counties around the NKMR properties there are 32 commercial or club shooting ranges with at least 18 ranges indicating they offer some form of potential public access (NSSF, 2013).

Camping

The NKMR fish, wildlife and natural areas lands are not open to overnight camping. However, numerous camping opportunities exist around the NKMR properties at the nearby state parks, Kettle Moraine Forest, county parks and privately operated facilities. Kettle Moraine State Forest has about 400 sites ranging from individual, backpack, utility hook up, group camp to bridle camping. Pike Lake State Park offers over 30 family campsites for both tent and RV style camping experiences. Harrington Beach State Park has 69 family camp sites, one group camp and kayak camping.

The majority of the privately operated campgrounds cater to RV or travel trailer style camping, some offer rustic cabins to their guests, but tent camping is also accommodated.

Recreation Opportunities and Need

The Statewide Comprehensive Outdoor Recreation Plan (SCORP) (WDNR 2006a) is a source of information on the broad range of outdoor recreation activities in Wisconsin. SCORP uses a national template that describes the status, trends and needs for outdoor recreation in Wisconsin and is revised periodically to assess changing trends. Information for the document is obtained from public surveys, listening sessions and interviews. Information is also referenced from the DNR Ecological Landscapes Handbook (WDNR, 2010). Because four of the NKMR properties are located in the Greater Milwaukee Metropolitan Area, additional relevant information is attributed to a WDNR collaboration with the UW-Madison Applied Population Laboratory, who produced "Regional Profile, Region 10," for southeastern Wisconsin.

For planning purposes, this Regional Analysis focuses on “nature-based” activities or those activities that generally take place in natural or undeveloped settings. These include traditional activities (e.g., hunting, trapping, fishing, camping, hiking, wildlife watching, canoeing, swimming in lakes and rivers, horseback riding) and non-traditional (e.g., geocaching, kayaking, and off-road biking) and motorized activities (e.g., ATV riding, motor boating). This analysis does not include outdoor activities associated with developed settings, facilities, and infrastructure.

Relative participation rates (percent population participating) are fairly consistent across the state for most outdoor recreational uses. The 2006 SCORP report identified the following public perspectives on top regional nature-based recreational issues and needs in the Lower Lake Michigan Coastal Region:

- Maintaining Rustic Areas
- Conflicts Between Silent Sport and Motorized Uses
- Noise Pollution from Motorized Activities
- Overcrowding
- Poor Water Quality Impairing Recreation
- Preserving Natural Lands
- Relevance to Urban Populations

One of the major recommendations in the SCORP report is the preservation and protection of the larger areas that provide space for popular regional outdoor recreational activities. Specific recommendations were based primarily on information from the Land Legacy Report. The Land Legacy Report was completed by WDNR in 2006 to identify the most important remaining sites in the state that warrant protection for their natural resource and outdoor recreation values. The LLR and SCORP reports identify the Kettle Moraine Areas as being an important recreational opportunity within a unique topography.

Population and Public Access Lands

The land base for providing quality hunting, fishing and hiking opportunities in lightly developed or rustic settings is diminishing due to residential, commercial and infrastructure developments in the region.

The NKMR properties currently provide about 35% of the lands available for hunting, fishing and trapping. The other large public access properties include the state owned Northern Kettle Moraine State Forest with 20,957 acres, several state parks and the county owned Sheboygan Marsh with 7,414 acres (Table 1).

Table 1 Public Access Lands for Hunting, Fishing and Trapping*	
Property Owner	**Acres**
Wisconsin DNR (NKMR)	16,438
Other DNR lands	20,988
US Fish and Wildlife Service	1,416
County**	7,414
Total	**46,256**

*Ozaukee, Sheboygan, Washington counties
** Sheboygan Marsh owned by Sheboygan County

Over 2,700 acres of open space lands are available in the local county park systems. A significant majority of this land is devoted to active team sports or family activities rather than nature focused recreation such as hunting, hiking and bird watching. Several of these parks do provide public fishing access.

The Ozaukee Washington Land Trust manages over 1,000 acres that where nature enjoyment, education, hiking and bird watching are allowed. However, hunting is limited due to the multiple uses occurring on the land trust parcels.

The UW-Milwaukee Field Station owns about 270 acres and 45 acres currently lie within the Cedarburg Bog state natural area project boundary. These lands are used for research and education and are not readily available for general public use.

The population in this region is growing and is increasingly living in urban and suburban settings. The three counties discussed above have a population of 334,361 (WDHS, 2011 web link). The broader seven counties that contain all or parts of the NKMR properties have a population of 676,178. Residents in southeast Wisconsin with ready access to these properties are home to over 2.2 million people.

Using the last population estimate as a basis of comparison, 39% of the state's population has ready access to only one-tenth of the state's conservation and recreation lands. This relative scarcity of public access land compared to all of Wisconsin (Figure 1) is further explained in the Wisconsin SCORP (WDNR 2006a).

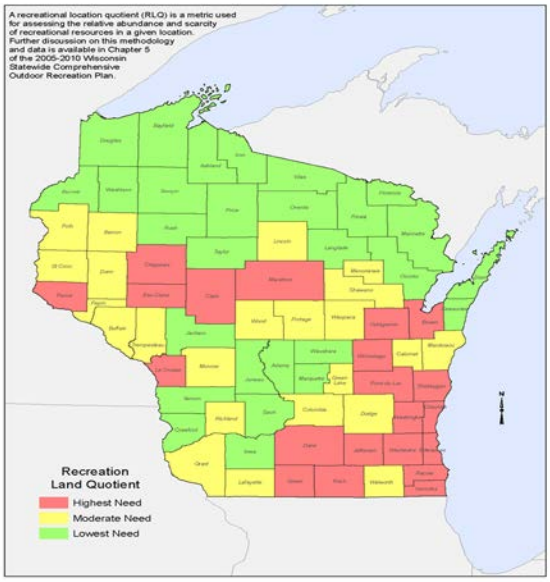

Figure 1 - Statewide need for recreation lands is greatest in southeast and south central Wisconsin.

There is a need to provide high quality, nature-based recreation opportunities for a broad population demographic in this region. The region has a heritage of hunting, fishing, trapping and pursuing other outdoor recreational activities like hiking and bird watching. The greatest recreation needs are to provide more opportunities near population centers that are easily accessible and can collectively accommodate a variety of traditional outdoor recreational activities (Land Legacy Report, WDNR 2006b).

Providing outdoor recreation opportunities can be accomplished by acquiring areas with high quality natural values and parcels that are somewhat degraded, but have the potential to be restored to provide a range of traditional outdoor recreational activities. To the degree practical, buffering, linking and expanding existing public access lands (i.e., state, federal, county, institutional, non-profit and private) could create more recreation opportunities and greater management efficiency (WDNR LLR, 2006b).

Recreation and Public Use Challenges

Seasonal crowding is problematic, especially on opening weekends and peak periods of the primary hunting seasons (deer, pheasant, turkey and waterfowl). This leads to rude behavior, safety concerns and a lower quality hunting experience.

Informational signage, parking lots and access roads need to be expanded and upgraded on all NKMR properties. Some townships (e.g. Jackson, Theresa) have passed ordinances eliminating or limiting parking along roadways to reduce problems related to snow removal and safety issues. Additional parking areas and access roads may be needed to ensure adequate public access to public lands.

Littering is also an ongoing problem in the parking lots and along roadways. Tires, appliances and electronic devices have been dumped on public lands to avoid disposal fees. Time and funds for clean-up continue to increase. Illegal or undesirable behavior has been an issue at some parking lots.

The NKMR properties share unique challenges associated with wildlife and human interactions because of their location near high density human populations. There is also a great opportunity for public outreach and education. Many urban residents are unfamiliar with wildlife and turn to DNR for guidance and information on a daily basis. The future of wildlife is best assured by raising the public's awareness and understanding of wildlife conservation. This can be done effectively on public lands where visitors can see for themselves the connections between people and wildlife, habitat, and land management. Well-designed interpretive signs and exhibits would explain wildlife's needs and DNR management actions. While helping to instill a land ethic, these properties can also show landowners how to make sustainable use of their lands and leave room for wildlife (USFWS, 1999).

HABITAT MANAGEMENT – CURRENT PRACTICES

Wetlands – Wetlands are an important habitat type on all of the NKMR properties. The primary purpose for managing wetlands is to provide habitat for wildlife reproduction and survival and for stopover habitat for migratory water birds. Traditionally wetland management focused on waterfowl and furbearers, but also benefits all wetland wildlife, including shorebirds, wading birds, reptiles and amphibians.

Management activities include manipulating water levels, using herbicides and/or prescribed fire to improve the ratio of emergent vegetation to open water in shallow to deep water emergent wetlands. This improves cover and food conditions for most wetland wildlife. Water level depths have to be stabilized during late spring and maintained at certain levels in the winter to provide overwinter habitat for muskrats, mink, otter and amphibians.

Moist soil management is usually done to provide attractive feeding areas for migratory birds – from waterfowl to shorebirds and wading birds. This is usually done on shallow emergent wetlands and wet meadow wetlands. Water control structures are used to drain wetlands during the growing season to allow early successional wetland plants to establish and develop seed. On areas dominated with reed canary grass, areas can be mowed late in the growing season – often by local farmers through sharecrop contracts - and then flooded during late summer and fall. This allows large increases in invertebrates and attractive feeding areas for waterfowl and shorebirds.

Many of these managed wetlands have significant infrastructure requirements including dikes, culverts and dams - all requiring monitoring and maintenance. The dam on Theresa and the water control structures on Mullet Creek, Allenton and Kiel Marsh all require intensive monitoring and manipulation during heavy rain events and during spring runoff to prevent flooding on public roads. Water levels controlled by dams managed by other entities, such as at Kiel Marsh, can affect the effectiveness of the Department's management activities.

All of the properties contain significant and some rare wetland types that provide both breeding and migratory habitat for birds. Restoration of previously drained wetlands has occurred on some wildlife properties. Wetlands are usually restored by removing or disabling subsurface drain tiles and plugging drainage ditches and sometimes enhanced by scraping deeper areas to increase water depths and increase habitat diversity.

Shrub-car wetlands that are dominated by wetland tolerant shrub species like willow, dogwood and tag alder are found on most of the properties. They are important habitat for variety of wildlife for cover and food. Species range from deer to woodcock, willow flycatchers and black-billed cuckoos. These habitat types are relatively stable over time and often can be passively managed. Tag alder areas can be rejuvenated to younger thicker cover by mowing. Drier sites can be burned, cut and/or chemically treated to setback woody vegetation and invasive species that may come to dominate sites over time.

Grasslands and Upland Areas – These areas provide valuable food and cover for a variety of wildlife species. Traditionally these areas were managed to provide nesting cover for pheasants and ducks with benefits to grassland songbirds as well. Pheasant populations have declined throughout this area from landscape scale changes in land-use that severely limits nesting cover. Grassland songbirds and some reptiles benefit from larger blocks of grassland cover and ducks benefit from nesting cover near wetland brood habitat.

These areas are developed by conversion of agricultural fields to native prairies, warm season grasslands and/or rotation of croplands through sharecropping into cool season grass/hay fields with restricted cutting dates. Warm season grasslands need to be burned or mowed on a regular basis to keep them in grass cover. Wooded and rock fence-lines have been removed on some properties to reduce impacts from predators on grassland nesting birds.

Agricultural Practices - Currently, about 860 acres/year are sharecropped of the 16,000 plus acres of state owned and easement lands on these nine properties. These share crop acres may be used for cropland, hay cutting or grazing. The croplands are used to provide food plots for doves and pheasants and aid habitat restoration activities.

In emergency circumstances, such as the drought of 2012, hay cutting may be allowed on the grasslands. In 2012, six permits were issued for several of the wildlife areas covering a total of 147 acres.

Smaller fields may be allowed to convert to upland shrub cover and eventually to forest cover. Some agricultural fields are maintained in agriculture through sharecropping until funds are available to convert them to permanent forest or grass cover types.

Forests – The principle management goal for forests on fish and wildlife properties is to provide sustainable habitats for fish and wildlife species. This goal benefits both present and future generations by providing long-term benefits such as healthy, productive habitats for wildlife, attractive recreational settings for users and neighbors, and potentially forest products for the local and statewide economies (e.g., firewood to saw timber). The long-term benefits are wide ranging and include public hunting, outdoor recreation, aquatic and terrestrial wildlife, native biological diversity, protection of soil and water resources, production of recurring forest products, and aesthetics.

Specific management practices include suppression of invasive plant species, thinning or regeneration harvests, and planting seedlings to re-forest harvested areas or create a new forest on open or brush lands as desired by the property manager.

Harvesting of timber is aimed at maintaining species diversity, while improving the vigor of desirable species such as those that produce mast crops (oaks, hickories, beech) or provide other benefits to these properties. Forest food crops are important to sustain populations of both game and non-game species such as white-tailed deer, turkey, squirrels, and other furbearers. It is also aimed at reducing high risk species (e.g., ash to the emerald ash borer) or other high risk trees such as those with obvious infections or decline so as to maintain a stable, yet dynamic, ecosystem. Retaining tree vigor is paramount to protecting trees from losses from both native and non-native forest pests such as gypsy moth.

As stands dominated by shade intolerant species (oaks, aspen) begin to reach their rotation age, the forests are either regenerated (clearcut harvest) or managed to develop into more shade tolerant types such northern hardwoods. Early successional types are of importance to deer, grouse and woodcock.

Sustainable forest management requires the protection of archeological or historical sites, sensitive species and communities, water resources, such as wetlands, streams, or ephemeral pools, wildlife trees both standing and downed, and legacy trees.

Planting tree seedlings can supplement natural seeding on regeneration harvests or conversion of conifer plantations to native hardwood forests, or the afforestation of open lands. The latter is often aimed at creating early successional forest types such as oak or aspen, reducing forest edge, or expanding forest stands to create larger blocks that are rare in southern Wisconsin and provide significant habitat for a wide range of threatened and endangered species, including forest interior birds.

Wisconsin's public forests are managed under the principles of sustainable forest management and are dual certified under the Forest Stewardship Council (FSC) and the Sustainable Forestry Initiative (SFI) programs. Certification means that the forests are managed according to strict environmental, social, and economic standards.

Coldwater Streams - Coldwater streams are dominated by groundwater inputs and can sustain fish communities adapted to cold, oxygen rich, flowing water conditions. They can support the following game fish - brook trout, brown trout, rainbow trout - and other native species such as white sucker, mottled sculpin and various minnow species. Coldwater streams will often support diverse communities of invertebrates as well as environmentally sensitive mayflies, stoneflies and caddis flies.

Habitat management can increase the carrying capacity, growth and natural recruitment of desirable fish species, specifically trout as well as improve access for anglers and other users. Coldwater streams often rely on external sources of energy for the aquatic food web. Small streams are often shaded by trees and grasses so the invertebrates are adapted to eating leaves and detritus from terrestrial sources. Management of the streamside vegetation can increase the productivity by allowing sunlight to penetrate directly into the stream to increase the production of algae and phytoplankton. This results in increases in invertebrate and fish populations, while balancing the need to remain sufficiently cold to sustain trout populations.

Most trout streams are actively managed and the following activities are conducted:

- Manage vegetation by planting desirable woody and herbaceous species or removing tag alder, aspen, box elder, black willow and invasive species to minimize bank erosion, excessive stream shading or degraded habitat quality.
- Install and maintain stream habitat enhancements such as bank stabilization, lunker and boom cover installations, revetments and current deflectors to provide enhanced in-stream habitat and cover.
- Remove beaver dams to maintain the free flowing environment.
- Stock trout.

Warmwater Streams - Lakes, flowages and larger rivers and streams on or adjacent to the NKMR properties provide an abundant, sustainable warmwater game fishery and habitat for diverse semi-aquatic and aquatic plant and animal communities. Currently, no stocking programs or habitat manipulations are being conducted on these resources. Passive management is typically followed for all warmwater fisheries.

BIOLOGICAL RESOURCES AND ECOLOGICAL CAPABILITY

Defining the Region

Ecological characteristics of the Northern Kettle Moraine Region are defined using the Wisconsin DNR Ecological Landscape classification system. This system divides the state into 16 ecologically similar regions based on soils, existing and pre-European settlement vegetation, topography, and types of aquatic features present. All NKMR properties lie within the **Southeast Glacial Plains Ecological Landscape** (Figure 2).

Background information for this Regional & Property Analysis is largely reproduced from the chapter describing the Southeast Glacial Plains found in *The Ecological Landscapes of Wisconsin Handbook* (WDNR 2011b). Developed by the WDNR Ecosystem Management Planning Team, this handbook identifies the best areas of the state to manage for natural communities, including their key habitats, aquatic features, native plants, and native animals from an ecological perspective. Additional information more finely tuned to regional characterization of these properties is reproduced herein from *The Rapid Ecological Assessment* for the Northern Kettle Moraine Region (WDNR, 2010d).

Land cover and vegetation descriptions in this document use different terminology, as evident in the narrative ecology vs. GIS mapped land cover descriptions. This is a result of programmatic database differences in the wildlife and forestry management programs; neither approach is incorrect; however, the mapped land cover descriptions contain fewer details, hence the necessity for additional narrative. The narrative vegetation and ecological community descriptions may contain critical details, based on analyses of plant and animal communities, as viewed from a "ground up" perspective. The corresponding land "cover types" in Map series D and referenced in tables within each property description, give 'tree-top' or aerial land cover perspectives from a forestry management perspective. This "top down" perspective misses certain qualities of ground level ecological communities; for instance, a rare bog community will appear only as a wetland.

Southeast Glacial Plains Ecological Landscape

The Southeast Glacial Plains Ecological Landscape borders Illinois and covers a large area of southeastern Wisconsin. This landscape is home to some of the world's best examples of landforms resulting from continental glacial activity. Drumlins, eskers, kettle lakes, kames, moraines, and other glacial features are evident throughout the entire area.

The prominent feature in this region is the terminal moraine, a long "ridge" that formed between the Green Bay and Lake Michigan glacial lobes during the Wisconsin Glaciation. Extending from Manitowoc County southward to Walworth County, this area called the "Kettle Moraine," contains some of the country's most impressive glacial features. The unique topography and geology of the Kettle Moraine creates great variation in site characteristics such as soils, slope, sun exposure and drainage resulting in diverse, and often rare, plant and animal communities.

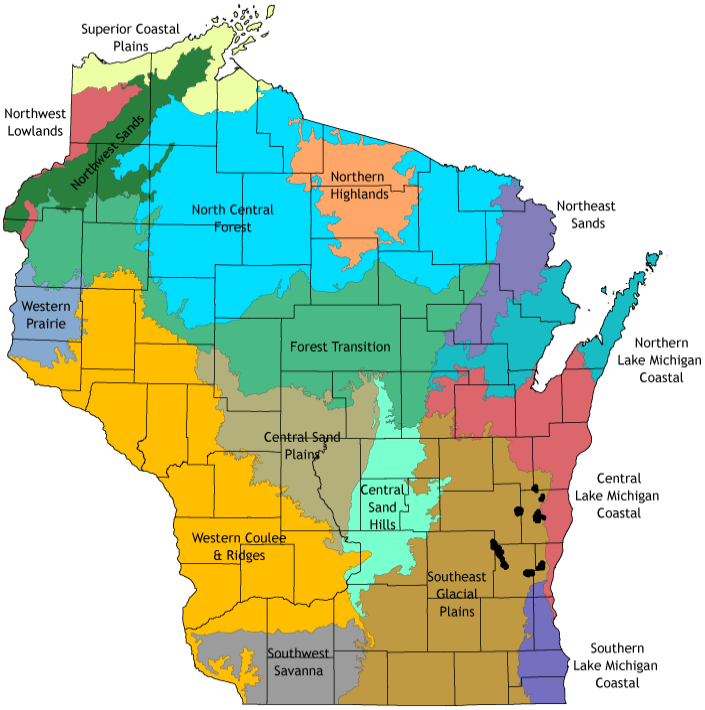

Figure 2. Ecological Landscapes of Wisconsin. The Northern Kettle Moraine Region properties (in black) lie within the Southeast Glacial Plains Landscape.

Historic Vegetation

Data from Wisconsin's original Public Land Surveys are often used to infer vegetation cover types prior to Euro-American Settlement. Public Land Surveys for the NKMR completed between 1832 and 1840 indicated pre-settlement forests were dominated by sugar maple, basswood, red oak, and white oak, with areas of American beech, and conifer swamps of northern white-cedar, black spruce, and tamarack.

Wet Prairies, Southern Sedge Meadows, Emergent Marshes, Calcareous Fens, and Tamarack swamps were found in poorly drained, wetter portions of the landscape which typifies this NKMR property group. End moraines and drumlins supported savannas and forests.

Agricultural and urban land use practices drastically changed the landscape after Euro-American settlement. Seasonal agriculture currently dominates, while the remaining forests occupy only about 10% of the land area, primarily consisting of oak, maple-basswood, and lowland hardwoods. No large areas of contiguous forest exist today, except within the Kettle Moraine State Forest on the Kettle Moraine, where the relatively rugged topography is ill-suited for row-crop agriculture.

Physical Environment: Geology & Soils

The surface geography of the region has been shaped by many factors, but the outstanding features of the Northern Kettle Moraine Region were shaped by glacial activity. The bedrock of this region is of Silurian age dolomite with a depth that is highly variable due to erosion and abrasion, both during and since glaciation. The NKMR is located on both sides of the interlobate region of the Green Bay and Lake Michigan lobes of the Laurentide ice sheet of the Wisconsin Glaciation. This area is characterized by pitted outwash plains, remnants of small glacial lakes, and till-covered dolomite uplands.

Soils are predominantly calcareous loamy tills, with areas of outwash sands and gravel, and silty lacustrine materials. Soils on the moraine uplands and drumlins are formed in brown calcareous sandy loam to loam till. They range from well drained to somewhat poorly drained and generally have silt loam to loam surface textures, moderately rapid to moderate permeability, and moderate available water capacity.

Most lowland soils are very poorly drained non-acid muck, but may also be silty and clayey lacustrine, or loamy till. The major river valleys have soils formed in loamy to silty alluvium or non-acid muck; they range from moderately well-drained to very poorly drained, and have areas subject to periodic flooding.

Water Resources and Aquatic Habitats

Basins and Watersheds

In Wisconsin, the state is divided into three (3) major river basins each identified by the primary water body into which the basin drains. They are the Lake Superior Basin, Mississippi River Basin and the Lake Michigan Basin. The majority of the NKMR properties drain into the Lake Michigan Basin, with the exception of Theresa Wildlife Area and Allenton Wildlife Area that drain into the Mississippi River Basin. River basins are divided into water management units (WMU) and further into watersheds. The NKMR is drained by a large number of streams and rivers. Springs are abundant on the NKMR landscape, though generally uncommon throughout the state. These springs are critical sources for coldwater streams, many of which are designated trout streams.

The NKMR properties occur along several regionally significant waterways including the North Branch Milwaukee River, La Budde Creek, Nichols Creek, and Mullet River, all of which are noted for their significant wetland habitats (Map B). The North Branch Milwaukee River is state designated as an Outstanding Resource Water (ch.NR 102.11), meaning it has outstanding recreational opportunities, supports fish and wildlife habitat, good water quality, and is not significantly impacted by human activities. In Wisconsin less than 8% of rivers and streams carry this designation. In addition, La Budde Creek and Onion River are classified as Exceptional Resource Waters, and Nichols Creek and Allenton Creek are Class I trout waters.

The Mullet River Watershed Plan (WDNR 2010a) provides updated information about water resources at the local level. The plan includes the **Mullet Creek Wildlife Area** and **La Budde Creek Fishery Area**. Current management issues, opportunities and recommendations are described for improving overall water quality.

Rivers and Lakes

The Sheboygan River flows through Kiel Marsh Wildlife Area and its tributaries form the major drainage system in Sheboygan County and the northern part of the NKMR. The Mullet River, a major tributary to the Sheboygan River, flows through Mullet Creek Wildlife Area. The Mullet River is fed by La Budde Creek which drains the La Budde Creek Fishery Area. Also feeding into the Sheboygan River is the Onion River, which is fed by Ben Nutt Creek and Mill Creek, both Class I designated trout streams that drain the Onion River SBP Area and Kamrath Creek.

The East Branch Rock River is a major stream in northwestern Washington County and flows through the wetland valley of Allenton and Theresa Wildlife Areas. Feeder streams that join the river on the properties include Allenton Creek (a Class I trout stream), Limestone Creek, No Name Creek, Kohlsville River, Lomira Creek, and Kiefer Creek.

The Milwaukee River, the major waterway of Ozaukee County, is fed by the North Branch Milwaukee River. The North Branch is a Class I trout stream and its headwaters flow from the Nichols Creek Wildlife Area. Cedar Creek is a major tributary to the Milwaukee River and, along with Evergreen Creek, drains Jackson Marsh Wildlife Area (Map B).

Lakes are rare on the NKMR properties. Cedarburg Bog SNA has five small lakes plus Mud Lake which is the largest inland lake in Ozaukee County. Shallow water impoundments are located on several properties, creating managed-wetland habitat used by a variety of wetland-dependent wildlife species.

Wild Game Resources

The primary game species include white-tailed deer, eastern gray and fox squirrels, cottontail rabbit, Canada geese, eastern wild turkey, ring-necked pheasant, mallard, wood duck, blue-winged teal, mourning dove, and woodcock. Low numbers of ruffed grouse, may still be found. In addition to other waterfowl species, rails, snipe and coot can be hunted. Popular furbearing animals found on these properties are raccoon, coyote, foxes, opossum, muskrat, mink, river otter and beaver.

Popular fish species include yellow perch, crappie, panfish, brook trout, brown trout, brook stickleback, pearl dace, mud minnow, common white sucker, Johnny darter, creek chub, and blacknose shiner. Less abundant northern pike provide additional angling opportunities.

Natural Community Management Opportunities

Management needs and opportunities for any landscape are often described in terms of “natural or native communities”. These are assemblages of native plants and animals that consistently occur together under similar conditions. The Ecological Landscapes of Wisconsin Handbook (WDNR 2011b) describes the best opportunities for sustaining natural community types by Ecological Landscapes. “Sustaining natural communities” means ensuring that a given natural community type will be present and has high potential to maintain its characteristic composition, structure, and ecological function over a long period of time (e.g. 100 years).

The Wisconsin Wildlife Action Plan (WDNR 2005) identifies 34 natural communities for which there are “Major” or “Important” opportunities for protection, restoration, or management in the Southeast Glacial Plains Ecological Landscape.

- A **major** opportunity (for Natural Community Management) exists when a community type is represented by many significant occurrences or for major restoration activities within an Ecological Landscape.
- An **important** opportunity means that a community type is not extensive or common in an ecological landscape but has a minimum of one to several significant intact occurrences that should be considered for preservation and/or management. Or, it means that the natural community type is restricted to just one or a few ecological landscapes within the state and should be considered for management there because of limited geographic distribution and lack of better opportunities elsewhere.

There are 16 “major” and “important” community types found on the NKMR properties, listed below. Managing for these community types, especially the 8 in bold font, provides a useful strategy for the flora and fauna of the Southeast Glacial Plains Ecological Landscape (O. Boyle, WDNR, pers comm.).

• **Calcareous Fen**	Shrub-carr
• Coldwater Streams	Southern Dry-mesic Forest
• **Emergent Marsh**	**Southern Hardwood Swamp**
• **Floodplain Forest**	Southern Mesic Forest
• Inland Lakes	**Southern Sedge Meadow**
• Northern Sedge Meadow	**Tamarack (Rich) Swamp**
• Northern Wet Forest	Warmwater Rivers
• **Northern Wet-mesic Forest**	**Warmwater Streams**

Species of Greatest Conservation Need

The Wisconsin Wildlife Action Plan (WDNR, 2005) describes Species of Greatest Conservation Need (SGCN) as animals that have low and/or declining populations in need of conservation action. They include various birds, fish, mammals, reptiles, amphibians, and invertebrates (e.g. dragonflies, butterflies, and freshwater mussels) that are:

- Already listed as threatened or endangered;
- At risk because of threats to their life history needs or their habitats;
- Stable in number in Wisconsin, but declining in adjacent states or nationally.
- Of unknown status in Wisconsin and suspected to be vulnerable.

The SGCN together with the natural communities they inhabit represent "Ecological Priorities" for the Southeast Glacial Plains Ecological Landscape. Appendix A contains a matrix with the vertebrate SGCN and priority natural communities for this landscape, currently mapped in the Natural Heritage Inventory database (WDNR, 2010d). Forty-two rare animal species are documented for the NKMR properties, including six State Endangered, seven State Threatened, and 29 Special Concern species. Additionally, thirty-four rare plant species are documented, including three State Endangered, seven State Threatened, and 24 Special Concern species. Ecological Priorities include those natural communities that were determined to provide the best opportunities for management on the NKMR from an ecological and greatest biodiversity perspective.

Conservation Opportunity Areas

Conservation Opportunity Areas (COA) offer opportunities to protect unique ecological features, natural communities, or habitat for SGCN from a global, continental, upper Midwest, or state perspective as described in the Wisconsin Wildlife Action Plan (WDNR 2005). Many COAs have additional merit from federal and/or non-profit organizations. Conservation Opportunity Areas in the NKMR region are shown on Map C.

Global Significance - Lake Michigan is recognized for its global significance and the Lake Michigan migratory bird flyway significantly influences bird abundance on NKMR properties. Additionally, Horicon Marsh State and Federal wildlife lands are recognized globally as an Important Bird Area and a Wetland of International Importance. Formed by the glaciers of the last Ice Age, Horicon Marsh is the largest freshwater cattail marsh in the United States.

Continental Significance – The Kettle Moraine is a terrestrial feature of continental significance. This is a large glacial interlobate moraine starting east of Lake Winnebago and running southwest for almost 90 miles into southern Wisconsin. Its rugged topography contains many glacial features such as kames, drumlins and eskers and a complex mosaic of savanna, prairie, sedge meadow, emergent marsh, fens and southern forest communities. Kiel Marsh Wildlife Area, Mullet Creek Wildlife Area, and Nichols Creek Wildlife Area are within the North to Mid Kettle Moraine COA. They contain complexes of uplands, wetlands, and rivers including northern wet forest, southern dry forest, southern dry-mesic forest, southern mesic forest, oak woodland, shrub-carr, alder thicket, calcareous fen, bog relict, southern sedge meadow, dry prairie, emergent marsh, and submergent aquatic communities. The area supports 50 species designated as SGCN.

National Natural Landmark - Cedarburg Bog State Natural Area is a National Natural Landmark as designated by the National Park Service. The property contains an extensive conifer swamp forest and patterned peatland, characterized by noticeable ridges and swales running perpendicular to water flow; the southernmost example in the world (SEWRPC, 1997) and one of only four known in Wisconsin. Recognized as a Legacy Place and an Important Bird Area (WDNR, 2007), the area contains significant habitat for breeding and migrating birds. Additionally, Cedarburg Bog bears federal Critical Habitat designation by the US Fish & Wildlife Service for the federal and state endangered Hine's emerald dragonfly (*Somatochlora hineana*) and prairie white-fringed orchid (*Platanthera leucophaea*).

Upper Midwest Regional Significance - Cedarburg Bog State Natural Area and Jackson Marsh Wildlife Area are identified as COAs within the NKMR region for their wet-mesic prairies, calcareous fens, sedge meadows, tamarack swamps and wetlands. These habitats support 48 species, including 12 leafhoppers, designated as SGCN species.

Statewide Significance - Allenton Wildlife Area and Theresa Wildlife Area are High Quality Wetland Communities within the Southeast Glacial Plains and are of statewide significance. These wetland communities are large, deep water features containing southern sedge meadow, bog relict, northern hardwood swamp and surrogate grassland communities. These wetland properties together with other Southeast Glacial Plains properties provide an opportunity to protect and manage 29 species of SGCN status.

LAND USE AND SOCIO-ECONOMIC CHARACTERISTICS

Defining the Region

Land use and socio-economic characteristics are described on a regional basis for the NKMR properties by the Wisconsin DNR Ecological Landscapes Handbook (WDNR, 2011b). Additionally, because four of the NKMR properties are located within the Greater Milwaukee Metropolitan Area, additional relevant information for this section comes from Wisconsin DNR collaboration with the UW Madison Applied Population Laboratory, who produced a Regional Profile for Region 10, southeastern Wisconsin, in order to best characterize certain social-economic characteristics. This area also includes Kenosha, Milwaukee, Waukesha, Ozaukee, Racine and Walworth counties.

Transportation infrastructure (road, rail and airport) is much more developed than the rest of Wisconsin. The region has an excellent network of roads, including Interstate Highway 94 and state Highway 45, which connects the region to major metropolitan areas (Milwaukee, Chicago, Fond du Lac and Sheboygan). These major state highways bisect the region and connect many small and mid-sized urban areas. Nearly all state, county and local roads are well maintained, paved roads.

A mix of agricultural and urbanized land situated on glacial till plains, outwash landforms and moraines best characterizes this region of Wisconsin. Agricultural and residential interests have significantly altered the vegetation and hydrology of the landscape. Current vegetation is primarily agricultural cropland, with the exception of rugged topography of the Kettle Interlobate Moraine and extensive marsh complexes that are not suited for agricultural uses. Most riparian zones have been degraded through forest clearing, urban development, and intensive agricultural practices.

Population

As of January 1, 2010, the Wisconsin Demographic Services Center estimated that 2.2 million people resided in an eleven-county region of SE Wisconsin. While these counties constitute 10% of the total land in the state, they support 39% of the state's population or a population density of 405 persons per sq. mile. The population density in this part of Wisconsin is nearly four times that of the state as a whole (105 persons/sq. mile).

The Greater Milwaukee-Metropolitan Area has the largest population concentration in the state and contributes to the Southeast Glacial Plains counties being the most urban of the Ecological Landscapes. The most populous counties contribute 69% (1.5 million) to the regional population and overall 27% to the state's population, within less than 3% (1460 sq. miles) of the state's total land area. Population has more than doubled from 1950 to 2006, with a population growth of twice the rate of the state's overall population growth.

Land Use and Ownership

The region's combination of very productive soils, proximity to large population centers, and availability of Great Lakes shipping and rail service has long supported a diverse and dynamic economy that blends agriculture, manufacturing, retail, and other sectors. Current land uses reflect these economic drivers. Agriculture remains the dominant land use. Over half of all land in Sheboygan County is farmed, but farmland is being converted to other developed uses at a significant rate throughout the region. Corn, soybean, hay and forage rotations are the most prevalent farming practices.

Wisconsin has a legacy of natural resources protection and public land acquisition to ensure ample public lands are available for recreational interests. However, there is a notable discrepancy between the largest areas of statewide population and their proximity to available managed lands (Figure 3). Public outdoor recreation land makes up only 5% of land area in the population epicenter of the NKMR of southeastern Wisconsin, compared to 23% statewide. Such disproportionate availability of resources, when exacerbated by population growth and increasing urbanization, has potential to place huge pressures on natural resources and cause potential competition among users for limited access to enjoy a diversity of outdoor interests. Additionally, areas rich in natural resources, ever popular as tourist destinations, are experiencing steady levels of development, including conversion of seasonal homes to year-round living. "Privatization" of shorelands, forests and other natural resource areas effectively reduces the amount of land available for public recreation and limits water access.

Development around and within the property boundaries is increasing. Parcels adjacent to public lands are very desirable as home sites. Residential and commercial development makes future land purchases more expensive and difficult. It also leads to problems with feral and domestic animals, creates difficulties for effective habitat management practices (i.e., prescribed burning), and contributes to undesirable uses during critical times (such as "dog running" during the spring nesting season).

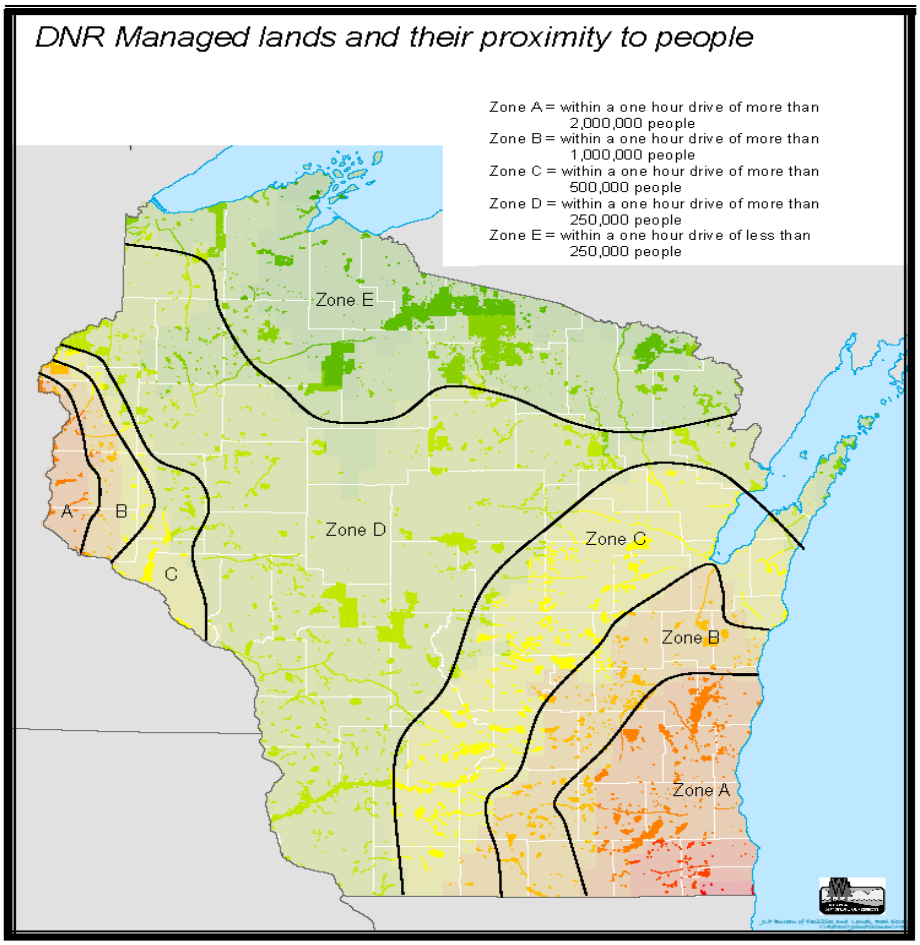

Figure 3. Population density gradient for 1-hour drives to managed lands.

Economic Issues

The proximity of the NKMR properties to the Greater Milwaukee-metropolitan area favors continued pressures of land development associated with economic growth, and an ever growing transportation network. This is apparent in the rapid development of rural lands in villages and towns surrounding the outer-ring suburban communities in the region. Commercial, urban, and rural residential development is expected to continue over time.

While the region has a higher median income than the state as a whole, it also has a higher proportion of population in poverty. Milwaukee County has lower income and higher poverty rates. At the same time, the more suburban counties surrounding Milwaukee (Ozaukee, Washington, and Waukesha) have high median income and low poverty rates. According to the American Community Survey estimates, Milwaukee County has a large number of households earning less than $20,000 per year. Waukesha and Ozaukee Counties have more households earning more than $100,000 than any other income group.

The economy is transitioning from being based largely on durable good production and wholesale trade, transportation and warehousing to an economy oriented towards services, including tourism and recreation.

ANALYSIS OF THE PROPERTIES

The following section describes the existing resources, uses, management opportunities, limitations, and needs on these properties. Notes are also provided regarding adjacent lands indicating how they may affect the NKMR properties.

The Northern Kettle Moraine Region planning group properties are depicted on Maps A, B and C. The approximate location and size in acres of state owned and managed lands are noted below.

1) Jackson Marsh Wildlife Area & State Natural Area (2,518 acres) is located in southeastern Washington County, two miles northeast of the Village of Jackson and 10 miles northwest of Milwaukee County.

2) Allenton Wildlife Area (1,160 acres) is located in west central Washington County along the headwaters of the East Branch Rock River. The property is 30 minutes north of the Milwaukee metropolitan area. US Highway 41 defines the eastern property boundary.

3) Theresa Wildlife Area (5,309 acres) is located in northern Washington and northeastern Dodge counties, largely bordered on its east by US Highway 41 and equidistant between the Northern Kettle Moraine State Forest and Horicon State/National Wildlife properties.

4) Mullet Creek Wildlife Area (2,217 acres) is located in east central Fond du Lac County, fifteen miles east of Fond du Lac and 10 miles west of Plymouth, on Wisconsin Highway 23.

5) Kiel Marsh Wildlife Area (843 acres) is located at the intersection of Calumet, Manitowoc and Sheboygan counties, just south of the City of Kiel.

6) Nichols Creek Wildlife Area (651 acres) is located in southwest Sheboygan County, approximately four miles southwest of Plymouth and just northwest of the Village of Cascade.

7) La Budde Creek Fishery Area (401 acres) is located in Sheboygan County in the Town of Rhine, just east of the Village of Elkhart Lake and centrally located between Green Bay and Milwaukee.

8) Onion River Stream Bank Protection Area (1,045 acres) is located in Sheboygan County, within three townships: Plymouth, Lyndon, and Mitchell. It is less than two miles east of the Northern Kettle Moraine State Forest, and southwest of Plymouth.

Property	Acreage
Wildlife Areas	
Jackson Marsh	2,518
Allenton	1,160
Theresa	5,309
Mullet Creek	2,217
Kiel Marsh	843
Nichols Creek	651
Fishery Areas	
La Budde Creek	401
Onion River SBA	1,045
Natural Area	
Cedarburg Bog	1,663

9) Cedarburg Bog State Natural Area (1,663 acres) is located in west central Ozaukee County, approximately two miles west of Saukville and 12 miles from the northern periphery of Milwaukee.

GENERAL CHARACTERISTICS OF THE NKMR PROPERTIES

Vegetation and Natural Communities

Some NKMR properties are situated in an agricultural landscape amidst low density development, although greater development exists near Jackson Marsh, Cedarburg Bog, Kiel Marsh, and the Onion River SBP Area. The properties are located among the top twenty counties for population size in Wisconsin.

The properties are comprised of numerous wetland types including Emergent and Submergent Marsh, Southern Sedge Meadow, Southern Hardwood Swamp, Northern Wet-mesic Forest, Tamarack (Rich) Swamp, Floodplain Forest, and Shrub-carr. Several small Calcareous Fens add to the overall diversity of the wetlands. The uplands are comprised of forests (Southern Dry-mesic and Southern Mesic), old fields, pine and spruce plantations, and farmland. The conifer forest types present here are near the southern extent of their range in the state.

FENS are an unusual natural community found in southern Wisconsin. Some fens are underlain by a calcareous substrate, through which carbonate-rich groundwater infiltrates and supports populations of plant species adapted to these conditions (i.e. calciphiles).

- Cedarburg Bog has the best example of calcareous fen in Wisconsin (described in the 1982 Master Plan).
- Allenton Wildlife Area has a quality fen in the headwaters area of Limestone Creek, a tributary of the Rock River. Dominant plant species are fen star (*Carex sterilis*) and tussock sedges, red-osier dogwood (*Cornus stolonifera*), and Canada bluejoint (*Calamagrostis canadensis*). Characteristic fen indicators include grass-of-Parnassus (Parnassia glauca), swamp-lousewort (*Pedicularis lanceolata*), marsh muhly (*Muhlenbergia glomerata*), and Kalm's lobelia (*Lobelia kalmii*).
- Onion River SBP has a small, high quality fen at the headwaters of Kamrath Creek. Calciphiles are common and springs bubbling from the slightly sloping fen continue down-slope into a Forested Seep.
- Theresa Wildlife Area has a small, isolated fen of lower quality.
- Nichols Creek Wildlife Area has a small fen and is embedded within a spring and Northern Wet-mesic Forest. It supports an unusual assemblage of herbs, many of them associated with alkaline groundwater including the species listed for Allenton.

Emergent Marsh (emergent vegetation) is one of the more dominant natural communities on the NKMR properties. Most are dominated by cattails (*Typha* spp.) with mixed broad-leaved sedges including lake sedge (*Carex lacustris*). Willows (Salix spp.) typically are scattered throughout the marshes. Reed canary grass (*Phalaris arundinacea*), Narrow-leaved cattail and hybrid cattail are common invasive species. While these communities are low in plant diversity, they are high in productivity and are important for providing significant migratory stopover areas for migratory waterfowl and other wetland bird species. Impoundments and flowages have been created on NKMR properties within emergent marshes, to manage water levels for migratory bird use, hunting opportunities, and wildlife viewing.

- Large impoundments within emergent marsh exist on Theresa and Mullet Creek Wildlife Areas; smaller ones on Jackson Marsh and Allenton Wildlife Areas.
- Cedarburg Bog occupies the shallowest parts of the Mud Lake basin. Representative plants include cattail species, bulrushes (Scirpus spp.), arrowhead (*Sagittaria* sp.) common reed (*Phragmites australis*), and spike rushes (*Eleocharis* spp.).

Forested Seeps (lowland hardwoods) are uncommon in Wisconsin with most occurrences in the Driftless Area or locally along major rivers flanked by steep bluffs. Forested Seeps are distinguished from Northern Wet-mesic Forests by their prevalence of hardwood species and from Hardwood Swamps by the active spring discharges present.

- Onion River SBP Area and Nichols Creek Wildlife Area. Springs in the Forested Seep at the Onion River SBP Area originate at the base of an upland forest and travel through a moderately sloped semi-open Calcareous Fen. These springs continue further down slope where the forest canopy becomes more closed and they become Forested Seeps. The forest is dominated by sugar maple, yellow birch, and basswood with large areas of skunk cabbage, wild ginger, and other species of both rich mesic forests and wetlands.

Southern Hardwood Swamps (lowland hardwoods)

- Jackson Marsh Wildlife Area has the most extensive and best quality swamps, with a canopy dominated by silver maple (*Acer saccharum*) and yellow birch. Hackberry (*Celtis occidentalis*), green (*Fraxinus pennsylvanica*) and black ash, and American elm (*Ulmus americana*) are included in the canopy along with Northern white-cedar in seepage areas within the swamp. The canopy is moderately dense. The canopy trees range from 8-10 inch diameter to 20-30 inch diameter and larger. The subcanopy is dense throughout and consists of canopy species. The ground flora includes stinging and false nettles (Laportea spp.), skunk cabbage, and fowl manna grass.
- Theresa Wildlife Area has a fairly large Southern Hardwood Swamp**.** It has a canopy of large silver maple and silver-red maple hybrid (up to 30-40inch dbh), black ash, green ash, American elm (saplings common, trees mostly dead), swamp white oak (*Quercus bicolor*), and red maple (*Acer rubrum*). Black ash saplings are common. Ground layer species include nettles, impatiens (*Impatiens capensis*), Virginia creeper, riverbank grape, and skunk cabbage.

- Onion River SBP Area. The Southern Hardwood Swamp in the Kamrath Creek area is characterized by a canopy of red maple and silver-red maple hybrid, with yellow birch, American elm, black ash, silver maple, and northern white cedar as common associates. There is high species diversity in the ground layer, very low invasive exotic species abundance, and a high potential for rare species.
- Allenton Wildlife Area Southern Hardwood Swamp are young and poor quality with no developed canopy. The subcanopy is dense and dominated by black ash, American elm, and yellow birch with a few tamaracks.
- Kiel Marsh and Mullet Creek Wildlife Areas have scattered poor quality patches of Southern Hardwood Swamp.

Northern Hardwood Swamp: La Budde Creek Fishery Area has lowland forests in a narrow corridor along the creek that varies from tamarack to black ash dominated forests with a high diversity of herbaceous plants and shrubs.

Patterned Peatlands (very rare in Wisconsin)

- Cedarburg Bog SNA is the southernmost known occurrence in the state of patterned peatlands. Characterized by low narrow peat ridges that support ericaceous shrubs, bog birch (*Betula pumila)*, and stunted conifers (i.e., northern white-cedar, tamarack). The ridges alternate with low swales, or flarks, that are generally sedge dominated and often partially inundated. Both strings and flarks are oriented parallel to the contours of the slope, perpendicular to the flow of groundwater. This Patterned Peatland contains a very diverse flora including numerous sedge species, round-leaf sundew (*Drosera rotundifolia)*, shrubby cinquefoil (*Pentaphylloides floribunda)*, pitcher plant (*Sarracenia purpurea)*, and bog bean (*Menyanthes trifoliata)*.

Sedge meadows - **Northern** at Kiel Marsh and Mullet Creek Wildlife Areas are dominated by tussock (*Carex stricta*) and others (*Carex* spp).

Sedge meadows - **Southern** at Nichols Creek and Allenton Wildlife Areas are dominated by tussock (*Carex stricta*) and others (*Carex* spp).

Shrub-carr (dominated by willows and dogwood) is present to some degree on most of the NKMR properties.

- At Cedarburg Bog SNA the shrub–carr almost completely surrounds the Emergent Marsh at Mud Lake and extends into other parts of the wetlands. The Shrub-carr is dominated by alder (*Alnus* sp.*)*, bog birch, dogwoods (*Cornus* spp.), leatherleaf, willows (*Salix* spp.), and poison sumac. Common ground flora species include sedges, cottongrasses (*Eriophorum* spp.*)*, and pitcher plants. Glossy buckthorn is problematic in many wetland areas.

Northern Mesic Forest

- At Cedarburg Bog SNA this cover type has a canopy dominated by sugar maple, red oak, basswood, and American elm. The ground flora includes such northern species as bunchberry (*Cornus Canadensis)* plus species that are more widely distributed like large-flowered trillium (*Trillium grandiflorum)* and large-flowered bellwort (*Uvularia grandiflora)*.

Northern Wet-mesic Forests (Swamp conifer)

- At Jackson Marsh Wildlife Area these swamp conifers are located within the State Natural Area and dominated by 6-12 inch diameter northern white-cedar (*Thuja occidentalis*), tamarack (*Larix laricina*), and to a lesser extent, black ash (*Fraxinus nigra*). The shrub layer is moderately dense and includes currant (Ribes spp.) species plus poison ivy (*Toxicodendron radicans*), sumac (Rhus spp.), grape (*Vitis* spp.), and Virginia creeper (*Perthenocissus quinquefolia*). The ground flora is diverse and includes species such as fowl manna grass (*Glyceria striata*), skunk cabbage (*Symplocarpus foetidus*), and gold-thread (*Coptis trifolia*).
- At Mullet Creek Wildlife Area these forests are dominated by medium-aged northern white-cedar with lesser amounts of tamarack and black ash in the canopy. Northern white-cedar trees range from 6 to 28 inches diameter. Small openings are scattered through the forest. The ground flora is fairly diverse and includes wild sarsaparilla (Aralia nudicaulis), gold-thread, and fowl manna grass.
- At Nichols Creek Wildlife Area this cover type occurs on the west and east sides of the North Branch Milwaukee River. On the west side of the river, the forest has springs and seepages and is dominated by Northern white-cedar. The most common canopy species are yellow (*Betula alleghaniensis*) and paper birch (*B papyrifera*), black ash, and basswood (*Tilia americana*). Characteristic groundlayer species include marsh marigold (*Caltha palustris*), blue marsh violet (Viola cucullata), and skunk cabbage.

- At Cedarburg Bog this is the most extensive natural community in the natural area. The canopy is dominated by northern white-cedar and includes yellow birch, green ash, black spruce (*Picea mariana*), and tamarack. The understory is rich in sedge species. Also present are gold-thread, leatherleaf (*Chamaedaphne calyculata*), and poison sumac (*Toxicodendron vernix*).

Southern Dry-mesic Forests (Oak, Northern hardwood)

- At Jackson Marsh Wildlife Area, the Southern Dry-mesic Forest is dominated by large bur oak (*Quercus macrocarpa*), red oak, and basswood.
- At LaBudde Creek Fishery Area the highest quality upland forests are dominated by red oak, sugar maple, American beech, white oak, and shagbark hickory. The density of the shrub and sapling layers varies and consists of eastern hop-hornbeam, red and sugar maples, and American beech. The groundlayer is diverse, including species indicating mesic conditions, although areas of thin leaf litter and duff are also present and have few ground flora species.

Southern Mesic Forests (Northern Hardwoods)

- At Nichols Creek Wildlife Area the upper portions of a northeast-facing slope support a mature mesic to dry-mesic hardwood forest dominated by medium to large sugar maple, red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), and basswood. Sugar maple saplings are common, and eastern hop-hornbeam (*Ostrya virginiana*) is a common small tree. The flora is richer down slope, with wild ginger (*Asarum canadense*), blue cohosh (*Caulophyllum thalictroides*), and zigzag goldenrod (*Solidago flexicaulis*). Springs are frequent on the lower slopes and the dominant canopy tree is northern white-cedar.
- Jackson Marsh Wildlife Area has good quality mesic forest of similar species composition.

Tamarack (Rich) Swamp (Swamp conifer)

- At **Cedarburg Bog State Natural Area**
- At **Allenton Wildlife Area** bordering Limestone Creek. Surveyed in 1992, it was dominated by medium to large tamarack, with black ash, red maple, and American elm, plus a few swamp white oak, green ash, and yellow birch in canopy.

Springs, Spring runs, and Spring ponds are important features at several areas including Nichols Creek Wildlife Area and the Onion River SBP Area.

Threats to Biodiversity Conservation

Ecological Simplification

A major conclusion of Wisconsin's Statewide Forest Assessment in 2010 was that forest composition and structure is changing and becoming more simplified (WDNR 2010b). Ecological simplification can be seen in the change in herbaceous species composition, the decline of native herbaceous species diversity and the increase in non-native plants, as well as simplification of forested overstory composition (Rooney et al. 2004). Factors contributing to ecological simplification include invasive species, altered ecological processes, and, for forests, the amount of non-forested habitat surrounding a forest patch and deer herbivory (Rogers et al. 2009; Rooney et al. 2004; WDNR 2010b). Rogers et al (2009) showed that rates of ecological simplification and loss of native plant species were slower in large forest patches within a less fragmented landscape than smaller and more isolated patches.

Structural characteristics such as large trees, cavity trees, snags, and coarse woody debris provide habitat for many rare and declining species, including migratory birds. Trends in Wisconsin's forests show a lack of old forests, old-growth forests, and a continued decline of the oldest age classes of trees (WDNR 2010b).

Wisconsin's wetlands, including those that are extensive on the NKMR properties, have also suffered from ecological simplification. Factors contributing to ecological simplification that impact wetlands include invasive species, altered hydrology, conversion to agriculture, and sediment/nutrient-laden runoff from croplands.

All fire-adapted habitats in southern Wisconsin have become simplified due to the inability of fire to sweep across the wetlands and uplands. Habitat edges have become more of a hard boundary, instead of a continuum of types, resulting in the loss of species habitat.

Habitat Fragmentation

Wetland, grassland and forest fragmentation results in remaining patches being too small, too isolated and too influenced by edge effects to support viable populations of breeding birds (Johnson 2001). Although research is not as extensive on the effects of habitat fragmentation on wetland-dependent flora and fauna as it is on forests, many species that use these habitats are also area sensitive, requiring large areas of appropriate habitat. Fragmentation results in an increase in edge effect and an increase in nest failure in ground and shrub-nesting forest birds, including neotropical migrants (Donovan et al. 1995).

The NKMR properties contain blocks of forests, wetlands and grasslands that await opportunities to enhance habitat and reduce impacts from habitat fragmentation. Within the region, much of the habitat is fragmented by roads, residential developments and agricultural uses. Although little can be done to remove existing infrastructure, minimizing the impacts of habitat fragmentation is important. Residential and commercial development is increasing at the borders and within the project boundaries of all NKMR properties. Lands adjacent to wildlife areas are very desirable as home sites. Modern residential and commercial development nearby project boundaries makes future land buying more expensive and difficult, leads to problems with feral and domestic animals, creates difficulties with effective habitat management practices (such as prescribed burning), and creates undesirable uses during critical times of the year (such as “dog running” during the spring nesting season).

Altered Ecological Processes

Ecologicial communities that historically occurred within the NKMR developed within a complex environment comprised of both elements that are static over ecological time (e.g., soils, underlying landforms) and dynamic ecological processes (e.g., hydrological cycles, nutrient cycles, and wildfires). Many of the dynamic ecological processes that shaped the landscape of the NKMR have been altered by humans.

Hydrological manipulation and degradation occurs through many means, including damming, ditching, draining, sedimentation, road building, and erosion, all actions that took place in the NKMR. Dams affect aquatic species and habitats by fragmenting them into disjunct segments, preventing the movements of some species between different stretches of streams. Increased water-levels associated with dams can displace small mammals due to prolonged flooding and restrict dispersal corridors and foraging areas of upland small mammals (Bautz 2010). In addition, natural hydrological fluctuations associated with free-flowing rivers and streams are integral to wetlands formed under fluctuating water levels and the many species that depend upon them, including amphibians that rely on a specific hydrological regime to complete certain life-stages (PARC 2002). Land use changes, poorly managed agricultural practices, and mineral or timber extraction can result in an increase in suspended solids and sedimentation in rivers and streams (Wood & Armitage 1997).

Threats to aquatic communities (springs, seeps, headwater streams) include hydrological alterations associated with groundwater withdrawal for commercial or industrial development, or agricultural irrigation systems and beaver activity. Changes to hydrology can allow for invasive plant infestations, increased sedimentation, and poor water quality thereby changing the conditions necessary for the continued health of rare species populations and some natural communities.

Other concerns include nutrient loading from agricultural or urban runoff, road construction, road salt, and incompatible forestry practices or recreational activities such as off-road vehicle use. Off-road vehicles and ATV’s can de-stabilize soils, which contribute to sedimentation in springs and headwater streams.

Fire is an essential ecological process to many natural communities and rare species within the NKMR. Without regular fire, native woody species can invade and dominate these communities. By volatilizing elevated soil nitrogen, fire also indirectly influences nutrient cycling; shifting conditions to favor native plants and to disfavor non-natives. In woodlands, fire facilitates seedling establishment, controls tree species that are not adapted to fire, and prevents smothering of short statured plants through the removal of leaf litter. In grasslands, fire promotes growth, flowering, and overall diversity of native plants by removing excess thatch.

Invasive Species

Invasive species are problematic in the NKMR and will limit the success of natural community regeneration on many of the properties if not adequately controlled. Buckthorn, honeysuckle, and garlic mustard are the most detrimental species in wooded areas, with Japanese hedge parsley and emerald ash borer (*Agrilus planipennis)* looming threats. Emerald ash borer was recently found near the NKMR properties. Reed canary grass, hybrid cattails, phragmites, purple loosestrife and Japanese knotweed are a threat to the NKMR wetlands. Spotted knapweed, wild parsnip, and various others are threatening the savanna and grassland areas of the properties.

Deer Herbivory

Herbivory by overabundant white-tailed deer populations has been identified as having major impacts on tree and herb species in northern forests of the Great Lake States. In addition to impacts on plants, deer density negatively impacts species richness and abundance of songbirds that nest in the intermediate canopy layer. Excessive deer herbivory is known to inhibit reproduction of certain trees, especially those species that are preferred forage, including northern white-cedar. Consequences include loss of vigor of forest herbs and shrubs leading to, decreased population size, increased invasive plants, and reducing species diversity through extirpation of species from the site (WDNR 2010c).

Opportunities for Biodiversity Conservation

The NKMR project area is noted for its diverse natural communities and species richness in "Rapid Ecological Assessment for the Wildlife, Fishery, and State Natural Areas of the Northern Kettle Moraine Region" and "Wisconsin's Strategy for Wildlife Species of Greatest Conservation Need (SGCN)." The NKMR supports 42 rare animal species and 34 rare plant species. The project area supports two rare invertebrates: the federally endangered Hine's emerald dragonfly and the state endangered swamp metalmark butterfly. High quality aquatic resources reside in the project areas, including seeps, springs, spring ponds, spring runs, and headwater streams. Rare fish, birds, and plants are known to utilize these high quality habitats.

Appendix A provides a matrix of vertebrate SGCN and their associated priority natural communities, from the Natural Heritage Inventory database (WDNR, 2010d). Forty-two rare animal species are documented for NKMR properties, including six State Endangered, seven State Threatened, and 29 Special Concern species. Thirty-four rare plant species are documented, including three State Endangered, seven State Threatened, and 24 Special Concern species.

Exceptional Characteristics of NKMR Properties

1. Northern Wet-mesic Forests and Tamarack (Rich) Swamp

Northern Wet-mesic Forests (Swamp conifer) and Tamarack (Rich) Swamp of the NKMR offer unique habitats not often found in this landscape and act as major reservoirs of 'northern' birds in southeastern Wisconsin. Jackson Marsh Wildlife Area and Cedarburg Bog both support breeding populations of 'northern' birds including brown creeper, winter wren, Nashville warbler, black-throated green warbler, northern waterthrush, mourning warbler, Canada warbler (SC), and white-throated sparrow. These areas provide refugia of increasing importance when considering the potential effects of climate change on northern species found at their southern range edge. These species are present in remnants of relict natural communities that likely were much more common in previous decades or millennia. Habitat protection offers a benchmark for the unique biodiversity of plant and animal habitat once present in this landscape.

Creating larger blocks of these natural communities within the surrounding matrix of hardwood swamp, upland forests, or open wetland types would benefit animal diversity, protect them from invasion of non-native plants, improve water quality, and aid in tree regeneration (WDNR 2006b). Northern white-cedar is regenerating at Nichols Creek and Jackson Marsh Wildlife Areas, and Cedarburg Bog SNA. This may in part be due to existing buffers around the Northern Wet-mesic Forest, abundant food available in this agricultural landscape, less need for deer to "yard-up" in southern Wisconsin, and possibly increased deer hunting pressure associated with State Wildlife Areas.

Northern Wet-mesic Forests (swamp conifer) are near the southern edge of their range in Wisconsin and are present in this landscape at Mullet Creek Wildlife Area, Cedarburg Bog SNA, Jackson Marsh Wildlife Area, and Nichols Creek Wildlife Area. Northern Wet-mesic Forests are regionally significant because they are one of the most diverse plant communities, providing habitat for many rare plants, including northern yellow lady's slipper showy lady's slipper, ram's head and important habitat to over 80 wildlife species. Regeneration of northern white-cedar has been rare in the upper Great Lakes region for decades because it is a preferred browse species for white-tailed deer and deer use Northern Wet-mesic Forests for winter habitat. Regeneration of northern white-cedar may benefit from white-tailed deer population reduction or northern white-cedar may, in future centuries, become confined to locations were deer are nearly absent.

Tamarack (Rich) Swamp are located at Allenton Wildlife Area and Cedarburg Bog SNA. Tamarack (Rich) Swamp is a relict conifer forest type that historically was much more common in southeast Wisconsin. The Tamarack (Rich) Swamp type is richer than the northern Tamarack (Poor) Swamp which is a more acid dominated tamarack-spruce swamp. There are larger and better examples of this type in the region, but the Tamarack (Rich) Swamps on the NKMR properties add to the biological diversity of these properties. Many historical swamps were drained and cleared for agricultural purposes and intact examples are now uncommon but occur in this region on the margins of lakes or streams and at the base of moraines (WDNR 2006b).

2. Springs, Headwater Streams and their Important Aquatic Species

Unique aquatic resources are present in the NKMR and include Seeps, Springs, Spring Ponds, Spring Runs, and Headwater streams. All add significantly to the overall diversity of the properties. The Springs and Spring Runs generally originate from and have direct outflow attributed to artesian openings in the underground dolomite and often represent headwaters or low-order tributaries of coldwater streams (FFWCC 2005). Springs typically have high water clarity, low sedimentation, and are a stable system with very little change in water temperature, water flow, or chemical composition.

Examples of these types are found at Nichols Creek Wildlife Area, an area that is laced with many springs and spring runs. These springs and spring runs are small, with cold, clear water and bottom substrates of muck, gravel, and sand. A Spring Pond lies at the woods edge with glacial deposits to the north, forested with oaks, and a white cedar-ash swamp on the east and south. Jackson Marsh and Mullet Creek Wildlife Areas have spring seeps that exhibit calcareous groundwater flows present in the Northern Wet-mesic Forest and Hardwood Swamp. Mullet Creek Wildlife Area protects the headwaters of the Mullet River. Theresa and Allenton Wildlife Areas protect the headwaters of the East Branch Rock River. The Onion River SBP Area has Springs and Spring Runs that originate below a wooded hill and flow downhill through Forested Seeps and feed Kamrath and Ben Nutt Creeks.

Rare fish species known to occur in the upper reaches of warm water streams at Theresa, Allenton, and Jackson Marsh Wildlife Areas include the redfin shiner (THR), which requires low gradient streams with cobble, boulders, sand, and detritus; the longear sunfish (THR), found in clear, quiet, shallow streams; and the least darter (SC), found in clear streams with dense vegetation along with gravel, sand, and boulders. The aquatic resource and associated marsh areas at Theresa Wildlife Area serves as an important foraging area for marshbirds such as rails and Least Bittern (SC) and waterbirds including Great Egret (THR) and Black-crowned Night Heron (SC). Theresa Wildlife Area is an important foraging area for birds, including those that may nest in nearby Horicon Marsh.

Both rare and common plants and animals are strongly associated with the coldwater spring community types present in the NKMR. Plants known from these types include water parsnip (*Berula erecta*), mare's tail (*Hippurus vulgaris*), round-leaved monkey flower (*Mimulus glabratus*), brook grass (*Catabrosa aquatica*) (END), marsh valerian (*Valeriana sitchensis*) (THR) and the invasive watercress (*Nasturtium officinale*). Seepage areas with more calcareous groundwater flows often can signify the likelihood of more fen-loving species that would include many additional uncommon plant species.

Vertebrate species that are likely to be found using these spring areas include adult pickerel frogs (SC) which require cold water habitats associated with springs and trout streams for much of their life cycle including hibernation. Blanchard's cricket frogs (END) which were common in southern Wisconsin until the 1970's have the potential to use these types of habitats. Recent reports of individuals found in southeast Wisconsin merit investigation. Many of these spring areas are relatively fish-free except for the very small central mud minnow and brook stickleback (pers. comm. J. Lyons). These fishless aquatic areas would make them attractive to wood frogs, chorus frogs, and spring peepers for breeding. In forested landscapes these Spring Ponds would present excellent opportunities for salamander breeding ponds. Turtles may include the semi-aquatic Blanding's turtle (THR) when open wetland habitat is nearby. Queen snakes (END) are historically known from Cedarburg Bog and require cold, clear streams with moderate to fast currents and rocky bottoms which are present. Waterfowl, wading birds, and forest raptors such as Red-shouldered Hawk (THR) and Broad-winged hawk favor areas of plentiful amphibian prey. Springs also are important feeding areas for many bat species. Invertebrate species likely to be found in these aquatic habitats include crayfish, freshwater shrimp, diving beetles, mayflies, stoneflies, caddisflies, dragonflies, and damselflies.

3. Rare Invertebrates and Their Habitats

Southern Sedge Meadows at one time covered nearly one million acres in Wisconsin, but wetland losses increased with technological advancements that converted wetlands to agriculture in the mid 1900's. Currently only about 200,000 wetland acres remain, many dominated by the invasive reed canary grass. Calcareous Fens (Bog relict) have always been rare in Wisconsin due to their unique requirements. Becoming increasingly rare as wetlands diminish, they currently cover less than 1,000 acres. Many are small in size and are threatened by encroachment of trees, shrubs, and non-native invasive plants.

Rare specialized plant and animal species especially invertebrates would benefit from protecting, managing, and restoring remaining Calcareous Fens and Sedge Meadows. One example is the Federally Endangered **Hine's emerald dragonfly** which is found at Cedarburg Bog SNA. Cedarburg Bog and the Lower Wisconsin State Riverway represent this dragonfly's only verified breeding locations in Wisconsin, outside of Door County. There is a matrix of vegetation types present at Cedarburg Bog with open seepage sedge meadows and cool calcareous marsh areas providing important larval habitat. Open herbaceous areas associated with these meadows are also important for hunting adult dragonflies.

Rare **snails** are known from Calcareous Fen and meadow habitats at or near Allenton Wildlife Area and Cedarburg Bog. These include tapered vertigo (SC), eightfold pinecone (SC), and *Pleistoceine catinella* (SC).

The State Endangered **swamp metalmark butterfly** habitat is open fen-like or wet meadow areas with low or sparse vegetation that includes an abundance of the larval food plant swamp thistle (*Cirsium muticum*) and suitable nectar plants. The swamp metalmark butterfly is currently being assessed to determine if it should be added as a candidate for Federal listing under the Endangered Species Act. Before surveys for this project, there were only two known locations in Wisconsin for this species. Other locations once supported populations, but these have disappeared. Surveys in 2008 and 2010 for swamp metalmark butterflies at sites within the NKMR, indicated that Allenton and Theresa Wildlife Areas had habitats with potential to support this species.

A high-quality fen with a large population of swamp thistle at Onion River SBP contains a population of swamp metalmark butterflies. This is the first new population discovered in 18 years and one of only three populations.

4. Migratory Bird Habitats

The NKMR habitats offer important resources for numerous for many bird groups. The habitats range from large wetlands, streams, and flowages at Theresa and Allenton, Mullet Creek and Kiel Marsh Wildlife Areas to undeveloped forests and shrub cover found at Cedarburg Bog SNA, Jackson Marsh, Mullet Creek, and Nichols Creek Wildlife Areas. Many bird species congregate in large numbers here during migration because of proximity to the Lake Michigan bird migration corridor. At Cedarburg Bog, over 100 migratory species were captured during a 30-year autumn banding program (WDNR, 2007). During single-day migratory bird surveys at nearby Northern Kettle Moraine State Forest, more than 1,000 migrants have been documented. Seasonal estimates of 10,000 migratory birds are believed to be conservative estimates (WDNR, 2007).

Large emergent wetlands and associated open water areas provide good habitat for migratory waterfowl, shorebirds, songbirds, and waterbirds (i.e. cranes, herons, bitterns and egrets) during migration. Features include foraging areas of emergent aquatic plants such as smartweed (*Polygonum* spp.), arrowheads and cattails; open water areas that team with amphibians, fish, and aquatic invertebrates; and mudflats with abundant invertebrates and insect larvae. Moist soil management on the large impoundments on Theresa and Mullet Creek provide varied habitat from mudflats to flooded pioneer plants that provide food for invertebrates and attract large concentrations of waterfowl and shorebirds. Lowland shrubs in these wetlands offer migrating songbirds protection from severe weather and predators during a critical time in their life cycle. Shrubs offer perches for capturing emerging aquatic insects in spring and feeding on fruit in fall. Fruit is utilized by migrants to build fat reserves necessary for sustaining long migratory flight.

Sites of High Conservation Significance

Seven **Primary Sites** for biodiversity conservation are identified in the *Rapid Ecological Assessment for the Wildlife, Fishery and State Natural Areas of the Northern Kettle Moraine Region* (WDNR, 2010d). Primary Sites encompass the best examples of 1) rare and representative natural communities, 2) documented occurrences of rare species populations, and/or 3) opportunities for ecological restoration. Management alternatives for the Primary Sites will be considered during the master planning process. Primary Sites descriptions are included in the property descriptions of this document.

Cultural Resources

A cultural review indicated the presence of recorded archaic and prehistoric campsites, a modern Native American cemetery, Indian fish weir, and a historic structure on the property grouping. Management policy (Wis. Stats. 44.40 and Manual Code 1810.10) requires that any activities with the potential to disturb archaeological sites will only be undertaken after consultation with the Department Archeologist (Dudzik 2010).

PROPERTY DESCRIPTIONS: Resources, Use, Management & Constraints

Land cover and vegetation descriptions in this document contain differences in terminology between the narrative ecology descriptions and the GPS mapped land cover descriptions. This is a result of programmatic database differences in the wildlife and forestry management programs; neither is incorrect. The mapped land cover descriptions contain fewer details. The narrative vegetation and ecological community descriptions include critical details based on analyses of plant and animal communities, viewed from a "ground up" perspective. The land "cover types" in the Map D series and referenced below in tables within each property description, provide 'tree-top' or aerial land cover perspectives, a forestry management perspective. Such "top down" land cover perspective misses some qualities of ground level ecological communities; for instance, a rare bog community will appear only as a wetland.

Jackson Marsh Wildlife & State Natural Area

Jackson Marsh Wildlife Area (2,518 acres) is located in southeastern Washington County, two miles northeast of Jackson and 10 miles northwest of Milwaukee County.

Within this property lies the southernmost white cedar swamp in Wisconsin. The land consists mostly of forested wetland surrounded by grasslands, croplands, scattered ponds with wetlands, feeder streams, and small woodlots. Cedar Creek originates at Big Cedar Lake and flows eastward through Jackson Marsh. Ephemeral wetlands arise from several unnamed tributaries and springheads adjoining Cedar Creek.

Fee Title Lands:	2,518 acres
Current Project Boundary	3,340 acres
Current Acreage Goal:	3,173 acres

The Wisconsin Conservation Commission established the Jackson Marsh Wildlife Area in 1952 due to importance for wildlife, opportunities for hunting, and proximity to urban centers. In February 1953, the initial property acquisition included the purchase of 107 acres from William and Mary Schubert. Land acquisition has proceeded steadily since establishment with over 2,500 acres now under state ownership within a 3,173 acre project boundary. Regional demographic and land use trends have changed the landscape surrounding the property. Scattered ownership and residential development have fragmented the landscape and slowed achievement of the acquisition authority.

Habitat and Vegetative Cover

Jackson Marsh Wildlife Area is the second largest property in this NKMR group and contains a diverse mix of cover types (Map D-1). Table 1 provides a breakdown of current cover types on the property.

Table 1. Jackson Marsh Wildlife Area Cover Types (estimated)

Cover Types	% Cover
Agriculture	5
Aspen	1
Bottomland Hardwood	44
Grassland	20
Shrub	2
Swamp Conifer	9
Swamp Hardwood	2
Upland Conifer	2
Upland Hardwood	1
Wetland	14

The core of the property is the 1,571-acre Jackson Swamp, classified by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) as a type 2 natural area (NA-2) consisting of lowland hardwoods, white cedar and tamarack, a community more common in northern Wisconsin. Around the perimeter of the woodland, two areas have been developed as dike flowages, and several additional potholes have been constructed. Upland fields, previously farmed, have been planted to trees and grassland or sharecropped to provide nesting cover and food plots for wildlife. Several wetlands, degraded or drained from agricultural production, have been restored.

The Jackson Marsh Wildlife Area offers a variety of fauna. Bird life is diverse including the state-threatened Kentucky warbler, sharp-shinned hawk, broad-winged hawk, northern waterthrush, white-throated sparrow, scarlet tanager, winter wren, veery, and blue-winged, mourning, Canada and black-throated green warblers. Game species are also abundant on the property including pheasants, deer, rabbits, turkeys, squirrels, waterfowl, mourning dove, woodcock, and furbearers.

Cedar Creek, the major water feature within the wildlife area, flows less than 4 miles through the property. The creek has a low gradient and provides flooding potential to adjacent waterfowl impoundments and wetlands in the wildlife area. Three segments of Cedar Creek adjacent to the wildlife area are protected through the Stream Bank Protection program. Evergreen and Cedarburg Creeks join Cedar Creek within the property and are intermittent during dry summers. Most of the tributary systems were previously channelized and ditched, including sections of Cedar Creek within the swamp area. Cedar Creek is self-sustaining and provides a popular fishery in spring and summer. Common fish species include northern pike, white sucker, bullheads, rock bass, largemouth bass and a variety of panfish.

State Natural Area

Jackson Marsh State Natural Area was designated in 1994 as a reserve and ecological reference area to provide research and education opportunities. It features 212 acres of mature silver maple forest and a white cedar-tamarack swamp, an uncommon community type in southern Wisconsin. The understory consists of winterberry, sphagnum moss, and northern flora including twinflower, gay-wings, false mayflower, three-leaved goldthread, tall northern bog orchid, and numerous sedges. The SNA is managed passively to maintain its natural condition, with some exception of invasive species management. A map is provided in the Rapid Ecological Assessment (WDNR, 2010d) and on the Natural Areas web page (WDNR 2011a).

The mature silver maple forest is seasonally inundated wet forest with typical northern elements such as yellow birch and black ash. White cedar and tamarack are present in smaller numbers. The shrub layer is sparse with common winterberry. The white cedar swamp-tamarack tract has trees 6-12 inches in diameter. Both cedar and tamarack have good reproduction, an indication of low deer browse. The ground layer contains sphagnum moss and boasts an excellent northern flora including twinflower, gay-wings, false mayflower, three-leaved goldthread, tall northern bog orchid, and numerous sedges. A large area of wet-mesic forest with yellow birch and black ash borders the conifer swamp. This may serve as a good buffer and help protect it from windthrow. Bird diversity includes: both sharp-shinned and broad-winged hawks, northern waterthrush, white-throated sparrow, scarlet tanager, winter wren, veery, and warblers such as blue-winged, mourning, Canada and black-throated green species. The state-threatened Kentucky warbler is also found at this site.

Primary Sites: Cedar Swamp (796 acres) & Southern Hardwood Swamp (308 acres)

Jackson Marsh Cedar Swamp (796 acres) extends the outer perimeter of the Jackson Marsh State Natural Area, within the Jackson Marsh Wildlife Area. It contains a core of good quality Northern Wet-mesic Forest surrounded by good to moderate quality Southern Hardwood Swamp. The uplands include a small area of moderate quality Southern Dry-mesic Forest on the west and good to moderate quality Southern Mesic Forest in the southeast. The canopy is dominated by northern white-cedar, tamarack, black ash, red maple, and yellow birch with common winterberry, alder-leaf buckthorn, and poison sumac in the sparse shrub layer. The ground flora includes many northern species such as gold-thread, blue-bead-lily, twinflower, and gay-wings, and a variety of sedges and cinnamon fern. The surrounding Southern Hardwood Swamp has a canopy that includes red and silver maple, green and black ash, and some American elm. The ground flora is not diverse and includes abundant wood nettle and enchanter's nightshade. Invasive species include common buckthorn, multiflora rose, and reed canary grass present in both natural communities.

A 19 acre Southern Mesic Forest has a canopy dominated by sugar maple, American beech, basswood, ash species, and elm species. The ground flora is fairly diverse and includes spring beauty, wild geranium, trilliums, bloodroot, and Virginia waterleaf. The Southern Dry-mesic Forest has bur oak, red oak, and basswood in the canopy. Some oaks are 30 inches in diameter. Ground flora includes wild geranium, white avens, Jack-in-the-pulpit, and wood sedge. The invasive common buckthorn is present in the shrub/sapling layer.

Jackson Marsh Southern Hardwood Swamp (308 acres) also extends the outer perimeter of the Jackson Marsh State Natural Area, within the Jackson Marsh Wildlife Area. This site is dominated by large tracts of Southern Hardwood Swamps. The canopies are dominated by large silver maple with red maple, green ash, and elms. Other trees that are typically further north, including black ash and yellow birch are also part of the composition of the canopy. Shrubs and saplings are patchily distributed and include prickly ash, dogwoods, and the invasive species common buckthorn. Herbs include nettles, sedges, skunk cabbage, and impatiens. There are dense patches of reed canary grass in some of the canopy gaps. This site may have been affected by stream modifications, including a stretch of Cedar Creek that has been channelized.

Administrative Facilities and Access

There are no DNR-owned buildings on Jackson Marsh Wildlife Area. The property is managed by DNR Wildlife Management staff working out of the Pike Lake Unit, Kettle Moraine State Forest office near Hartford, WI.

Property access is available from County Highway G, which bisects the property. Access from the west is on Cedar Creek Road, from the north along Maple and Church Roads, and County Highway PV (Pleasant Valley Road), from the east along County Highway M, and from the south along State Highway 60. The Department maintains eight parking lots (four are gravel, four are mowed grass) on these roads. Additional single vehicle pull-offs along both sides of County Highway G are maintained by the Washington County Highway Department. Seasonal parking exists along most road shoulders and at the end of Maple Road. One and one-half miles of gravel service roads provide vehicle access to the property for DNR maintenance activities, pheasant stocking and walk-in public access for recreational activities.

Cedar Creek water access points suitable for canoe and kayak launching are located on County Highway G and Church Road parking lots. Additional access to Cedar Creek from highway right-of-ways is located on State Highway 60 and County Highway M.

Several major utility easements cross the property. A major power line transect, maintained by WE Energies, runs diagonally southwest-northeast through the property. A natural gas pipeline (ANR Pipeline Company) crosses the property from south to north on the west end of the property and a gasoline pipeline owned by West Shore Pipeline crosses the property just west of County Highway G.

Jackson Marsh Wildlife Area infrastructure is shown on Map E-1.

Recreation

Primary public uses are hunting, trapping and fishing. Other permitted uses include walking, cross-country skiing, nature study, berry picking, and snowmobiling on the Washington County snowmobile trail, which crosses the property from south to north just west of County Highway G. Despite no groomed cross country ski trails or designated hiking trails, there is significant public use year-round on the property due to its location near urban communities of the Milwaukee area. Dog walking is permitted, but all dogs must be leashed April 15 – July 31. Prohibited activities include horseback riding, vehicles (including bicycles, ATVs, other vehicles, and snowmobiles except on the designated snowmobile trail).

The property is open to archery and firearm hunting, with deer, turkeys, pheasants, Canada geese, and dabbling ducks (primarily mallards, blue-winged teal and wood ducks) being the main game species hunted. Coyotes, woodcock, squirrels, rabbits, mourning doves and other small game and waterfowl species are also taken. Jackson Marsh Wildlife Area is part of Deer Management Unit 77M for deer hunting regulations and permits, Management Zone 2 for wild turkey hunting, and is within the “Exterior” Canada goose zone. To provide opportunities for pheasant hunting, the Department stocks rooster pheasants once or twice each week during the first few weeks of the pheasant hunting season. The Department leases additional acreage for public hunting on an annual basis from adjacent property owners, when funds are available.

Cedar Creek is a popular bank fishing destination during the spring, summer and fall months and is a self-sustaining creek that flows throughout the property. Common fish species include northern pike, white sucker, bullheads, rock bass, and largemouth bass. A few small ponds scattered around the property provide additional fishing opportunities for bass and pan fish. Canoeing and kayaking are also accessible along Cedar Creek, as noted above.

Bird watching is increasing in popularity on the property. Jackson Marsh Wildlife Area and its State Natural Areas are highlighted in the Great Wisconsin Birding and Nature Trail (WDNR, 2008) for important warblers, waterfowl, and other wetland birds and habitat features.

Current Management, Challenges, & Constraints

Jackson Marsh Wildlife Area is managed to provide a wide range of hunting, trapping, fishing and other nature-based recreational opportunities, and to maintain and enhance the State Natural Areas and other habitat on the property. Management includes prescribed burning of grassland and savanna to restore habitat; maintenance of access roads and parking areas; boundary posting and litter pick up; controlling invasive species; conducting surveys of hunters and vehicles during peak hunting days; enhancing or restoring wetlands through the use of tile breaks, wetland scrapes and small berms; and administering sharecrop contracts that provide wildlife habitat or prepare fields for establishment of other vegetation types.

Habitat is managed for both game and non-game wildlife species, which is sometimes a balancing act when species are rare, such as the Butler's garter snake. Recent projects included oak savanna restoration and invasive species control. Several wooded fence lines were removed via issuance of firewood cutting permits to private landowners to enlarge grass nesting fields and remove invasive species.

Habitat management is challenging due to local urbanization and proximity to the Milwaukee metropolitan area, as previously described. The Wildlife Area is bordered by several new subdivisions and homes - some inside the project boundary.

Dikes east of County Highway G are not maintained and may be removed or allowed to disintegrate for wetland restoration purposes.

Invasive species concerns include reed canary grass and garlic mustard (*Alliaria petiolata*), with the latter abundant along the floodplain corridor toward the southern end of the State Natural Area swamp. Reed canary grass is dominant in some of the open wetlands and has begun to invade canopy gaps in the Southern Hardwood Swamp. Both common and glossy buckthorns are present. (WDNR, 2011b).

Allenton Wildlife Area

Fee Title Land:	1,160 acres
Current Project Boundary:	1,720 acres
Current Acreage Goal:	1,591 acres
Approved Master Plan:	1984

The **Allenton Wildlife Area** (1,160 acres) is situated along the headwaters of the East Branch Rock River, in west central Washington County. US Highway 41 defines the eastern property boundary, and to the northwest, Theresa Wildlife Area is separated from Allenton Wildlife Area by State Highway 33. The property is a 30 minute drive north of the metropolitan Milwaukee area.

Allenton was once a glacial lake which evolved into a wooded bottomland. An abundant water supply from many springs and creeks provided excellent wildlife habitat. As agricultural pursuits took hold, the marsh was subject to timber cutting and cattle grazing, altering the marsh community.

During the 1950's, rising costs in fencing and labor caused a decline in farming interests, providing an opportunity for public ownership and preservation. In 1953, Mr. Walter Brinkman, a key landowner on Allenton Creek, offered his property for sale to the state. Mr. Brinkman realized the property's recreational potential and encouraged development of a wildlife area. Lack of public interest delayed his proposal. The proposal was renewed after the Sheboygan Press published “The Tale of Two Creeks” which highlighted preservation efforts on Nichols Creek and the neglect and degradation of Allenton Creek. The article heightened public interest and approval was subsequently granted in 1955 for acquisition and development of the wildlife area, by the Wisconsin Conservation Commission.

Water Resources, Habitat and Vegetative Cover

The property consists of a wooded riparian corridor bordered by small woodlots, fence lines, brush, grass fields, two waterfowl impoundments, several small streams, and dozens of small manmade ponds. Bordered by agriculture, approximately 100 acres of private lands are leased annually by the Department to provide additional public hunting opportunities. Allenton is drained by Allenton Creek and Limestone Creek, of which their confluence forms the East Branch of the Rock River, flowing northward into the 6,000-acre Theresa Wildlife Area.

Allenton Creek bears significance due to its Class II trout water designation, from its headwaters to mile 3.9. It is the only designated trout stream in Washington County. Headwaters originate on private land southeast of the Wildlife Area, where the highest stream gradient and most trout reproduction occur. The headwaters area is included in the property “project” boundary and proposed for protection through stream bank easements. Trout stocking has included brown, and in recent years, rainbow trout fingerlings. Habitat improvements, including stream brushing and half-log structures, have been implemented to enhance productivity and access.

Limestone Creek flows east for 3 miles through this property, with headwaters originating just a few miles west, in Dodge County. The stream has a low gradient and a marginal fishery for warmwater species common to the Rock River Basin. A waterfowl flowage on the creek provides a periodic fishery for northern pike, yellow perch, bullheads, and crappie.

The best quality fen found on the NKMR properties is located in the headwaters area of Limestone Creek, a tributary of the Rock River (Map D-20 in the wildlife area. Dominant plant species are fen star (*Carex sterilis*) and tussock sedges, red-osier dogwood (*Cornus stolonifera*), and Canada bluejoint (*Calamagrostis canadensis*). Characteristic fen indicators include grass-of-Parnassus (*Parnassia glauca*), swamp-lousewort (*Pedicularis lanceolata*), marsh muhly (*Muhlenbergia glomerata*), and Kalm's lobelia (*Lobelia kalmii*).

Areas of Southern Hardwood Swamp are young and poor quality with no developed canopy. The subcanopy is dense and dominated by black ash, American elm, and yellow birch with a few tamaracks.

Table 2. Allenton Wildlife Area Cover Types (estimated)

Cover Types	% Cover
Bottomland Hardwood	23
Grassland	16
Shrub	1
Swamp Conifer	3
Swamp Hardwood	2
Upland Hardwood	1
Water	2
Wetland	52

Swamp Conifer (Tamarack (Rich) Swamp) is located along Limestone Creek. Surveyed in 1992, it was dominated by medium to large tamarack, with black ash, red maple, and American elm, plus a few swamp white oak, green ash, and yellow birch in canopy. Table 2 provides a breakdown of cover types on the property.

Administrative Facilities and Access

There are no Department-owned buildings on the property and no plans for any new building construction. The property is managed by DNR Wildlife Management staff working out of the Pike Lake Unit – KMSF office near Hartford located about 5 miles south of Allenton Wildlife Area.

Several town roads (Wildlife Road, Williams Road, Deer Road and Crooked Road) and County Highway W provide access to Allenton Wildlife Area. There is no parking or direct public access along the eastern boundary, bordered by State Highway 41, which is a restricted-access, multiple lane highway scheduled to become an interstate highway.

The Department maintains three gravel parking lots (Crooked Road, County Highway W, and Wildlife Road). Parking is permitted seasonally along the shoulders of most town and county roads and at the Williams Road and Wildlife Road cul-de-sacs. A total of one mile of Department-owned gravel service roads provides interior property access for DNR maintenance and walk-in public recreation.

Two small, diked flowages provide habitat for breeding waterfowl and other wetland species: 20 acres in the center of the property east of County Highway W; and 17 acres of “Safari Club” wetland restorations (3 bermed ponds) located along Wildlife Road near the southern border. About 60 small manmade ponds (from the 1960’s) are located throughout the property.

A Canadian National Railway railroad corridor runs the length of the property.

The Allenton Wildlife Area infrastructure is shown on Map E-2.

Recreation

The primary public uses on Allenton Wildlife Area are hunting, trapping and fishing. Access is primarily walk-in from parking areas and adjacent roads. Deer, turkeys, pheasants, Canada geese, and dabbling ducks (mallards, blue-winged teal and wood ducks) are the primary game species hunted. Jump shooting opportunities for waterfowl are available on flowage areas, streams and small ponds. Coyotes, woodcock, squirrels, rabbits, mourning doves and other small game are also present.

Allenton Wildlife Area is part of Deer Management Unit 69 for deer hunting, Management Zone 2 for wild turkey hunting, and is within the “Exterior” zone for Canada goose hunting. Rooster pheasants are stocked once or twice each week during the first few weeks of the pheasant season to provide pheasant hunting opportunities. The Department typically leases additional hunting acreage each year from two or three adjacent property owners.

Bank fishing for pan fish is popular along Limestone Creek and on the “Safari Club” main pond. Streams within Allenton Wildlife Area are generally too small and thickly vegetated which prevent access by canoes or kayaks. Limited trout fishing opportunities exist on Allenton Creek - a Class III trout stream located off of Wildlife Road.

Hiking, cross country skiing and snowshoeing are allowed, however there are no groomed or designated trails. All dogs must be leashed April 15 – July 31. Prohibited activities include horseback riding and vehicles including bicycles and ATVs.

Bird watching is increasing in popularity. The property is highlighted in the Southern Savannah region of the Great Wisconsin Birding and Nature Trail (WDNR 2008) for important wetland birds.

Current Management, Challenges, & Constraints

The two diked flowage areas are managed to provide high quality habitat for breeding waterfowl, furbearers, reptiles and amphibians and other wetland wildlife. Water levels are manipulated seasonally to provide optimum wetland habitat.

Most upland fields have been planted to warm season or cool season grass/forbs mixtures to provide nesting habitat and cover for ducks, pheasants, turkeys, and a variety of other grassland species. No fields are under agricultural production; former cropland fields have been converted to permanent grasslands or other permanent cover. There may be future sharecropping if more croplands are acquired, or if cropping is needed to control invasive plant species or other habitat management purposes. Prescribed burning, mowing, herbicide treatments, firewood cutting and other methods are used to maintain the habitat.

Management challenges include control of invasive glossy buckthorn which is abundant and threatens the Calcareous Fen. Invasive wild parsnip is a problem in many of the upland grass fields. Additional concerns include poor regeneration of tamarack; large die-offs have been attributed to larch sawfly infestations, invasive plant species, pollutants, pesticides and altered hydrology.

Theresa Wildlife Area

Theresa Wildlife Area is located in northern Washington and eastern Dodge County. The Department owns 5,309 acres and has easements on 534 acres and public hunting leases on 90 acres. Grassland, cattail and brush marsh, woodland, agricultural land, seasonally flooded wetlands, and permanent wetlands all are important property habitats.

Fee Title Land:	5,309 acres
Current Project Boundary:	8,770 acres
Current Acreage Goal:	5,990 acres
Approved Master Plan:	1985

Property History

A glacial lake once occupied the site of Theresa. Subsequent glacial activity created the present basin and outlet of the marsh flowing westward. A tamarack and lowland hardwood river bottoms were logged during early settlement, leaving open marshland.

In 1852, Solomon Juneau arrived and founded the Village of Theresa, which he named after his mother. He established a trading post and built grain and saw mills, damming the Rock River to provide water power. A 2,000-acre flowage resulted from the dam construction, which created ideal fish and wildlife habitat, and fabulous hunting and fishing for early settlers. Around 1900, the dam was removed by developers eager to profit by selling the fertile mucklands. Cattle ranching, canary grass seed production, truck farming, and mint farming followed. Eventually, all failed due to flooding risks and short growing seasons.

In 1948, the Wisconsin Conservation Commission approved acquisition of a Wildlife Area and by the late 1960's nearly 5,000 acres had been purchased. Permanent easements for public hunting, fishing, refuge and/or flowage rights were acquired on six additional parcels within the project boundary.

In 1968, a mile-long dike and stoplog/radial gate dam were built on the Rock River near Theresa Station, creating a 1,500 acre main flowage area. Subsequent development has emphasized the construction of impoundments for moist-soil or hemi-marsh management, and runoff catch basins, totaling about 600 acres.

Habitat and Vegetative Cover

Theresa Wildlife Area is the largest property in the NKMR and contains the most wetland and open water among the range of cover types (Maps D-3A and 3B. Table 3 provides a breakdown of current cover types on the property.

Table 3. Theresa Wildlife Area Cover Types (estimated)

Cover Types	% Cover
Agriculture	8
Aspen	3
Bottomland Hardwood	19
Developed	1
Grassland	11
Swamp Hardwood	1
Upland Hardwood	2
Wetland/Water	55

Emergent Marsh wetland vegetation is the dominant natural community on the marsh, consisting primarily of cattails (*Typha* spp.), mixed broad-leaved sedges including lake sedge (*Carex lacustris*), and willows (*Salix* spp.). The wetland and open water areas of Theresa offer productive foraging habitat for waterfowl (especially Canada geese, blue-winged teal, wood ducks, mallards and other dabbling and diving species), shorebirds, songbirds, and water birds such as herons and egrets.

Theresa appears to be important for breeding blue-winged teal (BWT) in Wisconsin. An 8-year study to determine the cause of population decline (Gatti 2009) found the highest density of breeding BWT and higher-than-average nest success (47%) on Theresa Wildlife Area. Blue-winged teal were the most abundant breeding duck in Wisconsin up to the 1980s (Van Horn et al. 2011); since then their populations have declined by 65%. The Wisconsin BWT population is declining most likely from problems on the breeding grounds rather than on migration-wintering areas because populations from other regions, which share migration-wintering areas, are not declining.

The Wildlife Area has a fairly large Southern Hardwood Swamp, with a canopy of large silver maple and silver-red maple hybrid (up to 30-40 inch dbh), black ash, green ash, American elm (saplings common, trees mostly dead), swamp white oak (*Quercus bicolor*), and red maple (*Acer rubrum*). Black ash saplings are common. Ground layer species include nettles, impatiens, Virginia creeper, wild grape, and skunk cabbage.

Sharecropped fields are used to produce corn, hay, and soybeans.

Garlic mustard is abundant along the floodplain corridor toward the southern end of the hardwood swamp. Reed canary grass (*Phalaris arundinacea*) is the dominant species in some of the open wetlands and has begun to invade canopy gaps in the Southern Hardwood Swamp. Other invasive species known to be present are phragmites, crown vetch, common and glossy buckthorn, autumn or Russian olive, multiflora rose, sandbar willow, honeysuckle and prickly ash.

Administrative Facilities and Infrastructure

There is no direct access from State Highway 41 along the east side of the property. Access From the east is at Mohawk Road and along a mile-long gravel frontage road. Drive-though access to the south is also from the frontage road, and to the north from the gravel access road off Highway 28, to reach the areas open to hunting in fall, during times when no-entry refuge restrictions are in place.

The Department maintains 10 gravel parking lots, one mowed parking lot (Island Drive), and one asphalt parking lot (Beaver Dam Road. The main lot at the Rock River on N. Pole Road provides ample parking and a boat launch area on the downstream side of the dam. Two floating boat ramps at the dam allow smaller boats and canoes to be pulled up and over the dam from each direction. The gravel access road south of Highway 28, open during spring and fall, also has a boat launch area. An unimproved launch area at the Highway D parking lot also provides upstream access to the Rock River for canoes, kayaks and small boats. Boat access sites on the north end of the dam and within several marsh impoundments provide access to DNR staff for dike maintenance and marsh management.

Most access roads and parking lots are not snow plowed in winter when the main hunting seasons have ended and public-use is light.

The DNR dam is located on the Rock River just east of the railroad tracks on the west side of the marsh. Eighteen other water control structures and an electric pumping station help control water levels in the various sub-impoundments.

The property has three storage buildings. Two are small, older pole framed buildings without electric power or other utilities that are used for the storage of non-essential equipment. The main storage building is a 100’ X 60’ pole frame metal building, constructed in 2004, located at the junction of County Highway DD and N. Pole Road. It has seven over-head doors, electric power, a well, and a small 20’ X 20’ insulated work area. This and the two other buildings provide storage for most of the equipment used to manage habitat and infrastructure on Theresa, Allenton and Jackson Marsh Wildlife Areas. All three Wildlife Areas are managed by DNR Wildlife Management staff headquartered at the Pike Lake Unit – KMSF DNR office near Hartford.

Several monuments and signs around the property recognize some of the individuals and groups who have contributed to the Theresa Wildlife Area or Wisconsin’s natural resources. The William Peterburs monument, located along State Highway 28, recognizes his accomplishments in banning the use of lead shot for waterfowl hunting. A bench dedicated to Wally Eickstedt, a long-time DNR Wildlife Technician, is located along the main dike, just south of the dam. Several signs and monuments along Mowhawk Road and State Highway 28 recognize the many contributions of Ducks Unlimited. Other informational and recognition signage is scattered throughout the property.

Canadian National Railway (CNR) tracks for freight train traffic run lengthwise through the property. There is also a 1,100 foot long siding extension (double tracks) located north of County Highway D. Three vehicle crossings maintained by CNR provide DNR vehicle access to state-owned lands east of the tracks. A one-mile long gravel service road off of West Bend Road crosses the tracks and siding extension, providing access to two impoundments and an electric pumping station in the south refuge area of the marsh. The pumps are operated seasonally to raise or lower water levels in the two impoundments. Hunters and pedestrians also walk across the tracks at or near these crossings, and in other areas of the Marsh, to gain access to the DNR lands east of the railroad tracks.

Additional infrastructure information related to water level management is included in the Property History and Management portions of this section.

Theresa Wildlife Area Infrastructure is shown on Maps E-3A and 3B.

Recreation

The property is open to archery and firearm hunting. Primary game species are wild turkey, pheasant, Canada geese and ducks (mallard, blue-winged teal, wood duck), followed by coyote, raccoon, woodcock, snipe, rail, gray and fox squirrel, cottontail rabbit, mourning dove and other small game and waterfowl species. Grass fields and dike edges provide good opportunity for mourning doves, as do sharecropped fields. The Department stocks rooster pheasants once or twice each week during the first few weeks of the season.

The Wildlife Area and surrounding lands are part of Deer Management 69 for deer hunting regulations and permits, Management Zone 2 for turkey hunting and the "Horicon Zone" for Canada goose hunting. Hunting and other access is prohibited within two 1,000-acre waterfowl refuges from September 1 through November 30 except for gun deer hunting during the regular 9-day and muzzleloader deer seasons. Waterfowl hunting in the refuge portions is prohibited at all times.

Muskrats are the most abundant and popular species for trapping in impoundments and the main flowage. Other species trapped include mink, otter, raccoon, coyotes, fox, skunks, opossums and weasels.

Fishing is popular along the Rock River and its tributaries for northern pike, largemouth bass, bluegill, pumpkinseed, green sunfish, rock bass, white sucker, bullheads, and carp. Fishing for northern pike, bullheads and pan fish is popular activity at the main dam and along the Rock River downstream from the dam. Bow fishing for carp is popular above the dam (motor boating is prohibited during the waterfowl season). Theresa is an important spawning area for northern pike. Until recently, the Department supplemented natural spawning in the marsh with the stocking of northern pike fry.

Excellent views of the property for wildlife and photography occur along State Highway 28, Mowhawk Road and at high points along the west edge of the marsh provide.

Other recreational opportunities include hiking, cross-country skiing, snow shoeing, nature viewing, photography, berry picking, canoeing, and kayaking.

Snowmobiling is allowed on two designated snowmobile trails. A club snowmobile trail operated by the Kohlsville Kruisers crosses the property near County Highway D. A county snowmobile trail administered by the Dodge County Planning and Parks Department crosses the west edge of the property near Theresa Station.

There are no designated hiking trails nor groomed cross country ski trails, but hikers, skiers and snowshoers can explore the property along the many dikes and service roads. Dog walking is permitted, but dogs must be leashed April 15 – July 31. Geocaching, increasing in popularity, requires written permits from the DNR property manager, for geocache sites.

Bird watching is also increasing in popularity. Theresa and Allenton Wildlife Areas are highlighted in the Great Wisconsin Birding and Nature Trail – Southern Savanna Region (WDNR, 2008) for sandhill crane, marsh wren, swamp sparrow, snow geese, rough-legged hawk, northern harrier, bobolink & American bittern. Other species include great egrets, Wilson's phalarope and northern saw-whet owls, in addition to waterfowl and other wetland birds. A pair of bald eagles began nesting on the Wildlife Area north of State Highway 28 in spring, 2011, north of the William Peterburs monument. The nest can be seen From Highway 28 when the foliage is off the trees.

Prohibited activities on Theresa Wildlife Area include target shooting and other indiscriminate shooting, paint balling, overnight camping or parking, blocking access to gates, stocking or releasing any wild or domestic animals, horseback riding, bicycles, vehicles (except snowmobiles on the two designated trails) and other activities not specifically permitted.

Current Management, Challenges, & Constraints

Water Management: The property manager maintains a water management plan, last revised in 1997 and presently under revision (T. Isaac, Pers. Comm, 2011). This document serves as a guide for seasonal, annual and long term water level management on Theresa Wildlife Area. Water levels on 2,100 acres are managed to provide optimal migration, breeding and brood rearing habitat for waterfowl and other game and non-game species, to allow recreational uses (especially hunting, fishing and trapping), for northern pike spawning, to minimize carp production, maintain water quality in the Rock River, maintain dikes and water control infrastructure, and to help reduce flooding.

Water levels on the 1,500-acre main pool are controlled by adding or removing stop logs from the dam or by opening or closing the 14' bottom draw radial gate. Eighteen "tin-whistle" type water control structures are located throughout the marsh and are used to manage water levels in the various sub impoundments and catch basins somewhat independently of the main flowage; however water levels throughout the whole system are still greatly impacted by levels at the main dam.

Water level management was achieved mostly by gravity flow in the 1960's. In the 1970's-80's, large gas-driven pumps were used to conduct draw downs and refill impoundments. In the 1990's, two existing electric pumps in the "mint farm" area of the marsh were retrofitted into a modern pumping station, and upgraded to control water levels on two sub-impoundments totaling 55 acres. A portable pump (donated in by Ducks Unlimited) is also used to raise/lower water levels on sub-impoundments.

The main pool and some of the impoundments are managed with the goal of providing a 50/50 seasonal ratio of open water to vegetation for waterfowl production and migration habitat. Short-term (1-2 years) and long-term (4-6 years) draw downs provide shorebird habitat (mudflats), furbearer habitat (deep water marsh), and migration habitat (moist-soil areas). Water level drawdowns result in beggar-ticks (*Biden* spp.), smartweeds (*Polygonum* spp.) and other annual plants growing on the mudflats, providing valuable food and invertebrate habitat for waterfowl.

Between 2006-2010, 220 acres of cattails on Theresa were sprayed by helicopter, some areas with Aquanet herbicide, but most with "Habitat" herbicide, with the goal of converting monotypic cattail areas to more desirable habitat. Some areas received follow-up treatment by burning. Results were mixed but generally positive.

Uplands Management: Currently, 471 acres of the property are managed under sharecrop agreements with eight local farmers. Typical 2- or 3-year rental agreements allow farmers to plant fields to corn, hay, soybeans or other crops in exchange for a rental payment and/or leaving a percentage of the crops unharvested. Sharecropping benefits the property by providing food for wildlife species, preparing fields for future planting to permanent cover such as native grasses or trees, or providing seasonal loafing and feeding habitat for migratory species ducks, sandhill cranes, Canada geese and other species primarily through the annual harvest of reed canary grass.

Upland fields (404 acres) have been converted to warm or cool season grass/forbs mixtures and are managed as permanent nesting habitat and hunting cover. Grass fields are maintained by periodic burning to invigorate the grasses and forbs and to control invasive brush. Fields are burned at intervals ranging from about 2 to 7 years. Each fall several miles of firebreaks are mown in preparation for spring burns. Firebreaks provide a secondary benefit as seasonal access trails for hunters and other property users.

Seven small fields (23 acres total) were "retired" around 2010, for natural conversion to shrubs and trees, due to small size, location near homes or roads, or other maintenance problems. Wooded fence lines separating the small fields have been removed, or are currently being removed, to enlarge fields for improving nest success for ground nesting birds such as blue-winged teal, turkeys, and mallards.

Annual management includes prescribed burning of savanna and wetland habitat; maintenance of gravel access roads and parking areas; boundary posting and litter pick up; maintaining and improving information signage; controlling invasive species with mechanical and chemical methods; conducting surveys of hunters and vehicles during peak hunting days; enhancing or restoring wetlands through the use of tile breaks, wetland scrapes and small berms; and restoring and enhancing other habitat where appropriate. Habitat is managed for both game and non-game wildlife species. Waterfowl, turkey and pheasant stamp funded projects have focused on restoring wetlands, grassland and oak savanna areas and controlling invasive plants.

Unique Challenges

The shared boundary with State Highways 28 and 41 (a future Interstate Highway) causes logistical challenges for prescribed burning, hunting, using or moving equipment, and contributes to wildlife/vehicle accidents.
Freight trains travel through the Wildlife Area rapidly and frequently (50 mph, 18-20 trains per day) on a track that bisects the property from north to south. Safety upgrades at areas frequently crossed by hunters and pedestrians may be appropriate.

Unique Opportunities

Theresa Wildlife Area provides both a popular hunting area and important habitat for marsh birds (rails, least bitterns (SC), great egrets (THR) and black-crowned night herons (SC)). Its proximity (8 miles) to abundant bird nesting at Horicon Marsh, provides an important foraging area upon which birds rely. The two 1,000-acre waterfowl refuges provide sanctuary to numerous migratory and breeding bird species. The "Wildlife Viewing Area" along State Highway 28 is designated by binocular logos on DOT highway signs. Wildlife seen at or near the viewing areas include black terns (SC), egrets, numerous waterfowl species, shorebirds, wading birds, and most recently a pair of nesting bald eagles located north of the William Peterburs monument along State Highway 28. The viewing area can be seen from the highway before and after leaf-out.
The Ducks Unlimited "Legacy Greenwing" Flowage, also located along State Highway 28, was the first site in the nation dedicated to youth DU members. A marsh overlook along Mohawk Road provides an excellent elevated view of the marsh and has information about several Ducks Unlimited projects. A floating boat ramp at the main dam provides access across the dam for small boats and canoes.

Mullet Creek Wildlife Area

Fee Title Lands:	2,217 acres
Current Project Boundary:	2,490 acres
Current Acreage Goal:	2,744 acres
Approved Master Plan:	1986

Mullet Creek Wildlife Area is located in east central Fond du Lac County, between Fond du Lac and Plymouth, on State Highway 23. The Mullet River flows through the entire property, eventually joining the Sheboygan River.

Mullet Lake lies about 0.5 mile southwest of the Wildlife Area. The lake and nearby swamp complex form the headwaters of the Mullet River. A State Natural Area (495 acres) project to encompass Mullet Lake was established by DNR in 2010 (through 2012 no acquisition has occurred). The 200-acre undeveloped, hard-water seepage lake is surrounded by an intact wetland complex of tamarack, shrub-carr, sedge meadow, and swamp forest. In addition to the river headwaters, these wetlands provide important breeding, nesting, and migratory habitat for many bird, reptile, and amphibian species.

Property History

The Mullet River watershed was formed by glacial activity 10,000 years ago. It is an extension of the Kettle Moraine landform. Topography of the property is characterized by a broad, flat basin through which the Mullet River flows. Rolling drumlins surround the floodplain. The Mullet River was periodically stocked with trout until the mid-1950's. In 1958, the Wisconsin Conservation Commission designated it as a state property. Land acquisition began in 1960 and continues today. When a beaver colony constructed a dam on the creek just west of the Sheboygan County line and flooded an extensive area, a safe haven was created for waterfowl, primarily mallard, wood duck and blue-winged teal. By 1971, two main waterfowl flowages created by dikes and water control structures were completed, comprising about 750 acres. Several smaller dikes were added to the wildlife area for an additional 36 acres

Habitat and Vegetative Cover

Mullet Creek Wildlife Area consists of a rich array of wetland, forest, grassland and farmland (Map D-4). The Mullet River flows east through the entire property towards the Sheboygan River. The central portion of this property consists of shallow open water with submergent vegetation and a cattail marsh of over 700 acres. Sedge, wild rice, reed canary grass, willow, dogwood, swamp conifers and swamp hardwoods occur in the lowland areas. Oak, aspen and grass fields occur on the upland sites.

Emergent Marsh wetland vegetation is most prominent of the cover types and natural communities (Table 4). Dominated by cattails (*Typha* spp.) with mixed broad-leaved sedges including lake sedge (*Carex lacustris*), willows (*Salix* spp.) typically are scattered throughout. While this community is low in plant diversity, it is important for providing significant migratory stopover habitat for migratory waterfowl and other wetland bird species. Impoundments and flowages were created, as described above.

The Northern Wet-mesic Forests (Swamp conifer) are dominated by medium-aged northern white-cedar with lesser amounts of tamarack and black ash in the canopy. This forest type is approaching the southern end of it's range at Mullet Creek Wildlife Area. Northern white-cedar trees range from 6 to 28 inches diameter. Small openings are scattered throughout the forest. The ground flora is fairly diverse and includes wild sarsaparilla (*Aralia nudicaulis*), gold-thread, and fowl manna grass.

Sedge meadows consist of dominant tussock (*Carex stricta*) and other sedge species (*Carex* spp).

Springy seeps that exhibit calcareous groundwater flows are present in the Northern Wet-mesic Forest and Hardwood Swamps. Mullet Creek Wildlife Area and Mullet Lake, to the southwest, protect the headwaters of the Mullet River.

Table 4. Mullet Creek Wildlife Area Cover Types (estimated)

Cover Types	% Cover
Agriculture	2
Bottomland Hardwood	1
Grassland	17
Oak	2
Shrub	1
Swamp Conifer	8
Swamp Hardwood	22
Upland Hardwood	4
Wetland	39
Water	4

Primary Site: Mullet Creek Forested Wetland (319 acres)

Mullet Creek Forested Wetland contains good quality Northern Wet-mesic Forest surrounded by a Southern Hardwood Swamp. The Northern Wet-mesic Forest is dominated by northern white-cedar with tamarack and some black ash. The groundlayer is typical of this community, including gold-thread, starflower, Canada mayflower, northern yellow lady's-slipper orchid, and a large population of cuckoo-flowers. There are good amounts of swamp lousewort which indicates calcium rich water and increases the likelihood of more fen species. The surrounding Southern Hardwood Swamp is dominated by silver maple, green ash, and American elm with some red maple and inclusions of northern white-cedar. Groundlayer includes skunk cabbage indicating seepage is present. The site is primarily owned by Wisconsin DNR and partially by private landowners.

The surrounding landscape includes high amounts of agricultural land, including some private holdings within the Wildlife Area. This primary site block of high-quality forest, free of invasive species, is rare in this fragmented landscape and should be left intact. Additionally, leaving the forest undisturbed could aid in preventing the spread of the invasive reed canary grass, which is present on the periphery of this forested block.

Administrative Facilities and Access

The Wildlife Area is located 15 miles east of Fond du Lac and 10 miles west of Plymouth on Highway 23. Travel south of Highway 23 on County Trunk G for one mile to reach the northeast parking lot, adjacent to where the Mullet River flows under the county road. The entire property is bisected east and west by Hillview Road. There are no DNR buildings owned or maintained on the wildlife area.

The Department maintains 5 gravel or grass parking lots, which provide ample parking for user's vehicles and trailers. The spacing of the parking lots assists in reducing possible user conflict, especially during fall hunting season.

Three large metal gates secure access to 4.25 miles of DNR service roads. Past abuse by off-road vehicles was destructive to the landscape, facilities and vegetation. Additional gates will be constructed and placed on the wildlife area as needed.

Mullet River access is obtained from three undeveloped points, located on Deerview Road, Hillview Road and County G. The narrow river channel accommodates only canoes, skiffs, and kayaks. Navigation can become difficult as water levels decrease and aquatic vegetation growth increases during summer.

Six dike systems and 5 water control structures are located on the wildlife area. Approximately, 3/4 mile of dike is mowed annually to facilitate inspection for muskrat damage and brush control. Such activities are critical for maintaining the structural integrity of the dikes.

There are 16.5 miles of exterior property boundary that require periodic inspection for posting and to monitor adjacent private property owner encroachment activity. Three large, wooden, routed property signs mark the wildlife area.

Mullet Creek Wildlife Area infrastructure is shown on Map E-4.

Recreation

Public hunting and trapping are the most common forms of recreation, representing 80% of the users on this wildlife area. This property is used for white-tailed deer, waterfowl, wild turkey, pheasant, cotton-tailed rabbit, squirrel, woodcock, ruffed grouse, and mourning dove hunting. Mourning dove hunting has become very popular since the season was introduced in 2001. Pheasant hunting is popular, despite limited wild pheasant reproduction. Pheasant hunting is supported almost exclusively by annual fall stocking of 300 captive raised rooster pheasants from the State Game Farm. The Wildlife Area and surrounding lands are part of Deer Management Unit 69 for deer hunting regulations and permits, Management Zone 2 for turkey hunting and the "Exterior Zone" for Canada goose hunting.

Trapping is popular, especially for furbearer species such as raccoon, fox, coyote, muskrat, mink, and otter. This activity has declined over the years due to low fur prices and aging of the trapper population.

Northern pike, central mud minnows, northern red belly dace, and brood sticklebacks were found upstream of the wildlife area during a fish distribution survey. In contrast, the waterfowl flowages within Mullet Creek Wildlife Area are shallow with organic bottoms, contributing to periods of summer and winter oxygen depletion, and low potential to support a viable sport fishery. Little evidence of fishing activity has been observed on the wildlife area, primarily due to the water control structures that are fish passage barriers during most of the year (WDNR, 2010a). Water control structures are used to manage the wetlands in support of waterfowl productivity.

There are no designated hiking trails nor groomed cross-county ski trails, but hikers, skiers and snowshoers can explore the property among the many dikes and service roads. Dog walking is permitted, but dogs must be leashed April 15 - July 31. Geocaching, increasing in popularity, requires written permits from the DNR property manager for geocaching sites.

Camping and horseback riding are not allowed on the wildlife area. Camping opportunities exist at a private campground located ½ mile east of the wildlife area. Both camping and horseback riding activities are available within the 30,000 acre Northern Unit-Kettle Moraine State Forest, just south, near Dundee.

A popular Spring/Fall activity on the wildlife area is the hunting and gathering of edible mushrooms, especially morels, during spring. Bird watching is increasing in popularity. Additional pursuits include berry picking, wildlife photography, and wildlife viewing (including a black tern colony), which represents 20% of property users. There are infinite opportunities for 'primitive picnicking". These uses are compatible with hunting, trapping and fishing.

Snowmobiling is a popular winter activity when snow depths and conditions are favorable. There are about 2 miles of designate, groomed snowmobile trails in the southern half of the wildlife area. The trails are part of the Fond du Lac County Snowmobile Trail System. The local snowmobile club marks, grooms and maintains the trails on the wildlife area. Some of the trails serves as firebreaks on the grassland fields we prescribe burn, thereby saving us time, fuel and money for firebreak construction.

Current Management, Challenges, & Constraints

The primary goal of the wildlife area is to manage for waterfowl production. Water levels in the two main flowages are managed to provide sufficient water to maximize waterfowl production and provide fall hunting opportunity, though the 2010 Mullet River Watershed Plan notes that these dams are passage barriers to fish (WDNR, 2010a). Annual water level drawdown begins in very early spring to accommodate spring run-off and minimize spring flooding of Hillview and Deerview Roads. Prevention of road flooding dictates wetland management strategy, rather than the ecological needs of the property.

One of the two main waterfowl flowages are drawn down in summer when open water exceeds about 35% of the flowage area. Primary waterfowl species managed are mallard, wood duck and blue-winged teal. Other marsh birds benefiting by this management include black tern, great egret, American bittern, sandhill crane, and northern harrier. These flowages provide important migratory stopover habitat for a suite of shorebirds to find critical resting and foraging habitat. Two main flowage water control structures need replacement within the next ten years.

Annually, 20% of the grasslands are maintained by prescribed burning during spring and fall. Grasslands provide critical nesting cover and brood-rearing habitat for pheasant, turkey and nongame grassland bird species such as bobolinks and meadowlarks. The grasslands are adjacent to the waterfowl flowages, whereby waterfowl such as mallard and blue-winged teal will nest then lead their broods to the waterfowl flowages. This close proximity of habitat types increases duckling survival by not having to travel great distances to water.

A sustainable forest habitat management program was recently developed, which emphasizes improvement of wildlife habitat for species such as wild turkey, gray and fox squirrel, ruffed grouse and woodcock. Timber production is a secondary benefit. Practices such as regeneration cut, selective cut and shelterwood cut will be utilized depending on forest stand type. The wildlife area RECON determined a yearly schedule of timber harvest by the DNR Forestry program. Since 2001, nearly 50 acres of forest land received management through timber sale activity. Mature forest stands on the wildlife area contribute important migratory stopover habitat for songbirds, particularly those forest blocks that are large in size and have high structural diversity with a strong oak component. Close proximity to the Kettle Moraine State Forest - Northern Unit enhances value as a regional migratory corridor for songbirds. Priority species include Acadian flycatcher, veery, Canada warbler and yellow-billed cuckoo.

Approximately 100 acres of agricultural land are farmed by local sharecroppers. Crop rotations include hay, corn and soybeans. The state share of corn is left standing to provide winter food for pheasants, rabbits, deer and wild turkey.

Invasive species management and control are major work activities. Reed canary grass and hybrid cattails are invading many of the areas, especially the floodplain forest and southern sedge meadow communities. Both aerial chemical spray and mechanical control are management techniques applied to hybrid cattail and phragmites. Chemical and biological control are used on spotted knapweed to slow its spread. Hand pulling and chemical control are used to combat garlic mustard, wild parsnip, and dame's rocket. Both cut stump and basal bark chemical application are techniques used to control buckthorn, honeysuckle, black locust and box elder. Invasive crown vetch and hairy vetch are present.

Annual inspection is needed to plan eradication of new invasive species infestations before they become a larger problem. Private landowner education is needed to teach invasive species identification and more importantly, what actions visitors can take to slow down the spread of these invasive species while visiting the wildlife area.

Communication with the Town of Forest during updates of their Comprehensive Smart Growth Plan will be important for encouraging the township to maintain a buffer area, and to discourage residential development adjacent to the wildlife area. Funding sources are needed to maintain the infrastructure of the wildlife area. Hunting license and stamp sales continue to decline, resulting in lower financial resources for management.

State Highway 23 expansion in 2012 to a four lane expressway will likely affect the wildlife area. Changes may include altered hydrology of wildlife area wetlands, springs and seeps, altered wildlife migration corridors and greater user demands from the increased traffic volume.

Kiel Marsh Wildlife Area

Fee Title Land:	843 acres
Current Project Boundary:	1,180 acres
Current Acreage Goal:	1,072 acres

Kiel Marsh Wildlife Area is located at the intersection of Calumet, Manitowoc & Sheboygan counties, just south of the city of Kiel.

The Sheboygan River meanders lazily for three-miles through the entire length of the property.

Kiel Marsh was formed during the Pleistocene period of the Great Ice Age. The glacier receded around 11,000-years ago, leaving behind topography of unique moraines formed by accumulation of glacial till between two ice lobes. Gravel, steep-sided depressions known as “kettles” occur along State Highway 67 on the east side of the marsh, formed when buried ice blocks melted. Drumlins, the half-egg-shaped hills to the north, contain glacial till that formed hills parallel to the direction that the glaciers retreated. Eskers, formed by glacial meltwater streams flowing in tunnels beneath the ice sheet, lie to the east. Early inhabitants include the Fox and Sac Indians, and later, the Menominee, who undoubtedly used the marsh for hunting, trapping, and fishing.

A mill dam was built in Kiel during European settlement, which also controlled the water level of the marsh. Much of the marsh was managed as a private fur farm for about twenty years. Several level-ditches were constructed during that time to increase furbearer and waterfowl habitat. In 1963, the Conservation Commission approved the property as a State Wildlife Area when approximately 800 acres were acquired from Harry and Elsie Klemme. Funding for state purchase was through federal restoration Pittman-Robertson and Dingall-Johnson grant funds, and required water level management control at the dam located east of the property, in City of Kiel.

Kiel Marsh is located within the “Mid to North Kettle Moraine” Conservation Opportunity Area (COA) of Wisconsin’s Wildlife Action Plan. The area is noted as having continental-wide ecological significance because of its complexes of wetlands and rivers, which include Shrub Carr and Emergent Marsh. Some of the “Species of Greatest Conservation Need” include willow flycatcher and veery.

Springs and seeps along the marsh feed into the Sheboygan River from the east and south. Muehl Springs State Natural Area, less than one mile southeast, is one of the more significant spring complexes in the area and should be considered for inclusion within the property Project Boundary. Expanses of privately owned lowland forests continue to the west.

Habitat and Vegetative Cover

An extensive shallow-water marsh of cattail and other emergent aquatic plants parallels both sides of the main Sheboygan River channel. Lowland brush intermixed with sparse stands of Northern White Cedar and hardwoods occur in adjoining lowlands.

Emergent Marsh wetland vegetation is one of the more prominent natural communities on the NKMR. Dominated by cattails (*Typha* spp.) with mixed broad-leaved sedges including lake sedge (*Carex lacustris*), willows (Salix spp.) typically are scattered throughout. Remnants of 3.7 miles of level ditches, constructed by the previous owner for furbearer management, remain on the emergent marsh and adjacent wet meadows. Portions of these ditches are used by hunters and bird watchers via canoe or kayak. The cover types for Kiel Marsh are shown in Map D-5 and Table 5.

Table 5. Kiel Marsh Wildlife Area Cover Types (estimated)

Cover Types	% Cover
Agriculture	1
Bottomland Hardwood	2
Swamp Conifer	9
Swamp Hardwood	1
Water	11
Wetland	76

Northern Sedge meadows with dominant species of tussock (*Carex stricta*) and other sedges (*Carex* spp), invaded by reed canary grass, are located southeast on the property and on the adjoining private lands.

Kiel Marsh has scattered poor quality patches of Southern Hardwood Swamp (swamp conifers) with more expansive swamp areas on adjoining private lands on the west side of the property.

Primary Site: Kiel Marsh Breeding and Migratory Bird Area (1255 acres)

This site is a cattail-dominated Emergent Marsh along the Sheboygan River with scattered areas of willow-dominated shrub-carr. The Sheboygan River is classified as a slow, warm, hardwater stream. The main channel and backwaters have submerged and floating-leaved aquatic vegetation. There are scattered patches of swamp hardwoods on slightly elevated patches of riverbank. Data from field surveys in 1978 indicate that a Southern Sedge Meadow natural community occurred, partially on private land on the south end of the property. The sedge meadow bordered a small spring-fed tributary with dominant plants including Canada bluejoint, numerous sedge species, sneezeweed (*Helenium* sp.), turtlehead (*Chellone* sp.), skullcap (*Scutellaria* sp.), and fringed brome (*Bromus ciliatus*). Aerial photos show the site has been overtaken by reed canary grass. This site is primarily DNR-owned and partially owned by private landowners.

Bird survey data in the DNR Endangered Resources program's Migratory Bird Stopover Project indicate that many rare birds use the Sheboygan River as a breeding and migratory stopover area. Uncommon birds present during the breeding season include yellow-crowned night-heron, black-crowned night-heron, a black tern colony (breeding confirmed), common moorhen, least bittern, yellow-billed cuckoo, willow flycatcher, veery, and blackbilled cuckoo. This area is also important for wood duck production and is popular for waterfowl hunting.

Administrative Facilities and Access

Kiel Marsh Wildlife Area has three opportunities for public access. Primary access is at the north end of the property at the terminus of 8th Street, from the City of Kiel. A gravel-surfaced parking area, boat launch and pier are managed and maintained by Kiel Fish and Game, a private conservation club. The parking area can hold about 12 vehicles and four trailers. A second access, on the southwest side of the property, provides challenging, carry-in boat access to ditches that connect to the Sheboygan River. A small, unimproved grass parking area can be found off the north end of Highview Road, approximately 3-miles north of Elkhart Lake. A third access, more easily reached, is provided by Hermitage Conservation Club on their private land at the southeast border of the marsh. They provide and maintain an easy boat and pier access for public launching of small boats, canoes, and kayaks onto the Sheboygan River. There is parking for about six vehicles and trailers.

An underground pipeline and overhead electric utility line easement run north-south near the western boundary of the property.

There are no Department-owned buildings on the property and no plans for building construction.

Kiel Marsh Wildlife Area infrastructure is shown on Map E-5.

Recreation

Hunting opportunities include deer, wild turkey, coyote, waterfowl, woodcock, fox, cottontail rabbit, squirrels, raccoon and other small game animals. It is one of the more popular areas for trapping aquatic furbearers. Fishing, berry-picking and cross-country skiing are also pursued.

Bird watching special opportunities include black-crowned night heron, least bittern, and black terns throughout the emergent marsh areas. Yellow-billed cuckoo, willow flycatcher, veery, and black-billed cuckoo are present during the breeding season in the shrub-carr and lowland forest areas.

Canoeing and kayaking on the Sheboygan River and the remnant ditches on the southwest end of the marsh are popular activities.

There is some interest in geo-caching, for which limited permits are issued.

Camp Y-Koda Outdoor Skills and Education (a Branch of the Sheboygan County YMCA). Camp Y-Koda is located on 80 acres near the Sheboygan River and operates outdoor and nature-based youth camp activities. For over 30 years it has provided a wide variety of hands-on educational programs, which have reached over 4,700 pre-kindergarten through 12th grade students per year. The Outdoor Skills signature program is their Wetland Ecology Program. Since the early 1990s, they have led over 18,000 students out of classrooms and into Sheboygan Marsh and Kiel Marsh Wildlife Areas to “get their feet wet” in a wetland ecosystem.

Current Management, Challenges, & Constraints

The marsh water level is maintained by the City of Kiel through regulation of the control gates at the dam in Kiel. There is interest by DNR managers in re-evaluating shared water level management objectives described in a 1961 Memorandum of Understanding between the City of Kiel and the State Conservation Commission of Wisconsin (WDNR). Historical management practices from days as a private fur farm, used water-level manipulation and level-ditching to increase furbearer production. At present, aquatic furbearer trapping remains highly competitive among families who have trapped here over generations. Hence water level manipulation is heavily scrutinized.

Current management aims to stabilize water levels to benefit breeding and migratory marshland wildlife.

Small patches of lowland forest containing hardwoods are too small and remotely located in marshlands to manage through modern sustainable forestry practices.

In many areas of the Wildlife Area, signage does not adequately identify the property as DNR owned and managed.

A Chicago Milwaukee Corporation railroad line runs almost the entire eastern boundary and crosses a small section near the southeastern corner of the property. During the past three years, hundreds of empty (bright pink) railroad cars have been stored here, leading to complaints from private individuals concerned that the cars impede deer movement.

Invasive species monitoring for purple loosestrife, phragmites, and other problem species is done annually. Reed canary grass and cattails are invading many of the sedge meadow and emergent marsh areas of the property.

Nichols Creek Wildlife Area

Fee Title Land:	651 acres
Current Project Boundary:	1,050 acres
Current Acreage Goal:	1,012 acres
Approved Master Plan:	1988

Nichols Creek Wildlife Area is a 651-acre property located in the southwest portion of Sheboygan County about 4-miles southwest of Plymouth and just northwest of the Village of Cascade. The main access is a parking area located along County Highway N about 2-miles west of County Highway E.

Past property uses were timber harvest and farming. Interest in state acquisition of the Nichols Creek Wildlife Area first arose in 1946 when a choice parcel of land and stream were almost purchased by a group who intended to convert the property to a private hunting and fishing area. Conservation organizations in Sheboygan County raised money for purchase of this area to ensure public access to the stream. The Sheboygan County Conservation Association first acquired 40-acres from the County Pension Board. That land was then purchased by the Wisconsin Conservation Commission after it approved the project as a State Wildlife Area in 1946. Several small purchases of land were made, followed by a 200-acre acquisition in 1959.

Habitat and Vegetative Cover

The property includes several coldwater seeps and spring runs which combine to form Nichols Creek. The creek becomes the North Branch of the Milwaukee River before flowing off of the property at the southeast corner. Nichols Creek is a Class I Trout Stream with naturally producing brook and brown trout. Lowland woods of northern white cedar, black ash, tamarack, and yellow birch; and shrub-carr of speckled alder and red-osier dogwood parallel the springs and creek as it meanders through the property. Marsh marigold and skunk cabbage are two of the most prevalent spring ephemerals present in the understory. Rolling uplands with restored prairies, cool-season grasses, and northern hardwoods of maple, basswood, and ash are located in the southern, western, and northern portions of the property. Vegetation is shown on Map D-6.

Northern Wet-mesic Forests (Swamp conifer) occurs on the west and east sides of the North Branch Milwaukee River. On the west side of the river, the forest has springs and seepages and is dominated by Northern white-cedar. The most common canopy species were yellow (*Betula alleghaniensis*) and paper birch *(B papyrifera*), black ash, and basswood (*Tilia americana*). Characteristic groundlayer species include marsh marigold (*Caltha palustris*), blue marsh violet (*Viola cucullata*), and skunk cabbage.

Southern Mesic Forests are located at the upper portions of northeast-facing slopes and support a mature mesic to dry-mesic hardwood forest dominated by medium to large sugar maple, red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), and basswood. Sugar maple saplings and eastern hop-hornbeam (*Ostrya virginiana*) are common small trees. The flora is richer down slope, with wild ginger (*Asarum canadense*), blue cohosh (*Caulophyllum thalictroides*), and zigzag goldenrod (*Solidago flexicaulis*). Springs are frequent on the lower slopes, where the dominant canopy tree is northern white-cedar.

Table 6. Nichols Creek Wildlife Area Cover Types (estimated)

Cover Types	% Cover
Agriculture	4
Grassland	6
Oak	4
Shrub	18
Swamp Conifer	5
Swamp Hardwood	22
Upland Conifer	2
Upland Hardwood	28
Water	1
Wetland	10

Unique Considerations:

Coldwater springs and seeps originate on the property and feed Nichols Creek to form the headwaters of the North Branch of the Milwaukee River. The Wisconsin Wetlands Association has designated the complex of coniferous swamps, sedge meadows, seeps, spring runs and the waters of Nichols Creek and the North Branch of the Milwaukee River as a “Wetland Gem”. The Nichols Creek Wetland Gem is one of 100 such "Gems" in the state that are high quality habitats that represent the wetland riches - marshes, swamps, bogs, fens and more - that historically made up nearly a quarter of Wisconsin’s landscape. For more information, (http://www.wisconsinwetlands.org/gemslist.htm). This portion of the North Branch has also been recognized by the State as an “Outstanding Resource Water”. Waters designated as such are surface waters which provide outstanding recreational opportunities, support valuable fisheries and wildlife habitat, have good water quality, and are not significantly impacted by human activities.

Nichols Creek Wildlife Area is located within the "Mid to North Kettle Moraine" Conservation Opportunity Area (COA) of Wisconsin's Wildlife Action Plan. In this plan, the area is noted as having continental-wide ecological significance because of its complexes of uplands, wetlands, and rivers, which include Northern Wet Forest, Southern Mesic Forest, Southern Sedge Meadow, and Submergent Aquatic. As noted in the plan, some of the "Species of Greatest Conservation Need" that are present here include: American woodcock, bobolink, field sparrow, hooded warbler, northern harrier, and wood thrush.

Primary Site: Nichols Creek Cedar Swamp and Springs – 238 acres

This primary site is split into two units separated by anthropogenic old field habitat; the two units are connected by the spring-fed headwaters of the North Branch Milwaukee River. The site is a complex of good quality Northern Wet-mesic Forest, Springs and Spring Runs, Spring Ponds, a couple of small Calcareous Fens in the lowlands, and variable quality Southern Mesic and Southern Dry-mesic Forest in the uplands. Good quality Northern Wet-mesic Forest occurs in both units, with each being dominated by northern white-cedar. There is also paper birch, yellow birch, black ash, and some basswood in the canopy. Somewhat unusual is strong northern white-cedar reproduction in patches within the forest, which may be a result of adequate deer control through hunting.

Ground flora is diverse and includes marsh marigold, skunk cabbage, impatiens, and fowl manna grass. Invasive species are relatively uncommon within the Northern Wet-mesic Forests. The western unit is bisected by a power line Right of Way that is dominated by cattails. This site is a mixture of good quality natural communities. Northern Wet-mesic Forests have the potential to support many rare species such as the northern yellow lady's-slipper, a species that has been observed in the western unit. The flora associated with Calcareous Fens typically is unusual as growing conditions in these alkaline-rich communities are harsh. Swamp thistle, the host plant for the State Endangered swamp metalmark butterfly has been recorded from the fens at the site. Hooded Warblers, listed as Threatened, have been documented in both units of the site. Additionally, Yellow-billed Cuckoo has been noted near the site. Yellow-billed Cuckoos are significantly associated with the Southeast Glacial Plains Ecological Landscape meaning that conservation actions in this landscape could greatly benefit this species. The majority of this site has been designated as NA-1, natural areas of statewide or greater significance, by Southeast Wisconsin Regional Planning Commission (SEWRPC, 2007).

Administrative Facilities and Access

County Highway N bisects the northern half of the property from the south and provides access to a large portion of the property. Additionally, township-owned gravel roads provide access to the property at two locations. There are three parking lots. The main lot is gravel-surfaced, holds approximately 15 cars and is located on the south side of County Highway N. This lot provides access for trout fishing, hunting and volunteer footpaths to springs historically (and currently) used to provide drinking water, and for bird-watchers and hikers. A foot bridge constructed as an Eagle Scout project crosses one of the spring runs, providing access for fishing and to a spring pond to the east. One unsurfaced, five-vehicle gravel parking area is located on the eastern boundary off Cedar Lane Road. It provides access to grass fields stocked with pheasants and Northern Wet-mesic forest. On the western boundary, an unmaintained, two-car grass parking lot exists near the south end for hunter access.

One barn, considered structurally unsafe and in need of demolition, is located on the west side of the parking lot at the main entrance off County Highway N. Two metal access gates on Highview Road and Cedar Lane Roads await removal. They mark former access lanes, presently overgrown with brush and trees.

Nichols Creek Wildlife Area infrastructure is shown on Map E-6.

Recreation

Common species such as white-tailed deer, turkey, woodcock, cottontail rabbit, gray squirrel, and farm-raised ring-necked pheasant provide hunting opportunities.

Other major recreational pursuits include hiking, wildlife-viewing, fishing and trapping. Berry-picking, snow-shoeing and cross-country skiing are also pursued. Users of the property enjoy viewing the cold water streams, springs and spring pond during all seasons of the year.

Bird watching opportunities include numerous warbler species that invade the lowland wooded areas adjacent to the flowing waters of the spring runs and streams during migrations.

Snowmobiling is allowed on the marked county-wide trail system that passes along the eastern edge of the property on Cedar Lane Road (the road is closed to other vehicles during winter). Maps of the county-wide trail system are available on the Northern Kettle Moraine Snowmobile Association website .

There is some interest in geo-caching, for which limited permits are issued by the property manager.

Current Management, Challenges, & Constraints

The variety of habitat on the property provides a range of management opportunities. Grasslands of restored prairies and cool-season grass fields are managed to provide upland nesting and brood cover for grassland nesting birds. High quality lowland forest along the spring seeps and streams are left undisturbed to provide a natural ecosystem. Upland forests and shrubs provide high-quality forest habitat for woodland wildlife species. Such habitat diversity benefits upland game hunters and other nature-based recreational opportunities.

Management includes prescribed-burning to slow down brush encroachment on the restored prairies and cool-season grass fields. This provides upland nesting and brood cover for grassland nesting birds, and grasslands to hunt pheasants. However fragmentation of these grass fields caused by growing trees and brush in remnant rocky hedgerows make these fields less habitable for grassland wildlife species. Additional funding is needed to completely remove these woody and rocky hedgerows to restore a larger grassland complex.

Fish management includes trout habitat maintenance and improvement, and protecting the high-quality water of the streams. Trout stream habitat maintenance takes the form of brush control, exotic species control, and repair of in-stream brush bundles and wing dams.

A sharecrop program including about 40-acres provides nesting and brood cover for grassland birds, and maintains openings for a diversity of hunting opportunities. Pheasant stocking prior to and during the fall hunting season also enhances hunting on this property.

A stone foundation and artesian spring which historically provided drinking water, continues to receive heavy public use. Illegal behavior and littering also occur in this area of the property.

A variety of conservation organizations have provided valuable assistance in managing Nichols Creek Wildlife Area. The Sheboygan County Conservation Association secured the first 40-acre parcel of land and stream for the property in 1946. The Lakeshore Chapter of Trout Unlimited Wisconsin currently provides help brushing and other trout stream habitat maintenance. One dedicated volunteer helps with mowing and interior access.

La Budde Creek Fishery Area

Fee Title Land:	401 acres
Current Project Boundary:	490 acres
Current Acreage Goal:	504 acres
Approved Master Plan:	1981

LaBudde Creek is one of three trout streams in Sheboygan County with naturally reproducing, native brook trout. The creek originates and obtains the majority of its flow from several seepage springs and two wetlands located northeast of the Fishery Area. It flows in a southwest direction for 7 miles until it joins the Mullet River. The Mullet River merges with the Sheboygan River, which eventually flows into Lake Michigan in the City of Sheboygan. The LaBudde Creek watershed is 12-square-miles of wooded and grassland ecosystems. It averages 8-feet wide, 10-inches deep, and has a relatively low gradient of 5.6-feet of drop per mile.

La Budde Creek was first stocked with brook trout in 1933 to supplement the native fish population. The first major fish survey in August 1956 captured 36 native brook trout with electro-fishing gear. Investigator Vern Hacker stated, "This stream, as noted previously, should have the highest priority for improvement of all brook trout streams in Sheboygan County - with the possible exception of Nichols Creek."

On June 2, 1958, the Wisconsin Conservation Department informed the Town of Rhine of its intent to purchase acreage along La Budde Creek. The Sheboygan County Board of Supervisors in resolution No. 46 gave approval to the project in November 1958. A revised plan in 1959 by the Wisconsin Conservation Commission created a 422 acre La Budde Creek Fishery Area.

Habitat and Vegetative Cover

La Budde Creek is classified as a Class I and II trout stream. The Class I section of the stream runs approximately 3.9 miles from its origin and the Class II section is defined as 0.01 miles before it joins with the Mullet River to 3.05 miles upstream or around Badger Road. Past development activities, ditching, and grazing have reduced the fishery potential of the stream.

The environment is characterized by lowland brush and bottomland hardwoods adjacent to the stream and oak, northern and central hardwoods, conifer plantations, aspen, upland brush, and grassland in the upland areas of the property (Map D-7). Forest management and timber harvesting have been active on this property when compared to other state lands in the area. Located within the "Southeast Glacial Plains" ecological landscape, the area is noted as one of the landscapes with the highest wetland and river productivity for plants, insects, and invertebrates.

Table 7. La Budde Creek Fishery Area Cover Types (estimated)

Cover Types	% Cover
Agriculture	6
Aspen	1
Bottomland Hardwood	40
Grassland	15
Oak	6
Shrub	14
Upland Conifer	10
Upland Hardwood	5
Wetland	3

The property has a 40 acre red and white pine plantation and approximately 58 acres of former cropland converted to grassland. Approximately 25 acres of the property north of County Highway A is sharecropped. Crops are rotated to provide food adjacent to wintering wildlife and to maintain open areas for upland game, primarily pheasants.

The Northern Hardwood Swamp on La Budde Creek Fishery Area is typical of lowland forests, in a narrow corridor along the creek, and one that varies from tamarack to black ash with a high diversity of herbaceous plants and shrubs.

The Southern Dry-mesic Forest is high-quality upland forest, dominated by red oak, sugar maple, American beech, white oak, and shagbark hickory in the canopy. The density of the shrub and sapling layers varies and consists of eastern hop-hornbeam, red and sugar maples, and American beech. The groundlayer is diverse, including species indicating mesic conditions, although areas of thin leaf litter and duff are present with few ground flora species.

Administrative Facilities and Access

The property is located in the Town of Rhine, less than a mile east of the Village of Elkhart Lake. Borders include County Highway FF to the north, Garton Road on the south and State Highway 67 on the west. The property is bisected by County Highway A (east-west) and Little Elkhart Lake Road (north-south).

Three gravel-surfaced parking lots are located at access points on the southern (Garton Road) and eastern property boundaries (Keystone Road and County Highway A). A steel gate at the entrance to an interior access trail on the south-side of Badger Road provides periodic access for forestry management.

A Class II dog training area, consisting of approximately 20 acres of upland brush and grasslands, is posted off the south parking lot on Garton Road. This same area contains the beginning of a 3.5 mile segment of the Ice Age National Scenic Trail (IAT), constructed in 2010, that traverses the length of La Budde Creek Fishery Area. Access to the IAT is available from all three parking lots.

An underground natural gas pipeline runs across the northeastern section of the property, east of the intersection of County Highway FF and Little Elkhart Lake Road.

La Budde Creek Fishery Area infrastructure is shown on Map E-7.

Recreation

Fishing, hunting, hiking, bird-watching and photography are activities enjoyed by the public on the property. Fishing pressure early in the season on the property is high and lessens as the season progresses and water-levels drop. The area also experiences heavy use during turkey, pheasant and deer hunting seasons. Other hunting opportunities include grouse, woodcock, rabbit, and squirrel.

The property has a 20 acre Class II dog training area along the southern boundary on Garton Road just east of State Highway 67. There were 60 dog training permits issued for the property in 2008.

A 3.5 mile segment of the Ice Age National Scenic Trail traverses the property, as shown on Map B. This segment of the Trail receives heavy use by hikers, due to its close proximity to the Village of Elkhart Lake, a popular vacation destination. The Ice Age National Scenic Trail (http://www.nps.gov/iatr/index.htm) is a thousand-plus mile footpath from Potawatomi State Park in Door County to Interstate State Park on the Wisconsin-Minnesota border. The trail highlights the glacial ice flow that sculpted the Wisconsin landscape. The Ice Age remnants are considered to be among some of the finest examples of continental glaciation in the world. Trail development on this property is the result of years of work by Ice Age Trail Alliance, Inc. volunteers, and support from the National Park Service, Wisconsin Department of Natural Resources, and county and local partners, and private landowners. The Ice Age Trail Alliance, Inc. is a non-profit member and volunteer-based organization that builds, protects, promotes and maintains the Ice Age trail (http://www.iceagetrail.org/).

The Sheboygan County Conservation Association (SCCA) is an active conservation and educational partner and mentors individuals new to hunting, fishing, and trapping. (see http://www.sheboygancountyconservationassociation.org) Prior to fall hunting season, they stock pheasants on the grassland portions of La Budde Creek Fishery Area.

Angling Opportunities

With an average depth of 10 inches and a 6-to-8 foot width and mostly brushy shorelines, La Budde Creek offers challenging wading fishing for brook trout using short flip-casting. Fish communities were rated fair and poor in 2002 and 2009 (WDNR 2010a). As water levels drop, fishing becomes impossible in some stretches. Fish composition may be characteristic of a cold to cool water stream fishery and consists of brook trout, brook stickleback, pearl dace, mudminnow, common white sucker, Johnny darter, creek chub, and blacknose shiner. An occasional northern pike may be found in the lower, warmer reaches of the stream.

Current Management, Challenges, & Constraints

Fish management includes supplementing native brook trout with hatchery fish to provide recreational opportunities. Streambank management is limited, with occasional brushing and cut-stump treatment with environmentally approved herbicides. The 2010 Mullet River Watershed Plan (WDNR 2010a) for La Budde Creek identified two primary issues for management: land use and nonpoint source runoff pollution. Work is needed to restore wetlands and riparian buffers within a 50 foot corridor and establish permanent vegetative cover or best management practices on agriculture lands in the headwaters. Groundwater recharge areas should be identified and protected for cold water segments.

Providing wildlife-based recreation is the primary management objective, including activities such as fishing, hunting for deer, upland and small game, dog training, and trapping of raccoon, muskrat, and mink. Providing for compatible recreational and education opportunities, including nature-hiking, bird-watching, and photography is also important. These objectives have become challenging with the opening of the Ice Age Trail in 2008. The new trail may have displaced some of the dog training activity. The number of dog training permits dropped from 60 in 2008 to less than 20 in 2011.

Land management primarily targets upland game birds, including ruffed grouse, ring-necked pheasant and woodcock. Efforts also benefit songbirds that inhabit early succession vegetation and open fields. Northern hardwoods management benefits canopy-dwelling songbirds. Common songbirds of the area include yellow-throated and yellow warblers, catbirds, brown thrashers, empidonax flycatchers and a variety of woodpeckers. The wildlife habitat requires tree planting, prescribed-burning, and limited timber harvest to benefit game and non-game species and to provide recreational and educational opportunities at the property.

Invasive and exotic species such as reed canary grass, common and glossy buckthorn, and honey-suckle have varying levels of dominance. Purple loosestrife is beginning to establish in sections of the creek, both on the property and downstream along State Highway 67. Sheboygan County, DNR and the Southeast Wisconsin Invasive Species Consortium are working together to address problem areas along Sheboygan County highways.

Onion River Stream Bank Protection Area

The Stream Bank Protection Program (SBP) was established in 1990 as a supplement to the traditional Fisheries Areas Program with the goals to protect and restore corridors along selected exceptional waterways such as cool and coldwater streams to improve water quality, to manage fish habitat and provide public access.

Fee Title Land:	1,045 acres
Current Project Boundary:	2,390 acres
Current Acreage Goal:	No set goal

The Onion River property is located within three townships: Plymouth, Lyndon and Mitchell, less than three miles west of the city of Plymouth and less than two miles northwest of the village of Waldo. This property is bordered by County Highway Z to the north and County Highways U and N to the south. It is located within minutes of the Kettle Moraine State Forest - Northern Unit. Approximately 9.5 miles of the Onion River, Ben Nutt Creek and Mill Creek lie within the project boundary.

Established in 1990, the Stream Bank Easement Program authorized acquisition of land adjacent to streams statewide for protection of water quality and in-stream fisheries habitat, in addition to protection of streams most threatened from the impacts of development and nonpoint source pollution. Fish habitat and water quality can be degraded by erosion, runoff, and invasive species from development and agriculture. Through acquisition of adjacent lands, the program strives to maintain or improve the capability of aquatic resources to support fisheries and wildlife habitats.

The Onion River is part of a spring-fed watershed originating in western Sheboygan County. Spring water flows into the Ben Nutt and Mill Creeks, and (again) at their confluence, where the Onion River is formed. Ben Nutt Creek finds its source in a wetland just west of the City of Plymouth and two significant locations within the hills of the Kettle Moraine, known as Silver Springs, and the former Kamrath property. The Onion River flows entirely within Sheboygan County and enters the Sheboygan River in the City of Sheboygan Falls.

Restoration History

DNR Fisheries Management involvement in restoring trout fisheries in the Upper Onion River watershed began in 1986 with an acquisition of 68 acres from the Martha Meyer estate on the Onion River, south of Sumac Road in a section of the stream locally known as Ben Nutt Creek. Habitat restoration on the property included installing bank covers and cutting brush that had overgrown the stream. The initial effort was minimal but it laid the foundation for a unique partnership with Trout Unlimited (TU) and its local “Lakeshore Chapter” in the overall Onion River restoration effort.

The DNR and Trout Unlimited came together in the early 1990's to discuss the potential for Onion River to be a Class I trout stream, where the trout population would be sustained by natural reproduction in the stream. As a result, a 10 year plan was created that outlined the major restoration and implementation of goals.

Two significant headwater properties, Kamrath and Silver Springs (former fish hatcheries), were acquired with the assistance of Windway Capital Corporation and purchased with Knowles-Nelson Stewardship Program funds in 2000 and 2001. Restoration of headwaters areas is critical to the health of river systems. Major restoration projects were accomplished on them with funds acquired from the Great Lakes Protection Fund and the Trout Stamp program.

The Kamrath Restoration Project of the Onion River Headwaters began in 2001. Prior to restoration, the stream flowed over a small dam and through two large ponds (4 and 7 acres) that impounded the major spring sources. The impoundment caused the water temperatures to increase in summer months, which decreased the otherwise natural trout spawning and rearing habitat. The smaller pond was drained and the dam removed. The stream above that pond was diverted back into its original channel to allow fish to move further upstream into good spawning habitat. Another small dam on the tributary was also removed. Two years later, the larger pond was drained and the dam removed. The Kamrath tributary has since become a major spawning and nursery area for brown trout in the Onion River watershed.

The 135 acre Silver Springs property is an extensive spring complex including two small tributaries. The tributaries become Mill Creek before flowing to the Onion River. Before 1930, Silver Springs was used for a milling operation, hence the name Mill Creek. Afterwards, the site was converted to a private fish hatchery and fee fishing operation, which was abandoned in the 1990's. The water resources on the property were impounded into 12 small to large ponds separated by earthen berms, numerous concrete raceways, several dams, and control structures, before reaching Mill Creek. A hatchery house and at least 16 wells, the majority with strong artesian flow, were dug to supplement the water supply for the hatchery.

The Silver Springs Restoration Project of the Onion River Headwaters was more complex than that on the Kamrath parcel. Restoration included the removal of pond dikes and dams and the reconstruction of stream channels to simulate a natural meandering stream in former pond bottoms. Channel banks were seeded with native plants to stabilize and restore spring-fed forested wetland habitat. Many wells were capped so that groundwater discharge would be natural and in order to protect the groundwater from potential contamination. The new stream channel has become another major spawning and nursery area for brown trout in the watershed.

Habitat and Vegetative Cover

The Wisconsin Land Legacy Report (WDNR 2006) described Sheboygan County Trout Streams, including the Upper Onion River, Ben Nutt Creek and Mill Creek, as one of the 229 most important places to the state's conservation and recreation needs for the next 50 years. Mill and Ben Nutt Creeks were both classified as Class I trout streams in 2008, including a 5.2 mile segment of the Onion River from the confluence with Mill and Ben Nutt Creeks to County Highway N. Between 1997 and 2007, the trout population in the Upper Onion River watershed grew over ten-fold. Factors that contributed to the success of trout restoration included the stocking of wild brown trout and the implementation of special regulations to protect spawning adults. In 2004, a 15" minimum size, one daily bag and artificial lures only regulation were established in all waters above County Highway E. The trout size structure has improved due to these special regulations. Angler use has dramatically increased as trout numbers increased.

This property is characterized by swamp and bottomland hardwoods adjacent to the stream and northern hardwoods, upland brush and grassland in the upland areas of the property as shown on Map D-8. Table 8 shows the land cover described by DNR aerial forestry surveys. Located within the "Southeast Glacial Plains" ecological landscape, the area is noted as one of the landscapes with the highest productivity of wetland and river plants, insects, and invertebrates. (WDNR, 2011)

Table 8. Onion River Stream Bank Protection Area Cover Types (est.)

Cover Types	% Cover
Agriculture	12
Aspen	1
Bottomland Hardwood	7
Grassland	13
Oak	1
Shrub	3
Swamp Hardwood	41
Upland Conifer	3
Upland Hardwood	3
Wetland	16

Primary Site: Kamrath Creek Forest and Fen – 60 acres

This site features high-quality natural communities of regional importance. On the highest ground, Southern Dry-mesic forests of moderate quality consist of red oak and shagbark hickory. Of note in this forest is a patch of shooting star that is about ¼ acre in size. At the base of this forest, water seeps and spring runs flow onto a moderately-sloped, semi-open Calcareous Fen, dominated by sedges, with scattered tamarack and poison sumac. Many calciphile plant species are present. These springs continue further down-slope where the forest canopy becomes more closed and they become Forested Seeps. Dominant forest species include sugar maple, yellow birch and basswood, with large areas of skunk cabbage, wild ginger, and other species of rich mesic forests and wetlands. Also present is a rich Southern Mesic Forest with sugar maple, basswood, American beech, and a diverse groundlayer including many spring ephemerals. Spring runs are common in the Southern Mesic Forest and feed into Kamrath Creek. Invasive species are limited to the more disturbed edges of the forests.

The State Endangered swamp metalmark butterfly was located during recent surveys in a high-quality fen with a large population of swamp thistle, the larval food plant. This marked the first time in 18 years that a new population was found and one of only three currently known populations in the state. The swamp metalmark butterfly is currently being assessed to determine if it should be added as a candidate for Federal listing under the Endangered Species Act. This site warrants special management consideration because of presence of high- quality natural communities, a rare plant and animal population, and potential habitat for other rare species.

To the east of the primary site, a herptile hibernaculum was located in loose rock fill. No rare species are currently known to be using the hibernaculum, although its presence in a well-used public location warrants possible management considerations.

Administrative Facilities and Access

Public access is available for all areas of the Onion River Stream Bank Protection Area. The Department maintains five gravel parking areas scattered around the region. The Ben Nutt and Kamrath Creek areas are served by one gravel-surfaced parking area on the west side of County Highway ZZ, sized for approximately four vehicles. A metal gate there prevents off-

road vehicle use of remnant gravel paths in that area. Walk-in access on the west-side of the Ben Nutt/Kamrath area is available from County Highway S. There are two gravel-surfaced parking areas (one on Highway S, and one on Silver Spring Lane) serving the former hatchery at the Silver Springs area. The Highway S parking area has a metal gate to prevent off-road vehicle-use of remnant gravel paths. A four-vehicle parking area on Sumac Road serves the area north of the Onion River. A metal gate that once prevented off-road vehicle-use there will soon be removed; that 'lane' is now over-grown with brush. Another four-vehicle parking area, on County Highway U, serves the area south of the river. A gated access lane (to stop off-road vehicles) leads to a sharecropped field just south of the river on County Highway E. East of Highway E, County Highway U provides public access to easement sections of the river, and to the area of the property south of Highway U. Three road-crossings over the Onion River allow public access at: 1) Winooski Road, 2) County Highway E, and 3) County Highway U.

Two utility easements bisect the property. An underground pipeline runs with an overhead electric line in an east-west direction through much of the property north of County Highway U. Another overhead electric line runs east-west through the Ben Nutt area.

Onion River SBP infrastructure is shown on Map E-8.

Recreation

The Onion River is the most popular trout fishing resource in Sheboygan and surrounding counties. All sections of the river that have been improved are either on public land or private land eased for public fishing access. In addition to fishing, the property provides opportunities for environmental education, nature appreciation, hiking, bird-watching, cross-country skiing, berry-picking, photography, and hunting. Fishing pressure early in the season on the property is high and lessens as the season progresses. Songbirds of the area include yellow-throated and yellow warblers, catbirds, brown thrashers, empidonax flycatchers and a variety of woodpeckers. Hunting opportunities on the property include pheasant (natural reproduction), ruffed grouse, woodcock, turkey, rabbit, squirrel, and deer.

A snowmobile trail traverses part of the Ben Nut Creek section and the Kamrath Creek Forest and Fen "Primary Site." Although horseback riding is not allowed, there is evidence of riders using the snowmobile trail at the Primary Site.

Current Management, Challenges, & Constraints

The primary purpose for the Stream Bank Protection Program is to protect lands in their existing condition, to restore degraded sites by acquiring key riparian areas threatened by development or in need of restoration, and to prevent further degradation of water quality and habitat, both aquatic and terrestrial. This is achieved by using fee-simple and easement acquisitions.

Additional goals include: 1) reduction of thermal and non-point pollution, 2) restoration of key spawning habitat, 3) develop wild brown trout populations, and 4) develop scenic green space in the valley.

Management includes in-stream habitat work, livestock fencing, bank stabilization and re-vegetation of eroded areas.

A secondary management objective is to provide hunting for deer, upland and small game, and to trap furbearers. Land management primarily targets upland game birds. Limited sharecropping is used to provide grasslands and open-areas for brooding and dense-nesting cover.

Invasive species (reed canary grass, buckthorn, and honey-suckle) are problematic in localized areas of the property. Japanese Knotweed is beginning to invade sections of the Silver Springs area and along County Highway U east of County Highway S. A Sheboygan County effort, which includes DNR, is beginning to collaborate with the Southeast Wisconsin Invasive Species Consortium (SEWISC) to address invasive and exotic species along highways.

Interpretive signs established by trout stream restoration benefactors at the County Highway S and the County Highway ZZ parking and trail areas have been severely degraded over time. In many areas of the property, signage doesn't adequately identify the property as DNR-owned and managed.

Restoration of the Onion River and its wild brown trout population has involved several partner organizations and numerous volunteers throughout the years. The Lakeshore Chapter of Trout Unlimited, River Alliance of Wisconsin, Sheboygan County Conservation Association, Sheboygan River Basin Partnerships and Michels Corporation have all played a role in assisting the project with funding, planning, implementing, or performing the work on-the-ground.

Remnant trail systems at both the Kamrath and the Silver Springs areas pose management challenges and potential opportunities. Both systems are gravel-based and once provided access lanes to the former hatchery operations at each location. Neither system is currently managed or maintained by DNR, but each receives periodic mowing by volunteer neighbors. Two foot bridges exist on the Silver Springs trail system. The two bridges on the remnant trail system at the Kamrath area are in need of repair.

Four bridges are maintained as snowmobile crossings on the county-wide snowmobile trail system that crosses the Ben Nutt and Kamrath areas. Additional challenges include illegal use of the snowmobile trails by horseback-riders. A snowmobile trail into the Kamath Creek "primary site" may not be appropriate for best management practices.

Several challenges are the direct result of constraints from irregular and narrow project boundaries. More neighbors with conflicts, encroachments, and boundary disputes result. New homes are being constructed near property boundaries and within areas of narrow state-ownership. Hunting is effectively being eliminated in those areas because of regulations prohibiting discharge of firearms within 100-yards of an occupied building. Prescribed-burning and other land management is difficult because of the proximity to homes. Hunting and fishing interference by activities of nearby residents, roaming dogs and cats, and loss of view-shed are other challenges from these irregular boundaries.

One neighboring landowner recently proposed that the Town of Lyndon abandon Elderberry Lane for ease of the landowner to graze animals on their land on each side of the lane. If that happens, DNR would need the southern end of Elderberry deeded or eased for use as a 3 or 4-vehicle parking area to maintain public fishing access.

Management Considerations for Kamrath Creek Forest/Fen

Habitat for swamp metalmark butterfly is small but swamp thistle density is very good; however known nectar plants are noticeably absent. The lack of nectar plants should be investigated to determine the cause, determine if alternate nectar plants are being used, and possibly augment with Black-eyed Susan and mountain mint. Reed canary grass and European buckthorn are starting to invade portions of the site and should be controlled. Surveys and monitoring should be done, due to the small size of the population. Additional management considerations include enlarging the habitat and creating additional openings; done gradually and with monitoring to assess the response of vegetation and the swamp metalmark.

Outside of this site, there is potential habitat for pickerel frogs that could be created along the restored stream and in spring ponds. Ideas for spring ponds include excavations with groundwater feeds, backwater pools with stream connections, or small stream impoundments.

A snowmobile trail traverses the Kamrath Creek primary site. Horseback-riding is not an allowable activity, but there is evidence of horseback-riders using the snowmobile trail.

Exotic, invasive species of concern include Japanese knotweed, phragmites, spotted knapweed, and honeysuckle.

Cedarburg Bog State Natural Area

Fee Title Land:	1,663 acres
Current Project Boundary:	2,600 acres
Current Acreage Goal:	2,250 acres
Approved Master Plan:	1982

Cedarburg Bog State Natural Area (SNA) has 1,663 acres of DNR managed land located in west-central Ozaukee County. It lies approximately two miles west of the City of Saukville, just south of State Highway 33. Cedarburg Bog lies 12 miles from the northern edge of the City of Milwaukee.

Once part of a large glacial lake, the bog is a complex of relict natural communities more commonly found in northern Wisconsin. This property contains the largest, least disturbed peatland complexes in southeast Wisconsin. It has an extensive conifer swamp forest and a patterned peatland, characterized by noticeable ridges and swales running perpendicular to water flow; the southernmost example in the world (SEWRPC, 1997). Six lakes remain within the bog, all with varying sizes and depths. The 245 acre Mud Lake is the largest, followed by 34 acre Long Lake.

Cedarburg Bog has been recognized since 1935 as both the largest and biologically richest fen in southern Wisconsin. Despite its name, the bog is a large fen, due to groundwater recharge and plant community. The area was selected as one of the first state “scientific areas” dedicated in 1953, and more recently when the National Park Service designated the area a National Natural Landmark.

In February 1945, Aldo Leopold introduced a motion to the Conservation Commission, to appoint a Scientific Areas Committee consisting of a representative of the Commission, the University of Wisconsin and the Milwaukee Public Museum. The Committee acted to accept land gifts or purchase of scientific areas. State acquisition began in October 1946, with purchase of 40 acres from Ozaukee County and 520 acres from the Forsteria Investment Co. Milwaukee area conservation organizations made recommendations to preserve “botanical, forestry and wildlife features of extraordinary value.” In 1946, the Conservation Commission recommended that funds for further purchases be from the Kettle Moraine allotment and be administered as part of the Kettle Moraine Forest project.

In 1965, the University of Wisconsin-Milwaukee Field Station was established for study in environmental sciences. This field station is located on the west central side of Cedarburg Bog SNA and encompasses approximately 280 acres: 110 bog acres and 170 upland acres.

Cedarburg Bog is a designated National Natural Landmark by the US National Park Service.

Habitat and Vegetative Cover

Cedarburg Bog is the most intact large bog system in southeastern Wisconsin and is a mosaic of several natural communities shown in Map D-9. The very diverse flora and fauna include many species that are more common in northern boreal forests and are at their southern range limits here.

Much of the property is wetlands with Northern Wet-mesic Forests, Patterned Peatland, Emergent Marsh, and Shrub-carr. Northern Wet Mesic Forest is the dominant cover type (Table 9). Its canopy is dominated by northern white-cedar, and includes yellow birch, green ash, black spruce (Picea mariana), and tamarack (Larix laricina). The understory is rich in sedge species, while also present are gold-thread (Coptis trifolia), leatherleaf (Chamaedaphne calyculata), and poison sumac (Toxicodendron vernix).

Most unusual is a string or "patterned" bog, unique because it lies far south of its usual range in North America. It is composed of ridges of stunted cedar and tamarack that lie in an open flat sedge mat. The meadow vegetation consists of narrow-leaved sedges, pitcher plant, bogbean, water horsetail, arrow-grass, orchids, and the insectivorous sundew and bladderwort.

Table 9. Cedarburg Bog State Natural Area Cover Types (est.)

Cover Types	% Cover
Agriculture	1
Grassland	3
Shrub Communities	12
Islands (Hardwood)	1
Swamp Hardwood	12
Bottomland Hardwood	1
Swamp Conifer	39
String Bog	13
Marsh	5
Sedge Meadow	1
Water	10

Patterned Peatlands are rare in Wisconsin. They are characterized by low narrow peat ridges that support ericaceous shrubs, bog birch (*Betula pumila)*, and stunted conifers (i.e., northern white-cedar, tamarack). The ridges alternate with low swales, or flarks, that are generally sedge dominated and often partially inundated. Both strings and flarks are oriented parallel to the contours of the slope, perpendicular to the flow of groundwater. This Patterned Peatland contains a diverse flora including numerous sedge species, round-leaf sundew (*Drosera rotundifolia)*, shrubby cinquefoil (*Pentaphylloides floribunda)*, pitcher plant (*Sarracenia purpurea)*, and bog bean (*Menyanthes trifoliata)*. In addition to many State Threatened and Endangered species, two federally protected species (prairie white-fringed orchid and Hines emerald dragonfly) occur here.

There are six lakes of varying size and depth within the bog. The 245-acre Mud Lake is the largest, followed by the 34-acre Long Lake. Emergent Marsh aquatic vegetation surrounds the lakes, with successional shrub-carr in the zone beyond. Representative plants include cattail species, bulrushes (*Scirpus* spp*.)*, arrowhead (*Sagittaria* sp*.)*, common reed (*Phragmites australis)*, and spike-rushes (*Eleocharis* spp*.)*. Shrub-carr almost completely surrounds the Emergent Marsh at Mud Lake and extends into other parts of the wetlands. The Shrub-carr is dominated by alder (*Alnus* sp*.)*, bog birch, dogwoods (*Cornus* spp.), leatherleaf, willows (*Salix* spp.), and poison sumac. Some of the common ground flora species include sedges, cottongrasses (*Eriophorum* spp*.)*, and pitcher plants.

The Northern Mesic Forest has a canopy dominated by sugar maple, red oak, basswood, and American elm. The ground flora includes such northern species as bunchberry (*Cornus canadensis*) plus species that are more widely distributed like large-flowered trillium (*Trillium grandiflorum*) and large-flowered bellwort (*Uvularia grandiflora*). These stands are found on the islands and uplands surrounding the bog.

The invasive plant species of greatest concern is the Glossy buckthorn that is present in many parts of the wetlands.

Emerald ah borer is a significant concern for the numerous ash trees in the forest communities. Developing a forest health management strategy will be addressed in the master plan.

Cedarburg Bog is home to the UW-Milwaukee Field Station, a research and maintenance facility, also home to its Friends group. A valuable long-term project (since 1991) provides vegetation monitoring, with detailed data on herbs, shrubs, trees and seedlings of woody plants from 165 permanently located sample plots.

Cedarburg Bog habitat provides nesting, migratory stopover, and wintering opportunities for an extensive list of birds, approaching 300 species, and is listed as a state Important Bird Areas (WI DNR, 2007). Three nesting platforms encourage osprey use.

Primary Site: Cedarburg Bog SNA in its entirety

Cedarburg Bog is unique among the NKMR group of properties because the entire property is considered a "Primary Site" for the ecological characteristics noted above. Additionally, according to the WI Wildlife Action Plan, it merits significance in the entire upper Midwest of the United States as a Priority Conservation Opportunity Area. (Map C). The Cedarburg Bog Scientific Area Master Plan, approved by the Wisconsin Natural Resources Board in 1982, provides good characterization and background information about this site. Cedarburg Bog is a nationally recognized Experimental Ecological Reserve.

Administrative Facilities and Access

There are four public access points to the DNR managed portions of the bog. Primary public access is from a large, signed, gravel surfaced parking lot on the property's northern boundary off State Highway 33, about 2.6 miles east of Newburg. An interpretive, signed ADA accessible nature trail and boardwalk lead from the parking lot to a handicap accessible pier on Watts Lake. The second access point is on the southern property boundary (Cedar-Sauk Road) from a signed, roadside pull-off parking area. Access from this parking area to Mud Lake is challenging along the unmaintained and non-designated trails from the parking area. These informal trails are wet, mucky with poor footing and have dense poison ivy and poison sumac along portions of the trails. The remaining points include the Knollwood Road access (limited usage by hunters and bird watchers) and the other is at the end of Hillcrest Road. This last site is nearly impassable and is strewn with large rocks and overgrown with trees and shrubs. It presents safety, parking and tespass challenges.

UW-Milwaukee provides a fifth access point to the bog, but usage is by permission only from the UW-Milwaukee Field Station.

DNR has management access only (no public access) to an isolated parcel off Cedar-Sauk Road.

Cedarburg Bog SNA parking access points and infrastructure are shown in Map E-10.

Education, Research and Recreation

Numerous environmental education field courses are offered through the UW-Milwaukee Field Station, and educational field trips are facilitated through the Friends of Cedarburg Bog. Activities occurring at the Field Station and within the SNA include:

- Long-term ecological and bird surveys conducted on-site (25-30 years of continuous data)
- Dozens of research projects conducted annually on the property complex
- Average ~11,000 student hours of instruction and group use/year
- Eight to nine workshops/year on natural history
- Fifteen educational events/year sponsored by the Friends of Cedarburg Bog and the UW-Milwaukee.
- Volunteers contribute about 800 hours/year toward land management, boardwalk maintenance, raising funds, etc.

Recreational bird watching is growing in popularity at this property. Hiking is popular along the interpretive trail at the north end of the property. Limited fishing is available at Watts Lake off the north end ADA access pier. Cross-country skiing is pursued on ungroomed trails. Waterfowl hunting is a popular tradition at Mud Lake.

Due to sensitive ecosystem concerns associated with SNA status, prohibited activities on the property include horseback riding, driving vehicles (bicycles, ATVs, aircraft, snowmobiles), and collecting plants (including fruits, nuts, or edible plant parts). Collecting animals, fungi, rocks, minerals, fossils, archaeological artifacts, soil, downed wood, or any other natural material, alive or dead, is also not allowed.

Current Management Opportunities, Challenges, & Constraints

An important management issue for the Cedarburg Bog is identifying the critical management issues involving the complex hydrology and hydrogeology of Cedarburg Bog, These factors were not identified when the project boundary was established in 1989. In order to address the preservation and restoration of its fragile groundwater-dependent ecological communities, a project is underway to identify land areas that are important for groundwater recharge to Cedarburg Bog. The Friends of the Cedarburg Bog, in cooperation with WDNR, WI Geological and Natural History Survey, Ozaukee County and UW-Milwaukee are preparing maps of the water table and geologic stratigraphy of the Cedarburg Bog area to interpret local groundwater flow, its relation to surface water features in Cedarburg Bog. The objective is to develop a groundwater protection strategy as part of the Ozaukee County Comprehensive Plan. Results of this effort will be available in 2013.

This State Natural Area is nationally recognized for Patterned Peatland, Calcareous Fen, Tamarack (rich) Swamp, and Northern Wet-mesic Forest community conservation. Significant opportunities exist for continued research, education and enjoyment of this high quality reserve.

The Friends of Cedarburg Bog, a private, non-profit group, maintain the ADA accessible trail, the interpretive signs at the State Highway 33 access and assist with invasive species control. The parking area, boardwalk, and disabled access fishing pier are maintained to Department standards. Management includes removal of windfalls, hazardous trees over the trail, mowing and control of invasive plants. A legal management agreement was established in 2006 between WDNR and the Friends of Cedarburg Bog.

Specific management challenges include**:**

- damage or degradation of sensitive areas with increasing recreational/educational use;
- protection in perpetuity for rare species such as the eastern prairie fringed orchid;
- control of invasive exotic species such as glossy buckthorn and native, but invasive, Phragmites;
- regeneration of tamarack (e.g., due to multiple stresses larch sawfly infestations, etc.);
- accumulation of pollutants and pesticides in waters and sediment; and
- enforcement to limit undesirable activities occurring at the parking lots.

A growing concern is the threat posed by emerald ash borer. A forest health management plan consistent with the natural areas management objectives is needed to identify management options. The plan should consider forest health protection strategies and consider salvage or sanitation options if an infestation does occur.

There are differing perspectives regarding deer management and hunting policies between UWM and DNR, though both probably have similar conservation goals. DNR concerns include deer browse damage and poor-to-absent regeneration of northern white cedars nearby and within areas where hunting is not allowed. Access to the SNA lands managed by the University of Wisconsin-Milwaukee is by permission only.

South Access - Access to Mud Lake for hunting and fishing is challenging. Several informal trails through the bog have been created by users over the years. To improve footing, users have placed materials (i.e., palettes and other materials) on the boggy ground. These materials eventually decompose or sink into the muck. These materials may pose safety and ecological threats to the SNA. Placing these materials in the bog is illegal and only provides temporary solutions to the deteriorating paths. Constructing a boardwalk to Mud Lake off Cedar Sauk Road has been a topic of discussion since the first master plan was approved in the 1980's. A boardwalk would significantly reduce marsh degradation and improve access for non-motorized boat access. The boardwalk and wetland restoration along the paths through the marsh will be considered in the master planning process.

A chronic problem affecting the natural community ecosystem is unlawful public mooring of boats at the shoreline of Mud Lake over summer and winter (to avoid transportation issues).

One private landowner may have encroached on public property by constructing a private boardwalk to Mud Lake from their property.

Poison ivy and poison oak is abundant along the existing trail. Cautionary signage is missing at the site.

East Access - Private property (agricultural lands) off Hillcrest Road on the eastern property boundary is being used by the public to access the bog against the landowners' wishes. Several references and information sources (maps) present Hillcrest Road as a potential entrance. Although initially purchased for management access, the state-owned land at this location is physically inaccessible to both DNR staff and public, due to brush and scrub tree cover on the very narrow corridor leading into the main property.

North Access - This primary property entrance offers an opportunity to place informational and interpretive signs, with maps and other information, to help inform the public of appropriate uses and opportunities.

Northwest Access - Property access is indicated on some public maps, but on-site there is no obvious access. Several factors contribute to a public safety hazard at this site: including inadequate pull-off parking even for one vehicle, unmarked access, and speed of highway traffic.

UW-M Field Station (West) – Management at Cedarburg Bog involves both DNR and the UW-Milwaukee. In addition, an active Friends group has been a partner in the management process. Issues at this property include balancing management priorities and resources, differences in deer management philosophies, and public confusion about access and management due to in part to land swaps and outdated maps and web pages.

FINDINGS AND CONCLUSIONS

This section presents the findings and conclusions from the Northern Kettle Moraine Region (NKMR) planning group's Regional and Property Analysis. Two parts summarize existing conditions and trends on the properties and in the region: 1) the ecological significance and capability of the property, and 2) the property's recreational needs, opportunities, limitations and significance. A summary presents the major findings and conclusions and is not meant to include every issue.

These findings and conclusions will help guide future management, use and development of NKMR properties by highlighting significant opportunities and limitations on these properties, and setting the stage for a reasonable range of management alternatives that may be considered during the master planning process. As planning continues, these conclusions will help define the future Vision and Goals.

NKMR PROPERTIES AND REGIONAL OVERVIEW

The Northern Kettle Moraine Region project area is located in seven southeastern Wisconsin counties: Washington, Dodge, Fond du Lac, Calumet, Manitowoc, Sheboygan and Ozaukee. The project's nine properties comprise over 16,000 acres of state protected and managed land. They include six State Wildlife Areas (~12,500 acres), two State Fishery Areas (~1,500 acres) of which one is in Stream Bank Protection, and two State Natural Areas (~1,700 acres).

The “Kettle Moraine” stretches from Manitowoc County southward to Walworth County. This southeast Wisconsin area contains some of the state’s most impressive glacial features. Ecotypes at the southern extent of their range, such as northern wetland and hardwood swamp forests typify this property grouping. Native communities such as Calcareous Fens, Peatlands, and Tamarack Swamps, pose rare opportunities in southern Wisconsin for enjoyment and conservation.

Wetlands are the dominant landscape feature of the NKMR properties, with one type or another comprising about 75% of the overall land cover. However, there is variability across the properties, exemplified by Nichols Creek Wildlife Area and La Budde Creek Fishery Area, which are more than half upland habitats. The extensive wetlands on these properties are a mix of non-forested habitats (marsh, sedge meadow, fen, and lowland brush) and the forested habitats (hardwoods and conifer). Open, non-forested wetlands and open water are most common making up about two thirds of the wetland cover. On the forested lowlands, hardwoods are the most common with swamp conifer being a minor but important component. Across these properties, the uplands are dominated by grasslands and shrubs, making up about 70% of the upland cover. Most of the remainder is hardwood forest. Agricultural lands are present on nearly all properties, but in small amounts, comprising about five percent of the total land cover. The NKMR properties provide important habitat for a variety of common and rare wildlife, both resident and migratory species. Several properties are noted important bird habitat areas.

In southeastern Wisconsin public conservation lands are very limited and are in high demand for a variety of hunting and non-hunting public uses. Regional population size and growth is a significant driver of recreational demand of all the NKMR properties. Four of them are located within the Greater Milwaukee Metropolitan Area. As of January 2010, 39% of Wisconsin’s population (~2.2 million) resided in SE Wisconsin within the eleven-county region, comprising only 10% of the total land area in the state. Regional population more than doubled from 1950 to 2006, twice the rate of the state’s overall population growth.

Coordination with planning and transportation agencies on proposed reconstruction or expansion projects would be desirable to protect the existing properties and provide buffers to create sustainable fish and wildlife populations on these properties. For example, identifying road-stream crossings where aquatic organism passage is impaired could be addressed as part of highway maintenance and protecting wetlands/streams from excessive salt applications and sediment runoff.

ECOLOGICAL SIGNIFICANCE AND MANAGEMENT OPPORTUNITIES

A number of features of the NKMR properties are recognized as being ecologically significant from a regional and even broader view. Several of the properties are part of the Kettle Moraine landscape, which has continental significance. Because of its size, rare features and high quality, Cedarburg Bog has been designated as a Natural National Landmark. Allenton and Theresa Wildlife Areas have state level significance due to their high quality, productive deep water marshes and other wetlands.

From a regional or even continental perspective, the NKMR properties are an important contributor to the Lake Michigan Flyway. Many bird species congregate in large numbers here during migration because of proximity to the Lake Michigan bird migration corridor. Over 100 migratory species were documented during 30 years of autumn banding at Cedarburg Bog SNA and seasonal estimates of 10,000 migratory birds are believed conservative. The diversity of wetland habitat, from large wetlands, streams, and flowages present at Theresa, Allenton, Mullet Creek and Kiel Marsh Wildlife Areas to undeveloped forests and shrub cover found at Cedarburg Bog SNA, Jackson Marsh, Mullet Creek, and Nichols Creek Wildlife Areas, offer important resources for numerous bird groups.

The NKMR properties support a significant array of rare natural communities and species. Sixteen "major" and "important" natural communities of regional importance are represented. In total 42 rare animals (six endangered, seven threatened and 29 special concern) have been documented on the properties. Also, 34 rare plants have been recorded (three endangered, seven threatened, and 24 special concern). Seven sites called "primary sites," have been identified within and beyond the boundary of the properties, and they offer especially important opportunities for protecting “major and important” natural communities and managing for biodiversity conservation. Primary sites generally encompass the best examples of 1) both rate and representative natural communities and 2) significant, documented rare species populations. These "primary sites" are usually defined by the natural communities present. The seven primary sites are:

Jackson Marsh; Cedar Swamp: The primary feature is its core of good quality Northern Wet-mesic Forest (swamp conifer) surrounded by a good to moderate quality Southern Hardwood Swamp.

Southern Hardwood Swamp: The canopy is dominated by large silver maple, with red maple, green ash and elms. This site is located on the Jackson Marsh WA.

Mullet Creek Forested Wetland: Good quality Northern Wet-mesic Forest (swamp conifer) surrounded by a Southern Hardwood Swamp. Especially notable is that the site is free of invasive species. The site is primarily in DNR ownership but part is privately owned.

Kiel Marsh Breeding and Migratory Bird Area: This site is a cattail-dominated marsh along the Sheboygan River with scattered areas of willow-dominated shrub-carr.

Nichols Creek Cedar Swamp and Springs: The site is composed of two units connected by the North Branch Milwaukee River. The primary site features a complex of good quality Northern Wet-mesic Forest, Springs and Spring Runs, Spring Ponds, a couple of small Calcareous Fens in the lowlands, and variable quality Southern Mesic and Southern Dry-mesic Forest in the uplands. Good quality Northern Wet-mesic Forest is also present, being dominated by northern white-cedar.

Kamrath Creek Forest and Fen: Located on the Onion River Stream Bank Protection Area, this small site features several high-quality natural communities of regional importance. The highest ground is a Southern Dry-mesic Forest with an overstory of oak and shagbark hickory. Other features include water seeps and spring runs that feed a Calcareous Fen and an area of Forested Seeps. Significantly, this site is generally free of invasive species. Of special note, the swamp metalmark butterfly has been found on the site and is one of only three known sites in the state. This butterfly is currently being assessed as a potential candidate for Federal listing.

Cedarburg Bog SNA: Cedarburg Bog is the largest, least disturbed peatland complex in southeast Wisconsin. It contains extensive conifer swamp forest and patterned peatland (characterized by noticeable ridges and swales running perpendicular to water flow). This southernmost patterned peatland in North America is one of only four known in Wisconsin. Rare plants, including several insectivorous species and rare orchids characterize the ground cover.

Ecological Threats and Management Challenges

In general, future success in maintaining and enhancing native communities, habitats, and biodiversity on the NKMR properties will greatly hinge on managing to limit ecological simplification and habitat fragmentation, and to restore previously altered ecological processes and prevent future impacts. Some specific issues include:

- Many wetlands on the NKMR properties contain high-quality native community wetlands and minimal impacts from draining. Others have been heavily impacted by previous disturbances such as ditching and grazing. Opportunities exist to improve these sites through restoration and limiting further disturbances.

  Some specific management challenges include limits on use of fire and tamarack die-off. Fire is an important tool for maintaining certain types of natural communities. The ability of managers to use fire as a management tool is and will increasingly be challenged by the proximity of residential developments and major highways to these properties.

Other tools exist but they often are less effective and more costly. Over recent years southern Wisconsin tamarack has been experiencing a die-off and regeneration of stands has been poor. This poses a long-term challenge for managers, and maintaining is rare southern Wisconsin nature community may be difficult.

- Invasive species are a significant and growing threat to native communities and other habitats. If not controlled, there is the potential for significant harm to the high habitat values and their general fitness. They may prove to be the greatest threat and management challenge on these properties. Primary invasive species include: buckthorn, garlic mustard, honeysuckle, spotted knapweed, cattails, Japanese knotweed, and reed canary grass. The emerald ash borer, a major potential threat to the ash component of lowland hardwood communities, poses a significant long-term management challenge.
- As is true in nearly all areas of the state, deer herbivory has and continues to significantly impact many tree and shrub species. As long as deer numbers remain high across the area, their impacts will continue to be a limiting factor for property managers.

WILDLIFE AND FISH MANAGEMENT

NKMR properties provide abundant, high-quality habitat for game and common wildlife species in an area dominated by agriculture and development. Primary wildlife game species include white-tailed deer, eastern wild turkey, ring-necked pheasants, waterfowl and fur-bearers. These properties are known for their excellent bird watching opportunities. The demand for wildlife-based recreation is likely to steadily increase over time. Opportunities exist on the NKMR properties to improve habitat for both game and other wildlife species for hunting and non-hunting purposes alike.

Onion River and La Budde Creek Fishery Areas protect coldwater habitat and provide fishing access for native brook trout and naturalized brown trout. These streams sustain viable populations because of significant groundwater inputs that maintain coldwater temperature regimes needed by trout. Supplemental trout stocking occurs where in-stream habitat limits natural reproduction. Habitat conditions on La Budde Creek may be deteriorating as recent surveys show trout populations are declining. Impacts from incompatible landuse and non-point source runoff upstream may be the primary reason. Significant opportunities for enhancing and rehabilitating disturbed stream habitat to improve trout population fitness exist on these properties, since some areas have degraded. Long-term threats to the fisheries on both properties include nutrient loading and groundwater pumping that may reduce cold groundwater inputs to the streams. On all properties, protecting wetlands, spawning habitat and minimizing impacts from invasive species, such as carp, zebra mussels and Eurasian milfoil, are needed to maintain desired game and native species abundance and diversity.

RECREATIONAL SIGNIFICANCE, CAPABILITY AND DEMAND

While the Kettle Moraine State Forest is the dominant public land feature in the region, the NKMR properties provide important opportunities for outdoor recreation, particularly for activities related to waterfowl hunting and bird watching shorebirds. Other important recreational opportunities include deer and upland game bird hunting, and trout fishing. Hiking and cross-country skiing are popular, but the extensive wetlands on many of the properties significantly limit these and other "trail" type activities.

From a regional perspective, the low level of public lands, high population density and growing population create a large and increasing demand for outdoor recreation opportunities. Public outdoor recreation land is available on only 10% of the land in this southeast region, which is the population epicenter of Wisconsin, compared to 23% statewide. Such disproportionate availability of resources, when exacerbated by population growth and increasing urbanization, has the potential to place huge pressures on natural resources and cause potential competition among users for limited access to enjoy a diversity of outdoor interests. Looking long-term, regional demand for wildlife-related activities such as hunting, fishing and bird-watching will likely increase recreational usage on already popular NKMR properties. The aging 'baby boomer' population is shifting the population toward an increasingly older demographic, resulting in quiet and accessible sports such as wildlife viewing and hiking becoming more popular.

Specific Recreational Uses and Capabilities and Limitations

- The NKMR wildlife and fishery areas are heavily used for hunting and trapping, and a popular Class II dog training ground is provided on the La Budde Creek Fishery Area. While overcrowding tends to be an issue, conflicts between hunters and non-hunters currently are infrequent as most non-hunters are aware when hunting seasons are occurring. However, conflicts may tend to rise in the coming years if the level of use increases as projected.

- Birding, wildlife viewing and nature study are all popular activities in the region and on the NKMR properties due to their diverse wetland habitats and their migratory stopover significance. Many bird species congregate in large numbers here during migration because of proximity to the Lake Michigan bird migration corridor. Over 100 migratory species were documented during 30 years of autumn banding at Cedarburg Bog SNA. Seasonal estimates of 10,000 migratory birds are believed conservative. Cedarburg Bog has a long history of public participation in environmental education field courses, administered and led by its Friends group and the UW-Milwaukee Field Station.
- The NKMR offers both warmwater and coldwater sportfishing opportunities. The two primary Fishery Areas (Onion River and La Budde Creek) are important coldwater stream trout fisheries; however La Budde Creek may be declining due to streambank overgrowth and landuse impacts from the upstream watershed. Trout populations are maintained by natural reproduction, supplemental stocking or are totally supported by stocked fish. Wild-source stocked fish have improved the populations and encouraged natural reproduction in some areas. Restoring degraded stream habitat areas within the properties potentially could improve fishing opportunities. However, adverse impacts to water levels, stream temperatures and water quality from incompatible landuses outside the properties will continue to pose long-term challenges to fishery managers.
- Limited opportunities for boating (primarily non-motorized boating) are available on several properties. There may be no to only limited opportunities to expand boating on the properties.
- Regionally, walking for pleasure, hiking and sightseeing are among the highest demanded activities by recreational users. Hiking, cross country skiing (ungroomed), and snowshoeing, occur on most properties and demand is likely to increase in the future. However, the extensive wet soils and limited contiguous uplands pose significant barriers to the expansion of these activities on most of the properties.

  The Ice Age National Scenic Trail (IAT) is the premier hiking venue in the region. A section of the IAT is located in La Budde Creek Fishery Area. Currently, an active habitat management partnership has been developed between the DNR and volunteers associated with the Ice Age Park and Trail Foundation. A portion of the trail passes through a designated dog training area and some conflicts between dog trainers and hikers have been noted.
- Segments of regional snowmobile trails traverse almost all NKMR properties. The trails are maintained by local snowmobile clubs. ATV use is currently prohibited on the properties due to the combination of very wet soils and sensitive ecological communities. ATV and other off-road vehicle uses are generally not compatible with the purpose of state wildlife and fishery areas.
- Horseback riding and mountain biking are not authorized uses on the NKMR properties. Physical limitations of the properties such as the predominance of wet soils and limited contiguous uplands would not be conducive to trail development. Opportunities for horse and bike uses on these properties are further limited by the requirement (NR 1.51) that non-primary uses not significantly detract from the primary purposes of the property. Abundant equestrian and mountain bike trails are provided on the Kettle Moraine State Forest.
- With a few exceptions, State Wildlife Areas, Fishery Areas, Natural Areas and Stream Bank Protection areas are closed to camping. Camping is not provided on the NKMR properties. Camping opportunities are provided in the area on the Kettle Moraine Forest, county parks and at many privately operated facilities.

SUMMARY

The NKMR properties (six wildlife areas, two fishery areas, and one state natural area) are located in a highly developed and increasingly populated region of the state. Public lands and high quality native habitats are limited and public use demands are high and growing. These wetland-dominated properties are highly valued not only for the important hunting and non-hunting outdoor recreational opportunities they afford, but also for the regionally significant ecological features they harbor. Cedarburg Bog State Natural Area, a National Natural Landmark, offers unique opportunities for environmental education and research.

Collectively, the NKMR properties contain a variety of regionally significant ecological features, including northern wet communities (rare for southern WI), diverse cold and warm water fisheries, open wetlands, upland and lowland forests, springs, sedge meadows, tamarack swamps and populations of many rare species. These properties offer a number of significant opportunities to manage for regionally significant native communities and rare species. As is true in nearly all areas of the state, continuing major threats to the biodiversity are interrelated and include ecological simplification, habitat fragmentation, altered ecological processes, deer herbivory, and infestation by aggressive invasive species.

The NKMR properties provide significant hunting, fishing, trapping, and wildlife viewing opportunities. Hunting for deer, turkey, waterfowl and pheasant is highly popular. These properties are a functional link in the Lake Michigan flyway and are important stopover points for large numbers of migrating birds, particularly waterfowl and marsh birds. During the spring and fall migrations, birders from around the region and beyond are drawn here to observe waterfowl, marsh birds, grassland and other birds.

The close proximity of the NKMR properties to one of the largest and growing population centers in Wisconsin will result in increased pressure on these properties to provide a growing and diverse spectrum of users with quality outdoor recreational experiences. Additionally, in the future, the demand for more accessible, "user friendly" trails or wildlife viewing areas will increase substantially due to the aging of the population. Several of the NKMR properties offer some opportunities to accommodate additional amounts of lightly developed, non-motorized recreation uses such as hiking, cross country skiing, snow shoeing, and wildlife viewing\nature study. However, the extensive wet soils and lack of connected uplands are a limiting factor, especially for trails.

Thoughtful planning and management will be needed to maintain high quality wildlife and fisheries habitat and protect sensitive resource while also providing recreational experiences for an increasing number of users and uses.

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Appendix A

Natural Communities of Ecological Importance with identified Species of Greatest Conservation Need on the NKMR properties

The following are vertebrate Species of Greatest Conservation Need (SGCN) associated with natural community types that are present on the NKMR properties in the Southeast Glacial Plains Ecological Landscape (WDNR 2010d). Only SGCN species with a high or moderate probability of occurring in the Southeast Glacial Plains Ecological Landscape are shown. Communities listed are limited to those identified as "Major" or "Important" management opportunities in the Wisconsin Wildlife Action Plan (WDNR 2005). Letters indicate the degree to which each species is associated with a particular habitat type (S=significant association, M=moderate association, and L=low association). Animal-community combinations shown are assigned as either "S" or "M" are also Ecological Priorities, as defined by the Wisconsin Wildlife Action Plan (see dnr.wi.gov/org/land/er/WWAP) for more information about these data. Shaded species have been documented on NKMR properties.

	Major										Important					
	Calcareous Fen	Emergent Marsh	Floodplain Forest	Inland lakes	Shrub Carr	Southern Dry-mesic Forest	Southern Sedge Meadow	Tamarack (Rich) Swamp	Warmwater rivers	Warmwater streams	Coldwater streams	Northern Sedge Meadow	Northern Wet Forest	Northern Wet-mesic Forest	Southern Hardwood Swamp	Southern Mesic Forest
Species that are Significantly Associated with the Southeast Glacial Plains Ecological Landscape																
Acadian Flycatcher			M			S										S
American Bittern		S			L		M					S				
American Golden Plover		M					L					L				
American Woodcock	M		L		S			M				L	L	L	L	
Black Tern		S		M			L					M				
Black-billed Cuckoo			M		S			M				L	L		L	
Blanding's Turtle		S	M	S	M	M	M	M	M	M	M	M			M	M
Blue-winged Teal		S	M	M			M		L			M			L	
Blue-winged Warbler			M		M	M		M							L	M
Bobolink	L						M					S				
Buff-breasted Sandpiper		M														
Butler's Garter Snake	S	S	M		S		S					S				
Canvasback		L		M					S							
Cerulean Warbler			S			S										M

	Major										Important					
	Calcareous Fen	Emergent Marsh	Floodplain Forest	Inland lakes	Shrub Carr	Southern Dry-mesic Forest	Southern Sedge Meadow	Tamarack (Rich) Swamp	Warmwater rivers	Warmwater streams	Coldwater streams	Northern Sedge Meadow	Northern Wet Forest	Northern Wet-mesic Forest	Southern Hardwood Swamp	Southern Mesic Forest
Common Tern		M		L												
Dunlin		M							M							
Eastern Massasauga Rattlesnake	S	S	S		S		S								M	
Eastern Meadowlark	L						M									
Forster's Tern		S		L			L									
Four-toed Salamander		S	S		S		M	M			M	M	M	S	S	S
Gravel Chub									S							
Greater Redhorse				M					M	S						
Henslow's Sparrow							L					L				
Hooded Warbler						S										S
Hudsonian Godwit		S														
King Rail		S					M					L				
Lake Chubsucker				M					L	L						
Lake Sturgeon				S					S							
Least Darter				M					M	M						
Least Flycatcher			M		L	L								L	L	L
Lesser Scaup		L		M					M							
Longear Sunfish				M					M	M						
Louisiana Waterthrush						S					S					S
Northern Harrier	L	L			L		M					S				
Northern Ribbon Snake				S	M											
Ornate Box Turtle						S										M
Ozark Minnow										S						
Pickerel Frog	M	S	M	M	M		S		S	S	S	S	M	M	M	M
Prothonotary Warbler			S													

	Major										Important					
	Calcareous Fen	Emergent Marsh	Floodplain Forest	Inland lakes	Shrub Carr	Southern Dry-mesic Forest	Southern Sedge Meadow	Tamarack (Rich) Swamp	Warmwater rivers	Warmwater streams	Coldwater streams	Northern Sedge Meadow	Northern Wet Forest	Northern Wet-mesic Forest	Southern Hardwood Swamp	Southern Mesic Forest
Queen Snake		S		M	S		S		S	S	M					
Redfin Shiner				L					S	M	L					
Redhead		S														
Red-headed Woodpecker			M			M										
Red-necked Grebe		S														
Redside Dace										M	M					
River Redhorse									M							
Rusty Blackbird	M	M	S		M			M							S	
Short-billed Dowitcher		S														
Short-eared Owl		L			M		M					M				
Slender Madtom										S						
Starhead Topminnow				S					S	S						
Whooping Crane		S					M					M				
Willow Flycatcher	M		L		S		M	L							L	
Wood Thrush			M			S		L					L	L	L	S
Yellow-billed Cuckoo			S		M	M		L							M	M
Species that are Moderately Associated with the Southeast Glacial Plains Ecological Landscape																
Banded Killifish				M						L						
Bell's Vireo					M											
Black Buffalo									M							
Eastern Red Bat	M	M	M	M	M	M	M	L	M	M	S	M	M	M	M	M
Golden-winged Warbler					S	L		L					M	L	L	L
Hoary Bat	M	M	M	M	M	L	M	L	M	M	S	M	M	M	L	L
Marbled Godwit		S														
Mudpuppy				S					S		L					

	Major										Important					
	Calcareous Fen	Emergent Marsh	Floodplain Forest	Inland lakes	Shrub Carr	Southern Dry-mesic Forest	Southern Sedge Meadow	Tamarack (Rich) Swamp	Warmwater rivers	Warmwater streams	Coldwater streams	Northern Sedge Meadow	Northern Wet Forest	Northern Wet-mesic Forest	Southern Hardwood Swamp	Southern Mesic Forest
Northern Long-eared Bat	M	M	M	M	M	M	M		M	M	S	M	L	L	M	M
Pugnose Shiner				M						M						
Red-shouldered Hawk			S			M		L						L	L	M
Silver-haired Bat	M	M	M	M	M	L	M	L	M	M	S	M	M	M	L	L
Snowy Egret		S														
Solitary Sandpiper		S	S		L		L			M	M	L			L	
Upland Sandpiper							L					L				
Veery			M		S	M		L					M	L	L	M
Western Sand Darter									M							
Whimbrel		M														
Whip-poor-will			L			S										L
Wilson's Phalarope		S					L					S				
Woodland Vole			L			S										L
Yellow-bellied Racer						M										
Yellow-crowned Night-Heron		M	S		M				M						M	
Yellow-throated Warbler			S			M										