

Chapter 1: Purpose and Need for Action

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1.1 Purpose

The U.S Fish and Wildlife Service (FWS, Service) is proposing the establishment of a national wildlife refuge (NWR, refuge) in McHenry County, Illinois and Walworth County, Wisconsin. This Environmental Assessment (EA) provides the public and agency decision makers with an analysis of the range of options to restore, enhance, and protect wetlands and upland habitats within a new refuge in McHenry County, Illinois and Walworth County, Wisconsin (Figure 1). The EA also publicly discloses the direct, indirect, and cumulative effects of each strategy on the quality of the human environment, as required by the National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, 83 Stat. 852 as amended by P.L. 94-52, July 3, 1975, 89 Stat. 258, and P.L. 94-83, August 9, 1975, 89 Stat. 424). The Conceptual Management Plan found in the appendix presents a blueprint for management practices and public recreational opportunities on the proposed Hackmatack NWR.

The purpose of the Refuge is to contribute to the mission and goals of the National Wildlife Refuge System (NWRS, Refuge System) by:

1. Protecting and enhancing habitats for federal trust species and species of management concern, with special emphasis on migratory birds and species listed under the federal Endangered Species Act of 1973.
2. Creating opportunities for hunting, fishing, wildlife observation and photography, and environmental education and interpretation, while promoting activities that complement the purposes of the Refuge and other protected lands in the region.
3. Promoting science, education, and research through partnerships to inform land management decisions and encourage continued responsible stewardship of the natural resources of the region.

Alternative C, Cores and Corridors, is the Service's preferred action alternative. After reviewing the analysis in this document, including the attached appendices and any public comments, the Regional Director will determine whether to formally recommend to the Director of the Service that a refuge be established. At that time, the document, including any revisions, will be submitted to Service's Director for final review and approvals.

1.2 Need for Action

Several grassland bird species are declining throughout their range. The Service is the primary federal agency responsible for conserving these species. Recent research has shown that large blocks of grasslands such as those proposed in this Refuge project may be key to reversing the downward trend. The proposed Refuge could eventually restore and connect a landscape that includes large blocks of grasslands, wet prairies, and natural stream watercourses.

The Service seeks to provide Refuge visitors with an understanding and appreciation of fish and wildlife resources through environmental education and interpretation and through wildlife-oriented recreational experiences to the extent these activities are compatible with the purposes for which a Refuge is established. The official Service land acquisition policy for urban Refuges is to acquire lands and waters in or adjacent to metropolitan statistical areas to protect fish and wildlife resources and habitats that will provide the public wildlife-oriented recreation, education, and interpretation opportunities. The primary purpose for establishment of new urban Refuges will be to foster environmental awareness and outreach programs, and to develop an informed and involved citizenry that will support fish and wildlife conservation.

In addition, the proposed Refuge would contribute to a long-standing vision held by conservation organizations across the Greater Chicago metropolitan area. These partners have worked to identify key lands for conservation, open space, and greenways aimed at providing a way to connect urban and suburban residents with nature. The establishment of a refuge would provide an anchor for this broad-based conservation and environmental education initiative.

1.3 Conserving Wildlife and Serving People: The U.S. Fish and Wildlife Service

Refuges are administered by the Service. The Service is the primary federal agency responsible for conserving, protecting, and enhancing the nation's fish and wildlife populations and their habitats. It oversees the enforcement of federal wildlife laws, management and protection of migratory bird populations, restoration of nationally significant fisheries, administration of the Endangered Species Act, and the restoration of wildlife habitat. The Service also manages the NWRS.

1.3.1 The National Wildlife Refuge System

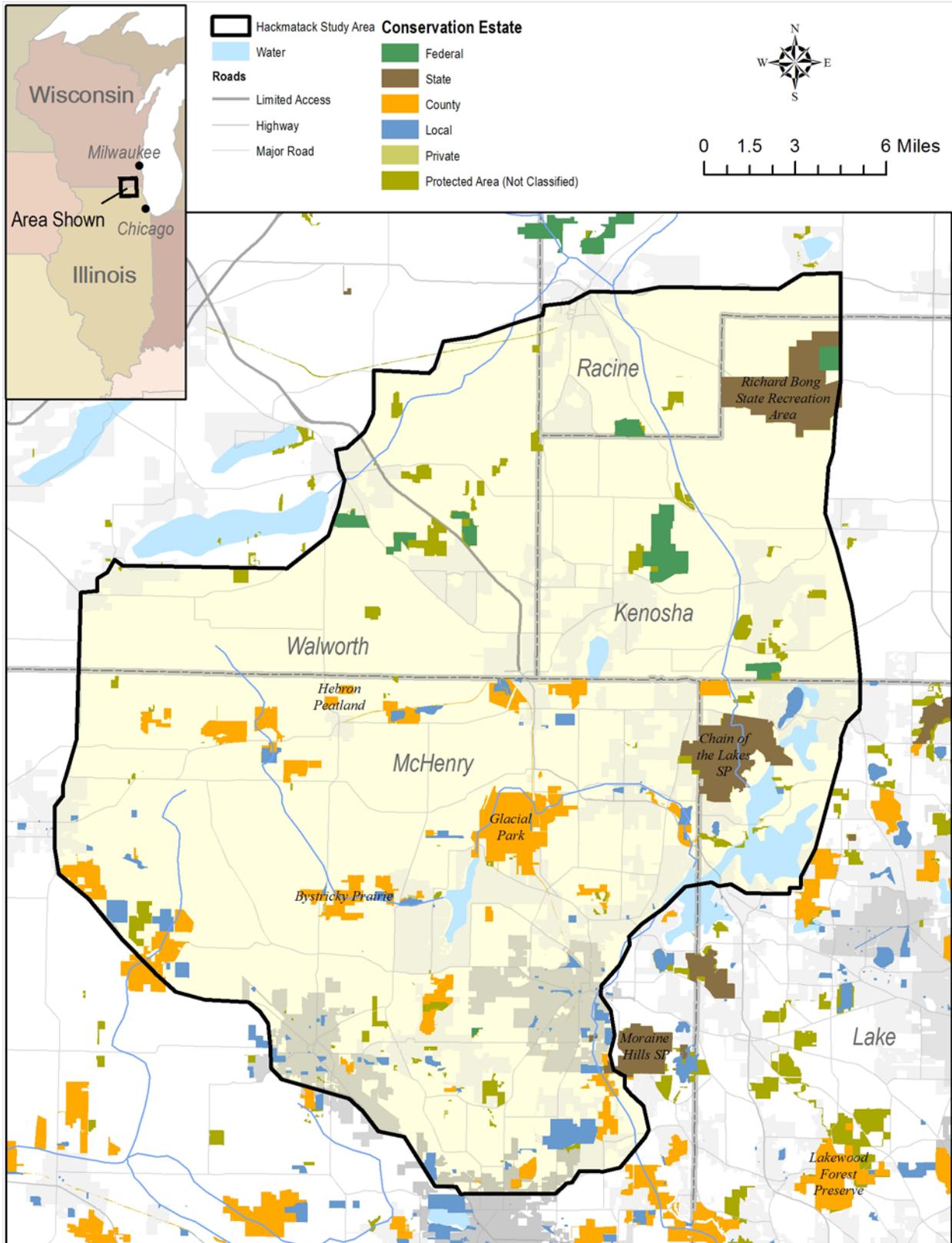
Refuge lands are part of the National Wildlife Refuge System (NWRS, Refuge System), which was founded in 1903 when President Theodore Roosevelt designated Pelican Island in Florida as a sanctuary for Brown Pelicans. Today, the system is a network of 555 refuges and wetland management districts covering over 150 million acres of public lands and waters. Over half of these lands and waters (51 percent) are in Alaska, with approximately 16 million acres located in the lower 48 states and several island territories, and the balance in submerged areas of the Pacific Ocean.

The Refuge System is the world's largest collection of lands specifically managed for fish and wildlife. Overall, it provides habitat for more than 5,000 species of birds, mammals, fish, amphibians, reptiles, and insects. As a result of international treaties for migratory bird conservation and other legislation, such as the Migratory Bird Conservation Act of 1929, many refuges have been established to protect migratory waterfowl and their migratory flyways.

Refuges also play a crucial role in preserving endangered and threatened species. Among the most notable is Aransas NWR in Texas, which provides winter habitat for the highly endangered Whooping Crane. Likewise, the Florida Panther Refuge protects one of the nation's most endangered predators. Refuges also provide unique recreational and educational opportunities for people. When human activities are

compatible with wildlife and habitat conservation, they are places where people can enjoy wildlife-dependent recreation such as hunting, fishing, wildlife observation, photography, environmental education, and environmental interpretation. Many refuges have visitor centers, wildlife trails, automobile tours, and environmental education programs. Nationwide, approximately 30 million people visited national wildlife refuges in 2004.

Figure 1: Location of Study Area



The National Wildlife Refuge System Improvement Act of 1997 established several important mandates aimed at making the management of refuges more cohesive. The preparation of Comprehensive Conservation Plans (CCPs) is one of those mandates. The legislation directs the Secretary of the Interior to ensure that the mission of the Refuge System and purposes of the individual refuges are carried out. It also requires the Secretary to maintain the biological integrity, diversity, and environmental health of the Refuge System.

The goals of the Refuge System are to:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that are strategically distributed and carefully managed to meet important life history needs of these species across their ranges.
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (e.g., hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

1.4 Public Involvement

Involvement by local government officials, organizations, landowners and other interested citizens is integral to planning for any new refuge. Proposals that involve land acquisition by a government agency can be controversial. Open communication with all parties is essential throughout the planning process. Starting in September 2010, the Service had provided and sought information through news releases, media interviews, open house events, a project website, letters to specific organizations and one-on-one discussions. A website (<http://www.fws.gov/midwest/planning/Hackmatack/index.html>) has been developed to share information with the public in a timely manner.

1.4.1 Background

A Preliminary Project Proposal for a refuge within the Study Area was developed by Service biologists in January 2010. The purpose of this report was to brief the Director of the Service about the resource conservation opportunities of the area and to obtain permission to conduct a study of the merits of the proposal. The proposal was approved by the Director on April 5, 2010.

An interagency Planning Coordination Team was formed in May 2010 that includes representatives from state, local, and regional governments, as well as the Service.

Beginning with a public announcement in September 2010 and extending through August 2011, the Refuge project planning staff have held four public open house events, placed or received hundreds of e-mail messages and phone calls, and have given several radio and newspaper interviews concerning the

Refuge proposal. Several non-profit conservation groups and individuals have also given presentations on the Refuge concept before and after this planning period.

Two open houses were held in Illinois. The first was on Tuesday, Oct. 12, 2010 at the McHenry County Government Center Administration Building, which is located at 667 Ware Road in Woodstock, IL. The second open house in Illinois was on Wednesday, Oct. 13 at the Lost Valley Visitor Center in Glacial Park, Route 31 and Harts Road, Ringwood, IL.

Two open houses were also held in Wisconsin. The first was on Wednesday, Oct. 20, 2010 at the Bristol Municipal Building, which is located at 19801 83rd Street in Bristol, WI. The second open house in Wisconsin was held on Thursday October 21, at the City of Lake Geneva City Hall, at 626 Geneva Street in Lake Geneva, WI.

All open houses were held from 4-8 p.m. and interested citizens were encouraged to stop by any time and stay as long as they wished to speak with Service staff or submit comments. Comment forms were available so that written comments could be submitted onsite or mailed in later.

These events drew more than 530 people who provided their reaction to the idea of a refuge and identified issues and opportunities that they felt needed to be addressed during the planning process.

1.4.2 Issues, Opportunities and Concerns

To date, the Service has received about 360 letters, comment forms, postcards and e-mail messages from people concerning the proposed Refuge. Comments were received primarily from local residents, non-profit organizations, and governmental offices.

Issues and concerns identified during scoping helped the Service identify and evaluate strategies for the proposed action (Table 1). Individual comments expressed during the open houses or received in writing have included the following themes:

Table 1: Summary of Public Scoping Comments

Category	Topic	Percent of Comments
Habitat/Species		80%
	General Concern for the Environment	
	Wetland Preservation/Restoration is Needed	
	Grassland Preservation/Restoration is Needed	
	Habitat Fragmentation Exists/Linkages are Needed	
	Conservation of Biodiversity is Desirable	
	Endangered Species Would Benefit	
Recreation/Education		12%
	Increased Recreational Opportunities are Desirable	
	Snowmobile Support	
	Horseback Riding Support	
	Hunting Support	
	Hunting Opposition	
	Environmental Education Support	

Category	Topic	Percent of Comments
Societal Issues		8%
	General Opposition to Government	
	Fear of Increased Government Control	
	Avoid Sand/Gravel Deposits & Consider Restoration	
	Economic/Tourism Boost will Benefit Area	

These issues will be discussed as an integral part of the Alternatives and Environmental Consequences chapter in this EA. In addition, we have included a list of frequently asked questions in the Appendix.

1.4.3 Conservation Plans and Initiatives Guiding Planning

The conservation goals and objectives of existing ecosystem plans for the landscapes in which refuges are located are important. They help to determine the manner in which a refuge can best contribute to overall conservation efforts and to the functioning of the ecosystems in that area. The Service must coordinate refuge planning with other units of government, other government agencies and nongovernmental organizations and to the extent practical to make refuge plans consistent with the fish and wildlife conservation plans of the state. The Service also endeavors to make refuge planning consistent with the conservation programs of the tribal, public and private partners within the ecosystem. The following plans were considered during the development of this document.

Upper Mississippi River and Great Lakes Region Joint Venture (2007). A primary goal of the Joint Venture is to integrate continental migratory bird priorities into conservation actions at regional and state levels. Bird Conservation Regions 22 and 23 are both within the Hackmatack Study Area. The Joint Venture Plan integrates conservation visions from the North American Waterfowl Management Plan, North American Landbird Conservation Plan, United States Shorebird Conservation Plan, and the North American Waterbird Conservation Plan. The goal of the Joint Venture Plan is deliver the full spectrum of bird conservation through regionally-based, biologically-driven, landscape-oriented partnerships. It utilizes 70 “focal” or priority bird species from which habitat conservation recommendations are based. Over half (36 of 70) of the focal or priority species identified on Joint Venture Implementation Plan breed within the boundary of proposed Refuge.

USFWS Climate Change Strategic Plan - Five Year Action Plan (2010). The USFWS Five Year Action Plan, designed to implement the Climate Change Strategic Plan, includes the promotion of habitat connectivity and integrity. The Hackmatack Study Area, with its rich conservation estate of protected but disconnected lands, offers an opportunity to implement habitat connectivity at a significant scale, specifically the north-south landscape linkage between the Kettle Moraine State Forest complex in Wisconsin and the Fox River watershed in Illinois.

State of Wisconsin Wildlife Action Plan (2005). The Wisconsin Wildlife Action Plan identified a number of general management recommendations for the Southeast Glacial Plains Landscape. These include increasing publically-owned lands to accommodate recreational needs; protect, link, and restore oak forests; restore and manage wetlands that provide important ecological functions, and protect and restore rivers and riparian zones.

State of Illinois Wildlife Action Plan (2005). The Illinois Wildlife Action Plan places special importance on assembling and protecting large blocks of habitat (grasslands, forests, and wetlands) that support a number of wildlife species in greatest need of conservation. The Illinois Department of Natural

Resources (DNR) has identified the Lake McHenry Wetlands Complex Conservation Opportunity Area (COA) within the proposed Refuge Study Area. COA's are locations with significant existing wildlife and habitat resources, where partners plan for and implement conservation plans, where financial and human resources are available, and where conservation is motivated by an agreed-upon conservation purpose.

Chicago Wilderness Biodiversity Recovery Plan (1999). This plan identifies the actions necessary to preserve the region's biodiversity including the vision of a network of protected lands and waters that will preserve habitat for a complete spectrum of the region's natural communities. It calls upon federal, state and local units of government to work cooperatively with private landowners to restore and manage the region's rich natural heritage of land, water and wildlife. The plan identifies conservation targets for both terrestrial and aquatic communities, provides recovery goals with action plans and a role for key players, identifies threats to communities, charts adaptive management strategies that include research and monitoring, and acknowledges the value of education and communication with the public. Many of the species and communities within the Hackmatack Study Area are important components of this plan.

Chicago Wilderness Green Infrastructure Plan (2004). Chicago Wilderness (CW) is a consortium of over 250 conservation organizations, museums, businesses, public agencies and nongovernmental organizations focused on regional approaches to conservation in the tri-state region of Illinois, Indiana and Wisconsin. The CW Green Infrastructure Plan was developed to provide "a visionary, regional-scale map of the Chicago Wilderness region that reflects both existing green infrastructure – forest preserve holdings, natural area sites, streams, wetlands, prairies, and woodlands – as well as opportunities for expansion, restoration, and connection." The overall goal of this plan is to develop a sustainable system of conservation lands, both public and private that can support the rich biodiversity of plants and wildlife native to the region.

McHenry County Green Infrastructure Plan (2011). This plan, currently under development by McHenry County, brings together stakeholders from various groups to identify important landscape features and natural resources, including the Hackmatack Study Area, that are of paramount importance in future planning related to growth. The plan identifies important elements of "green infrastructure" that include present and future open space, private conservation initiatives, ecosystem restoration opportunities, and where elements of conservation design should be incorporated into future development.

McHenry County Conservation District Natural Areas Protection Plan (2006). The Natural Areas Protection Plan calls for the protection and management of significant natural resources of the county; including natural areas, wildlife, geologic features of significance, endangered and threatened species, and high quality aquatic systems including Nippersink Creek and its tributaries.

McHenry County Conservation District Oak Ecosystem Inventory (2005). The Oak Ecosystem Inventory documents the loss of oak-dominated ecosystems from 1837 through 2005 across the entire county. With loss of these ecosystems at nearly 90 percent and fragmentation of the remaining blocks into small units generally less than 25 acres in size, the plan's recommendations for future conservation are comprehensive. They include protection of remaining savanna and woodland blocks through fee-simple acquisition and private easements, management of existing oak stands and replanting of oak dominated ecosystems.

U.S. Fish and Wildlife Service *Lespedeza leptostachya* Recovery Plan. U.S. Fish and Wildlife Service, Twin Cities, Minnesota (1988). This plan was developed by the Service to guide recovery efforts for prairie bush clover, a midwestern endemic grassland species, whose original midwestern range includes both northern Illinois and southeastern Wisconsin. Protection and management of known lespedeza populations is a recommendation of the recovery plan. Populations of this species are known to occur in

both Wisconsin and Illinois, within or in close proximity to the Study Area. Suitable habitat is present within the Study Area for the species.

U.S. Fish and Wildlife Service. Eastern Prairie Fringed Orchid Recovery Plan. Fort Snelling, Minnesota. (1999). This plan was developed by the Service to guide recovery efforts for the eastern prairie white fringed orchid, a midwestern grassland species, whose original midwestern range includes both northern Illinois and southeastern Wisconsin. Protection and management of known orchid populations is a recommendation of the recovery plan. Several populations of this species occur in the Hackmatack Study Area. Suitable habitat is present that may support additional populations that have yet to be discovered.

Natural Areas Plan for Southeastern Wisconsin (Southeastern Wisconsin Regional Planning Commission [SEWRPC], 1997). This plan identifies actions to protect and manage critical habitats for plants and animals and improve ecosystems. The plan maps important environmental corridors, critical habitats, and natural areas of statewide significance and calls for the protection of these areas as future development occurs within the southeastern Wisconsin region.

America's Great Outdoors Initiative. This national initiative seeks to increase American's access to outdoor recreation and identifies projects in all fifty states with the potential to do so. In Illinois, the proposed Hackmatack NWR was identified as one of those projects. The Refuge would also provide outdoor education opportunities to the estimated 3.5 million people that live within 60 miles of the project area.

1.4.4 Partners for Fish and Wildlife Program

The Service established the Partners for Fish and Wildlife Program in 1987 to work beyond the boundaries of refuges with landowners and other partners to improve habitat on private lands for fish and wildlife. The program is voluntary, relies heavily on a partnership approach, and leverages both ideas and funding from a variety of sources. Cost sharing agreements and technical assistance are important components.

The overall goal of Partners Program projects is to return a site to the ecological condition that likely existed prior to loss or degradation. Priority ranking is given to proposed projects that meet these conditions:

- Improve habitat for migratory birds, threatened and endangered species, interjurisdictional fish, marine mammals, and other declining species.
- Complement activities on Refuge System lands, or contribute to the resolution of problems on refuges that are caused by off-refuge practices.
- Address species and habitat priorities that have been identified through Service planning teams (with our partners), or in collaboration with state fish and wildlife agencies.
- Reduce habitat fragmentation or serve as buffers for federal or state conservation lands.
- Result in self-sustaining systems that are not dependent on artificial structures.

Service biologists work one-on-one with landowners to plan, implement, and monitor their projects. This level of personal attention and follow-through is a significant strength of the Program.

1.5 Decisions

This EA is an important step in the Service's formal decision-making process. In compliance with the National Environmental Policy Act, the Regional Director, Midwest Region, will consider the information presented in this document to select one of the alternatives.

The Regional Director will determine whether the preferred alternative will or will not have a significant impact on the quality of the human environment and issue a Finding of No Significant Impact (FONSI) or a Decision of Significant Impact. A FONSI means that the preferred alternative is accepted and can be implemented in accordance with other laws and regulations. A Decision of Significant Impact would indicate the need to complete an Environmental Impact Statement (EIS) or a rejection of the project proposal.

1.6 Legal Compliance

The Service planning process, land acquisition, and management are done in accordance with authority delegated by Congress and as interpreted by Department of the Interior and agency regulations and guidelines. Land acquisition authority includes the Migratory Bird Conservation Act of 1929, Endangered Species Act, Emergency Wetlands Resources Act of 1986, and the Fish and Wildlife Act of 1956. Land management authority, including comprehensive conservation planning, is directed primarily by the National Wildlife Refuge System Improvement Act of 1997. Other relevant Acts and Executive Orders are listed in the Appendices.

This EA was prepared by the Service and represents compliance with applicable federal statutes, regulations, Executive Orders, and other compliance documents, including the following:

- Administrative Procedures Act (5 U.S.C. 551-559, 701-706, and 801-808) as amended
- American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
- Antiquities Act of 1906 (16 U.S.C. 431-433)
- Archaeological Resources Protection Act of 1979 (16 U.S.C. 470)
- Bald Eagle Protection Act of 1940 (16 U.S.C. 668-668d) as amended
- Clean Air Act of 1972 (42 U.S.C. 7401 et seq.) as amended
- Clean Water Act of 1972 (33 U.S.C. 1251 et seq.) as amended
- Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) as amended
- Executive Order 11593: Protection and Enhancement of the Cultural Environment (issued in May 1971)
- Executive Order 11988: Floodplain Management (issued in May 1977)
- Executive Order 11990: Protection of Wetlands (issued in May 1977)
- Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations (issued in February 1994)
- Executive Order 13112: Invasive Species (issued in February 1999)
- Fish and Wildlife Coordination Act of 1958 (16 U.S.C. 661 et seq.) as amended
- Fish and Wildlife Improvement Act of 1978 (16 U.S.C. 7421)

- Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712) as amended
- National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) as amended
- National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.) as amended
- National Pollutant Discharge Elimination System (33 U.S.C. 1251 et seq.) as amended
- National Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) as amended
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq.)
- Partners for Fish and Wildlife Act of 2006 (16 U.S.C. 3771)
- Purpose, Policy, and Mandate for Implementing the Procedural Provisions of NEPA (40 CFR 1500 et seq.)
- Soil and Water Resources Conservation Act of 1977 (16 U.S.C. 2001-2009) as amended

Further, this EA reflects compliance with applicable State of Illinois, State of Wisconsin and local regulations; statutes, policies, and standards for conserving the environment and environmental resources such as water and air quality.

1.7 Establishing Authority

Lands acquired by the Service for the proposed Hackmatack NWR would be purchased under the authority of the Migratory Bird Conservation Act of 1929, the Refuge Recreation Act of 1962, and the Emergency Wetland Resources Act of 1986.

1.8 Goals of the Proposed Hackmatack NWR

The following goals for the proposed Hackmatack National Wildlife Refuge were developed within the framework of the Refuge System's mission statement, the National Wildlife Refuge System Improvement Act of 1997, the Refuge's primary purposes, and other Service policy and directives. The goals are intentionally broad statements that describe desired future conditions and would guide the management of the Refuge in the interim period and the development of management objectives and strategies for the CCP.

- Protect and enhance habitats for federal trust species and species of management concern, with special emphasis on grassland-dependent migratory birds and protection of wetlands and grasslands.
- Create opportunities for hunting, fishing, wildlife observation and photography, and environmental education and interpretation, while promoting activities that complement the purposes of the Refuge and other protected lands in the region.
- Promote science, education, and research through partnerships to inform land management decisions and encourage continued responsible stewardship of the natural resources of the Hackmatack NWR.

Chapter 2: Description of Alternatives

In this chapter

2.1 Formulation of Alternatives

2.2 Explanation of Alternatives

2.1 Formulation of Alternatives

Each of the following four alternatives was designed to benefit specific wildlife and plant habitats within the Study Area. The boundaries were formulated based on the watersheds, existing conservation areas, habitat requirements of desired wildlife species, public roads, and comments received from the public. The recommended protection levels (e.g., fee acquisition, conservation easement, private landowner initiatives, etc.) were based on the Service's policy to acquire the least interest in land necessary to meet Refuge goals.

2.2 Explanation of Alternatives

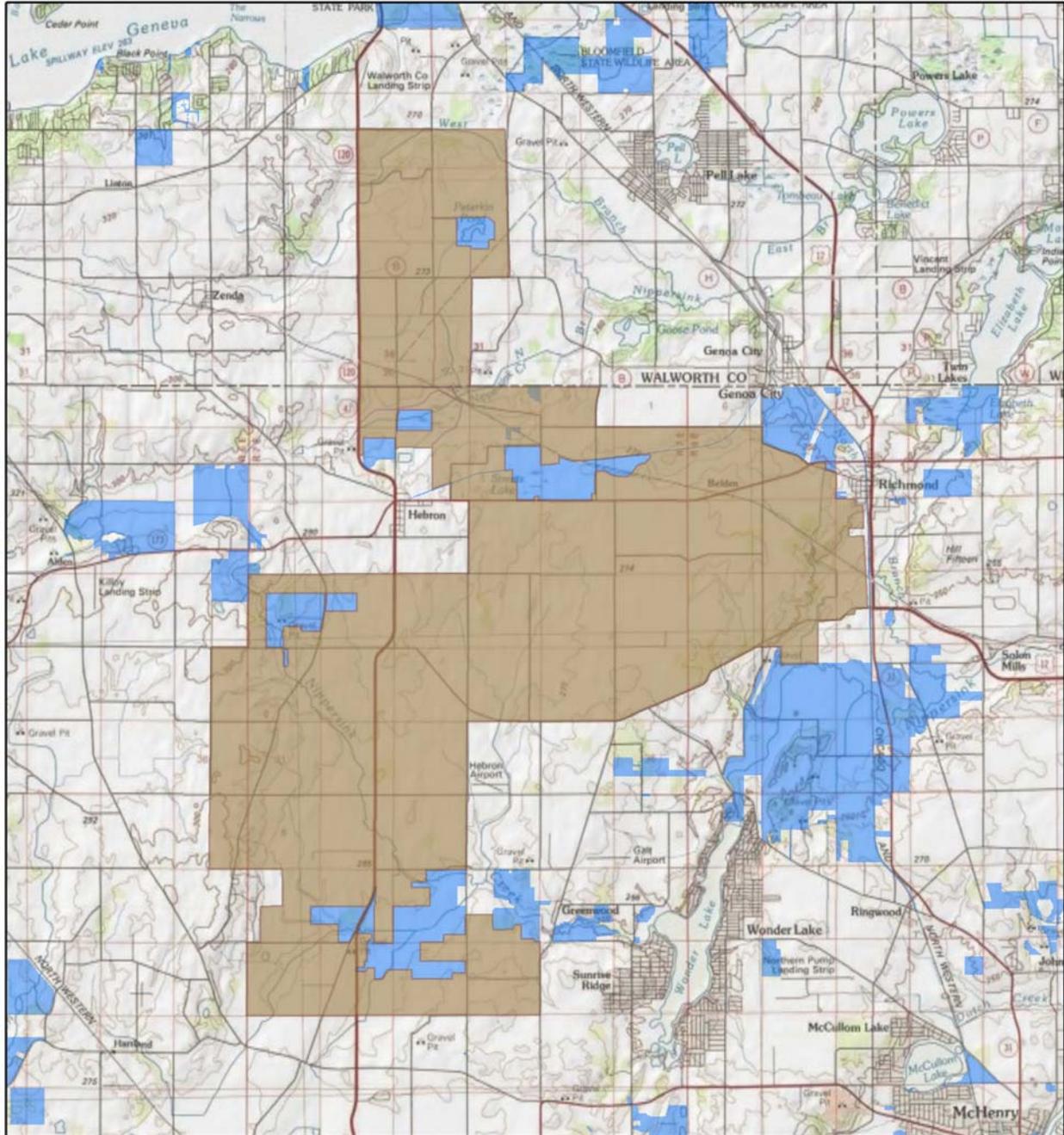
Alternative A: Current Direction (No Action)

The National Environmental Policy Act of 1969 requires all federal agencies consider a "No Action" alternative. In this case "No Action" means that a refuge would not be established in the Study Area. However, Service involvement in conservation work would continue under existing programs and, in some cases, may increase in future years. The Service would continue to emphasize habitat conservation on private lands through the Partners for Fish and Wildlife Program, Joint Venture projects under the North American Waterfowl Management Plan, the Endangered Species Program, and other federal or partner agency initiatives.

Alternative B: Refuge and Landscape Conservation Area

The Refuge and Landscape Conservation Area alternative would create a large contiguous block of habitat (28,127 acres). The proposed Refuge boundary would seek to connect a series of existing county and state conservation lands to increase block size and promote travel corridors for wildlife (Figures 2 & 3). The larger block sizes would provide sufficient habitat for nesting grassland birds and waterfowl that are sensitive to fragmented habitat and edges. Fee and conservation easement acquisition from willing sellers would be the preferred method of conservation.

Figure 2: Alternative B – Refuge and Landscape Conservation Area (Source: USFWS, Midwest Region)



Alternative B

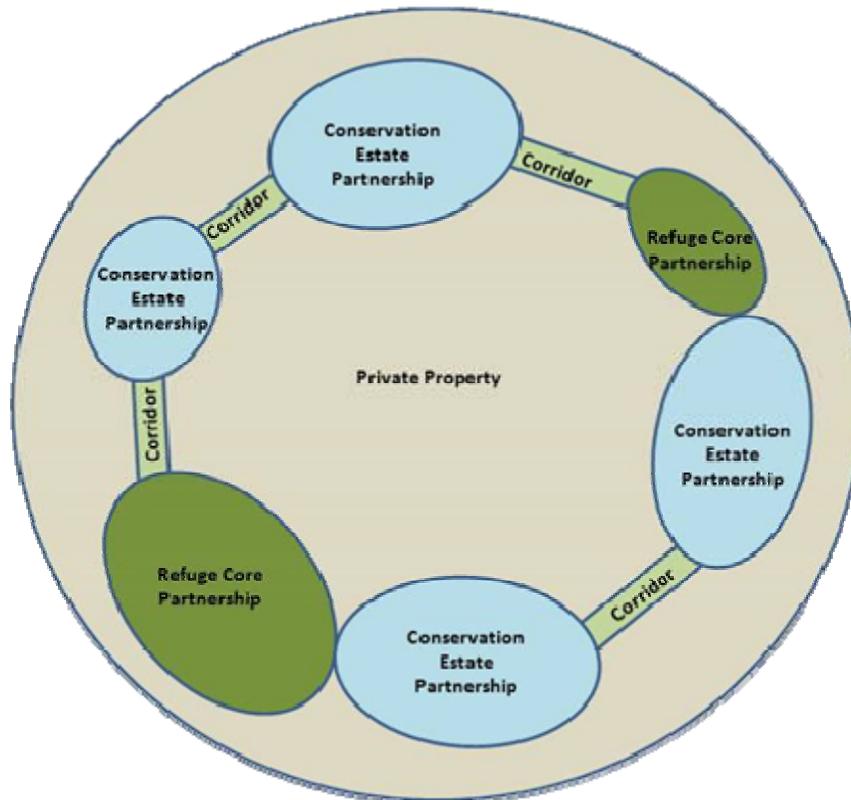
- Alternative B (28,127 ac)
- Existing Conservation Lands

0 1.5 3 6 Miles



Scale 1:140,000

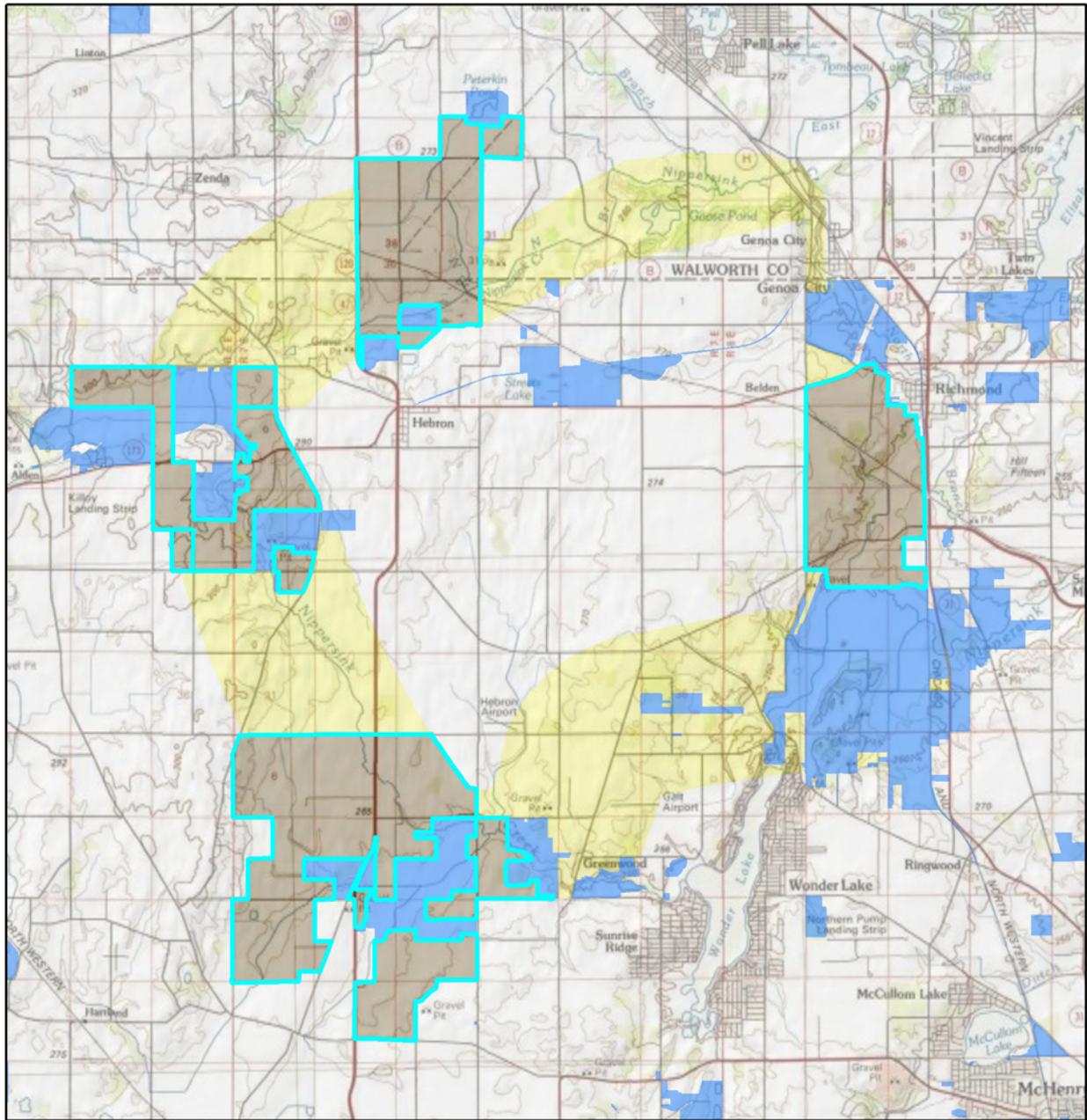
Figure 3: Conceptual Configuration for Alternatives C



Alternative C: Cores and Corridors (Preferred Alternative)

Alternative C would link and expand upon existing conservation areas to benefit migratory birds and endangered species. Similar to Alternative B, the larger block sizes associated with the cores would provide sufficient habitat for nesting grassland birds and waterfowl that are sensitive to fragmented habitat and edges. The corridors would assist terrestrial migration of small mammals, herptiles, and plants that may be impacted by a changing climate (Figure 4).

Figure 4: Alternative C – Cores and Corridors (Source: USFWS, Midwest Region)



0 1.5 3 6 Miles

Alternative C

-  Existing Conservation Lands
-  Conservation Core Area (11,193 ac)
-  Conservation Corridor



Scale 1:130,000

Land protection methods for the conservation core areas (11,193 acres) would include fee, conservation easement, and Non-Governmental Organizations (NGOs)/private opportunities aimed at creating contiguous natural habitat (Table 2). The conservation corridors would connect the cores primarily through use of partnership efforts and to a lesser degree with fee-simple acquisition. Specific, narrow corridors can't be identified at this time as detailed land status and partnerships would determine the ultimate siting. However, a continuous corridor of a minimum of 600 feet wide would be considered complete.

Table 2: Summary of Potential Conservation Tool Configurations

Area	Primary Conservation Tool	Secondary Conservation Tool
Conservation Core	Fee, easement, agreements	Same as primary tools
Conservation Corridors	Easement, agreement, Partners for Fish and Wildlife	Fee, private landowner initiatives led by others (NGOs, County)
Private Property (Agricultural areas adjacent to core and corridor areas)	Partners and NRCS programs, easements, agreements, private landowner initiatives	Same as primary tools

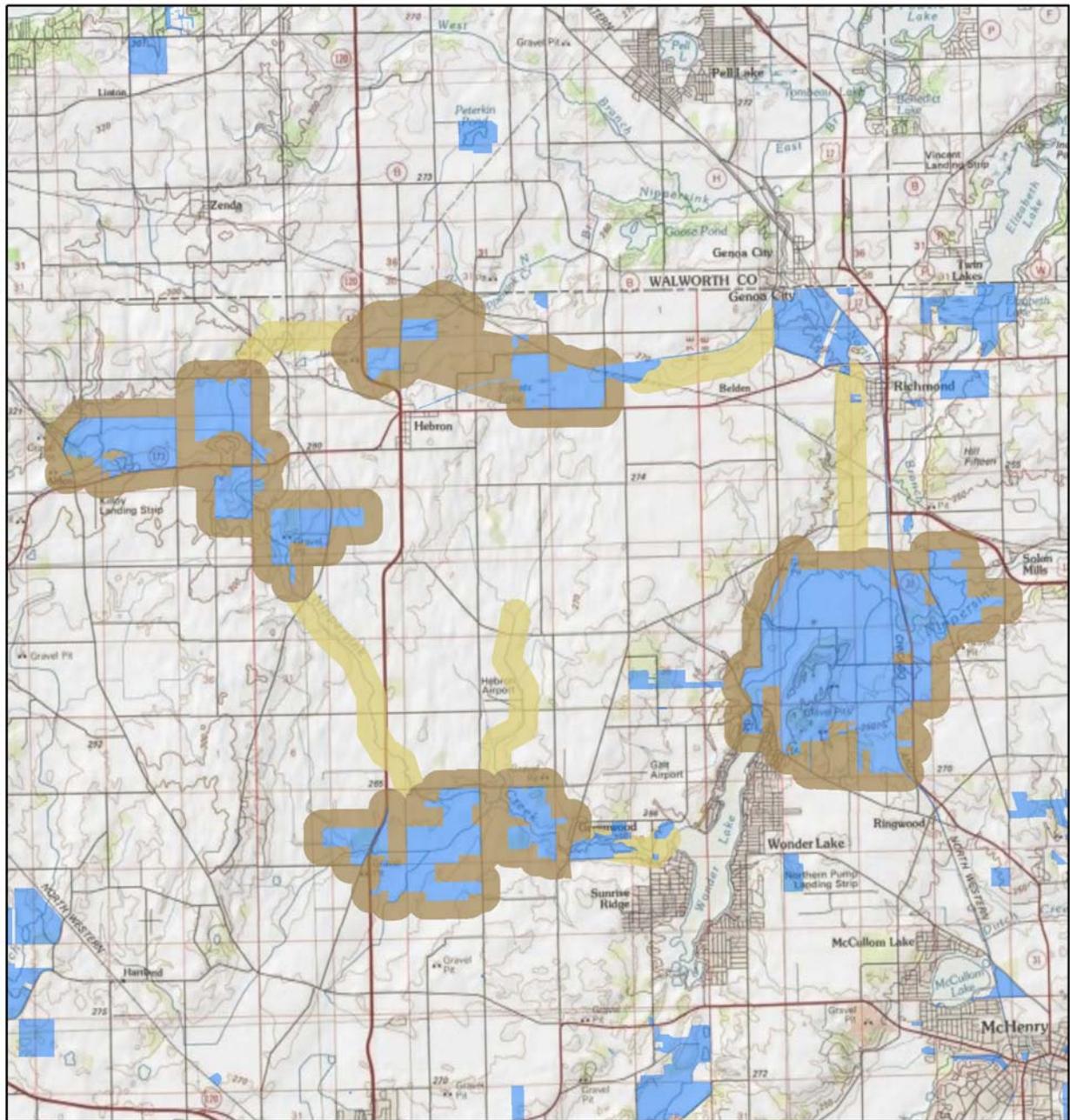
Cores: These areas serve to round out existing conservation lands to create contiguous natural habitat in 3,000-5,000 acre blocks. Land protection methods would include both fee and easements to conserve and restore lands. Federal programs such as the Service's Partners for Fish and Wildlife Program and the Natural Resource Conservation Service (NRCS) Wetland Reserve Program would be encouraged to increase efforts in these areas.

Corridors: Conservation corridors used to connect to primary areas. The Service's Partners for Fish and Wildlife Program would be actively engaged to work with landowners to conserve and restore natural habitat. Private landowners, NGOs, local governments, and other partners would provide the leadership for establishing connecting corridors.

Alternative D: Partnership Initiative

This alternative would seek to increase the amount of conservation land in the area similar to Alternative C but with a reduced acreage footprint (Figure 5). Core areas would encompass 9,687 acres, while the corridors would be similar to those in Alternative C with a minimum width of 600 feet. The emphasis of the Refuge would be to buffer and connect existing conservation lands. The Service would purchase lands if a landowner preferred that option. However, the Service would primarily work with established partners and private landowners on less-than-fee options.

Figure 5: Alternative D – Partnership Initiative (Source: USFWS, Midwest Region)



0 1.5 3 6 Miles

- Alternative D
- Primary (9,687 ac)
 - Secondary
 - Existing Conservation Lands



Scale 1:140,000

Chapter 3: Affected Environment

In this chapter

- 3.1 Introduction
- 3.2 Physical Environment
- 3.3 Biological Environment
- 3.4 Land Use and Management Status
- 3.5 Socioeconomic Environment
- 3.6 Conclusion

3.1 Introduction

This chapter describes the proposed Hackmatack NWR Study Area in southeast Wisconsin and northeast Illinois and its local and regional setting. The Study Area's physical environment, habitats, species, and human environment are all described. This description provides a thorough overview of the Study Area's current features so the effects of the proposal (establishing a new refuge) can be weighed within the larger context of its surroundings (The Greater Milwaukee and Chicago metropolitan areas).

3.2 Physical Environment

The Hackmatack Study Area is located in portions of Walworth, Racine, and Kenosha Counties in Wisconsin and McHenry and Lake Counties in Illinois encompassing 350,000 acres (54 square miles). Its approximate boundary is defined by a 30-mile radius from the village of Richmond, Illinois on the state border. The Study Area lies approximately 50 miles from downtown Milwaukee and Chicago. Located 20 miles west of Lake Michigan, the Study Area's varied landscape of lakes, streams, ridges, and valleys is intersected on the east by the Fox River.

3.2.1 Topography, Geology, and Soils

The Study Area falls within the physiographic morainal section. The topography and soils are a result of glaciers advancing and retreating from 13,000 to 26,000 years ago. These glaciers formed the many "moraines" or ridges in the area, left behind "glacial meltwater" or lakes and marshes, created rivers that scoured out valleys, and changed lake levels and shorelines. The "glacial drift" or raw soil materials left behind by the glaciers has been naturally weathered and sorted to create "outwash" in the lowlands and "till" in the uplands. More recently, this drift has been covered over by "loess" or wind-blown dust in some areas, and peat has built up in undrained basins. Over time, all of these processes have shaped the land within and around the Study Area (Sullivan, 1997).

The elevation ranges from 650 to 950 feet above mean sea level. A few pockets of the land on the western side of the Study Area range from 950 to 1150 feet above mean sea level.

The bedrock foundation is very old sedimentary rock, a magnesium-rich limestone known as dolomite, or more specifically Niagara dolomite (Sullivan, 1997). This dolomite has commercial value where it is close to the surface, both as dimensional building stone and, when crushed, as an aggregate for construction or as an agricultural soil conditioner. Even though the deposit is in fact dolomite, it is often referred to as Lannon stone or limestone, primarily calcium carbonate. Gravel and sand deposits are scattered within the Study Area. They are important sources of concrete aggregate, gravel for road

subgrade and surfacing, sand for mortar, and molding sand. The largest concentration lies to the north of the Study Area in Waukesha County (SEWRPC, 1997).

The soils are those typical of much of the Midwest. They include alfisols, which naturally form under hardwood forest cover and have a clay-enriched subsoil with high native fertility making them prime farmland; mollisols, which naturally form under grassland cover, have deep, high organic matter, and are also prime for farmland (especially if drained); and to a much lesser extent histosols, which consists mostly of organic materials, include mucks and peats, and due to their poor drainage and acidity are not prime for agricultural soils.

3.2.2 Climate

The climate of the Study Area ranges from continental to humid continental with wide variations closer to Lake Michigan. The winters are cold and snowy while the summers are warm and wet to hot and humid. About two-thirds of the annual precipitation falls during the growing season (freeze-free period). The average annual temperature is about 50°F, with an average temperature of 30°F in the winter and 70°F in the summer (Climatology of the United States, 2011).

The pronounced moderating effect of Lake Michigan is well illustrated by the fact that the growing season of 140 to 150 days along the east-central coastal area is of the same duration as in the southwestern Wisconsin valleys. The average date of last spring freeze is typically early May, while the first autumn freezes occur in mid-October (Climatology of the United States, 2011).

The long-term mean annual precipitation is between 30 and 35 inches over most of the area. Thunderstorms average about 45 per year and occur mostly in the summer. Occasional hail, wind, and lightning damage are also reported. The mean dates of first snowfall of consequence, an inch or more, is usually in early December with an average annual duration of snow cover of 85 days. Normal annual snowfall exceeds 38 inches (970 mm) in Chicago and is closer to 52 inches near Milwaukee (Climatology of the United States, 2011; and Climate of Milwaukee, 2011).

3.2.3 Hydrology and Water Quality

Water Resources

Since the landscape of the Study Area is considered “young” geologically and has just emerged from underneath the glaciers, much of the land is poorly drained. An elaborate network of branching streams and rivers has not yet formed, and some of the land does not drain at all. The water in the many depressions that dot the landscape is either evaporated or absorbed into the ground (Sullivan, 1997).

A continental divide runs just to the east of the Study Area, splitting the drainage of rivers and streams between Lake Michigan to the east and the Mississippi River to the west. The Fox River, Nippersink Creek, and various other rivers, streams, and creeks within the Study Area generally flow to the Illinois River and then on to the Mississippi River. The rest of the landscape contains numerous lakes, wetlands, bogs, and seeps of various sizes that play a part in the hydrology of the area. Most of the Study Area lies within the Upper Fox River Watershed with a small portion on the western edge in the Kishwaukee Watershed.

Water Quality

The existing rural areas within the Study Area allow most of the rain that falls to recharge groundwater or reenter the atmosphere. However, in the highly developed urban and intensive row crop agricultural locations in and near the Study Area, much of the rain that falls becomes surface run-off. This water mixes with chemicals applied to or contained in the surface and degrades the water's quality. While the Study Area has several groundwater aquifers from which local residents obtain drinking water, increased surface run-off has increased the potential for groundwater contamination by harmful pollutants. This is especially true in areas with highly permeable soils and subsurface materials such as sand and gravel.

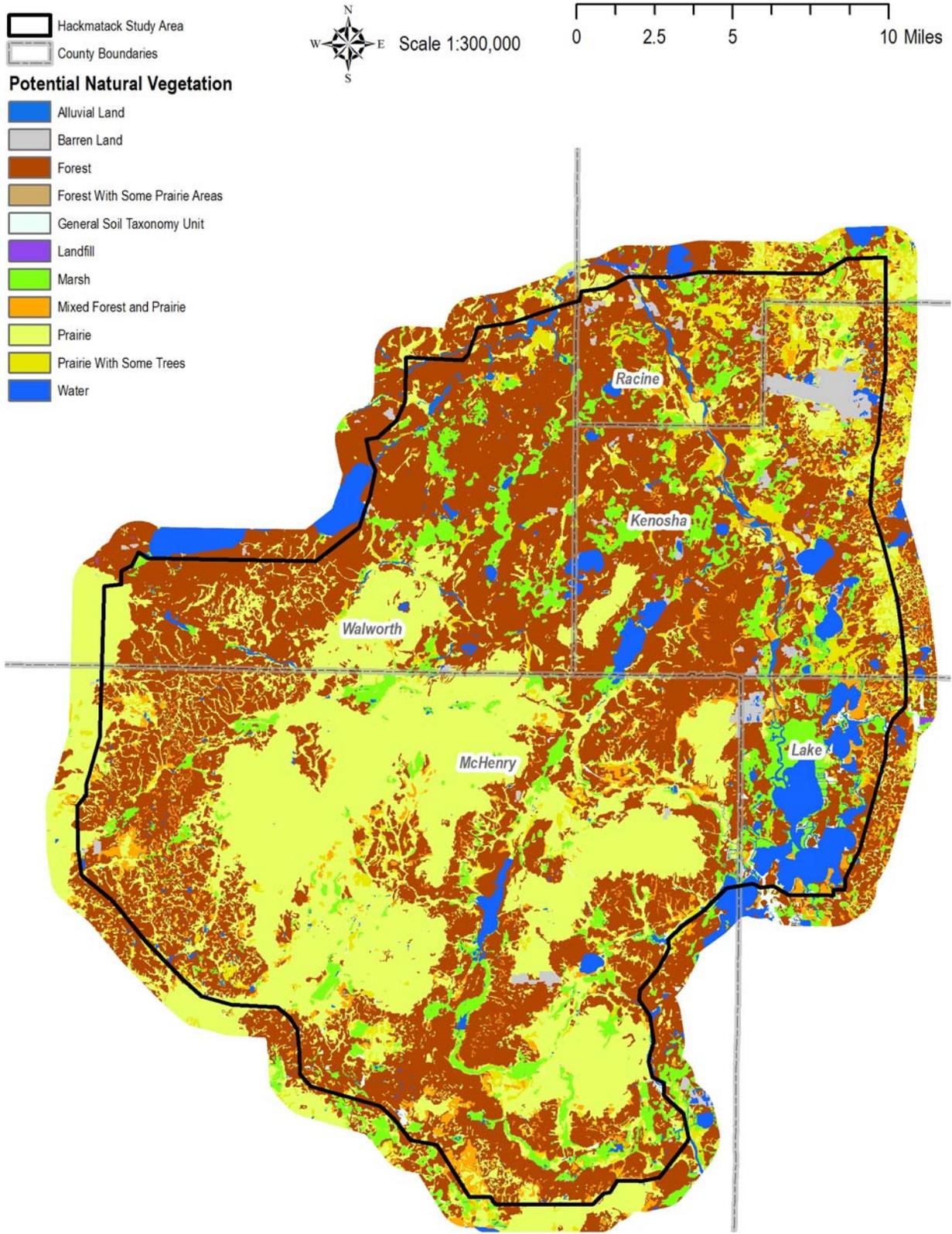
Five Class III Special Resource Groundwater Protection Areas have been established in McHenry County within or adjacent to nature preserves containing unique wetland natural communities that depend on a constant flow of clean, cool groundwater from shallow aquifers. McHenry County's rivers and streams represent some of the highest quality stream resources in northeastern Illinois. According to the Illinois Environmental Protection Agency and the Illinois DNR, most of these freshwater sources maintain healthy aquatic systems with biological integrity ratings of Class A or B (on a scale of A to E). The Kishwaukee River, Nippersink Creek, and Boone Creek are examples of these high-quality streams.

3.3 Biological Environment

3.3.1 Habitats

The varied landscape that was left behind after the glaciers finally retreated supported a wide variety of habitats that in turn support a wide variety of species. The Wisconsin portion of the Hackmatack Study Area lies in the Southeast Glacial Plains Ecological Landscape. Historically, this landscape supported a mosaic of prairie, oak forests, oak savanna, maple-basswood forests, marshes, and fens (Figure 6). The Illinois portion of the Study Area lies within the Northeastern Morainal Natural Division (NMND). This landscape historically consisted of wetlands, oak savanna, woodlands and prairie. Today, with the exception of lands in the existing conservation estate, only small, often isolated pockets of these habitats exist in the Study Area along with sculpted remnants of moraines, kames, kettle marshes, and bogs from its glacial past.

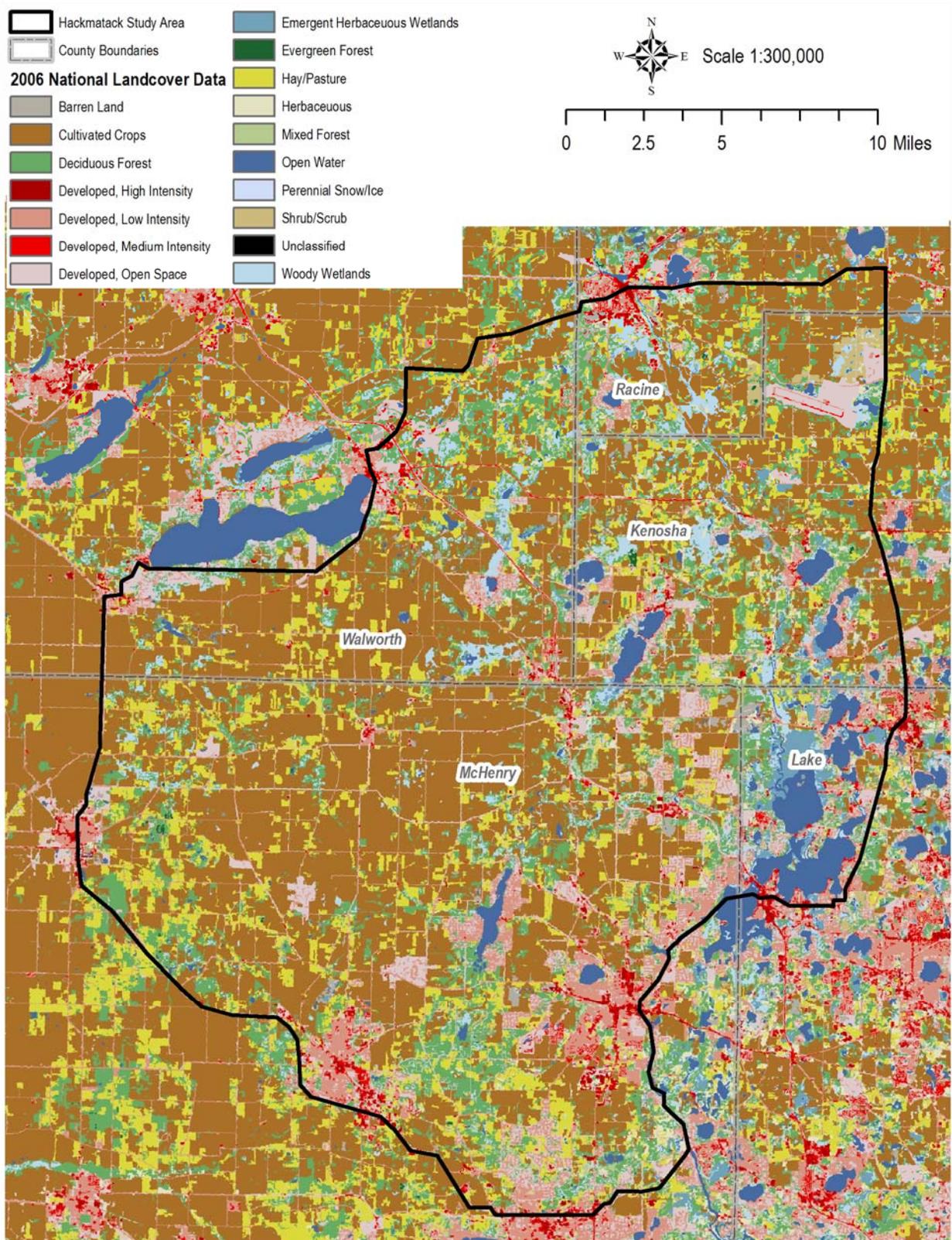
Figure 6: Potential Natural Vegetation of the Study Area



Agricultural and urban land use practices have drastically changed the land cover of the Study Area since Euro-American settlement. The current vegetation is primarily agricultural cropland (over 50 percent). Remaining forests occupy only about 10 percent of the land and consist of oak, maple-basswood and lowland hardwoods (Figure 7).

Two habitat types account for most of the sensitive species in the Study Area: wetlands and grasslands. Historically, as much as 22 percent of the Study Area may have been wetland while 21 percent may have been grassland; an additional five percent may have been savanna. The remainder of the landscape was most likely forest and mixed forest/prairie. The glacial history of the Study Area produced a rich variety of wetlands and water bodies including fens, bogs, marshes, swamps, ponds, lakes, and streams that attract abundant and diverse wildlife. While prairie was a dominate vegetation community on the landscape historically, only a patchwork of these grasslands too rugged or wet for agriculture still exist today.

Figure 7: Current Land Cover of the Study Area (Source: USFWS, Midwest Region)



Wetlands

Inventory information shows that about half of the original wetland area of Wisconsin has been lost to land use changes, primarily agricultural drainage and road, urban, and industrial development. Many of the remaining wetlands are in an altered or disturbed condition due to partial drainage, vegetation clearing, grazing, periodic plowing, and other agricultural uses. Some of these remaining wetlands (less than 25 percent of the original amount) are interspersed among the former prairie and oak savanna areas of southern and east-central Wisconsin within and near the Study Area. For Wisconsin, 32 percent of the state's threatened and endangered plants and animals are wetland dependent (Wisconsin Ecological Landscapes Handbook, 2001).

The remaining natural wetlands (excluding floodplain forest) occupy about one percent of Illinois, and only 6,800 acres are considered high quality. Marsh-type wetlands are scarce, highly degraded, and critical for the Species in Greatest Need of Conservation (i.e., species meeting one or more of eight criteria used when developing wildlife conservation strategies). Remaining wetlands are in poor condition due to fragmentation, siltation, altered hydrological conditions, and invasive species. Invasive plant species such as reed canary grass, common reed, Eurasian milfoil, and purple loosestrife can dominate disturbed wetlands and exclude native plant species, resulting in a loss of biodiversity. Wetland bird and insect communities are especially sensitive to changes in hydrology, plant species composition, and habitat loss (Illinois DNR, 2005).

The Illinois DNR has identified the Lake-McHenry County Wetland Complex, located within the Refuge Study Area, as a Conservation Opportunity Area in the Illinois Wildlife Action Plan. This area includes priority resources to conserve including "several rare wetland types including fens and bogs, rare wetland and grassland species-some not found elsewhere in Illinois," (Illinois DNR, 2005).

Grasslands (and Oak Savanna)

The prairie grasslands in Wisconsin are comprised of the tallgrass prairie that was intermixed with oak savanna. Tallgrass prairies, along with oak savanna, are among the most decimated and threatened natural communities in the Midwest and the world. Less than one percent of Wisconsin's original prairie still exists today even though soils and topography in Wisconsin have been preserved more than in other states. Most native prairies found today are small remnants, less than 10 acres in size with very few exceeding 50 acres, and are too small to support the full species diversity of the past. Mesic (moderately moist) prairie, which was the most common type in pre-settlement days, is almost gone now, with only about 100 acres known to exist today (Wisconsin Ecological Landscapes Handbook, 2001). Similarly, the oak savanna that once covered 5.5 million acres in Wisconsin, now covers fewer than 500 acres with a similar species diversity to that of the past (Wisconsin Natural Heritage Inventory, 2011).

Before settlement, prairie grasslands covered an estimated 21 million acres of Illinois. Now less than 2,600 acres of native prairie dot the state's landscape. Even though much of Illinois' native prairie has been destroyed, nearly one-fifth of the state is categorized as "grassland" habitat due to temporary agricultural programs. Most of the historic grasslands have been plowed, heavily grazed, or frequently mowed; and few are large or connected enough to support area-sensitive species. Often dominated by introduced grasses, especially fescue, these grasslands do not resemble native prairies as most are planted to monocultures or are otherwise highly manicured. The relatively high prices received for corn and soybeans in recent years have led to an accelerated conversion of these grasslands to row crop agriculture. Only a small portion of the state's land categorized as "grassland" habitat is actually functioning as a natural grassland ecosystem (Illinois DNR, 2005).

3.3.2 Ecological Systems

Prairie-Forest Border

The Study Area occurs within the Prairie-Forest Border Ecoregion as described by The Nature Conservancy (TNC), modified from Bailey (U.S. Forest Service) in 1994. This ecoregion is a transition zone between tallgrass prairie and northern forest. Much of the region was covered by glaciers in the last Ice Age, resulting in a varied landscape of rolling hills and extensive flatlands formed by moraines, drumlin fields, pitted outwash, and glacial lakes. Fire occurred regularly acting in concert with climate to create a shifting mosaic of oak savanna, forest, and prairie based on fire intervals, topography, and weather patterns.

Many different plant communities occur within the ecoregion, including globally significant oak savannas and a variety of prairies. Sixty-three plant and animal species occur within the ecoregion that are globally rare or federally listed. Thirteen plant communities, ten animal, and six plant species are endemic to the ecoregion, found only in this part of the world.

The Southwestern Great Lakes Morainal Section of the Prairie-Forest Border ecoregion encompasses the Hackmatack Study Area. This landform is characterized by ground and end moraines vegetated by oak savanna. Extensive wetlands and oak barrens occur in glacial lake plains; and sugar maple-basswood forests occur locally where there are natural fire breaks created by rivers or rugged, kettle-moraine topography. Extensive prairies occur in flat outwash plains, now mostly agricultural fields; lakes and wetlands are common, particularly in the pitted outwash region. This section has a long growing season, fertile soils, and relatively flat topography, well suited for both agriculture and development.

As mentioned previously, the Wisconsin portion of the Hackmatack Study Area lies in the Southeast Glacial Plains Ecological Landscape while the Illinois portion of the Study Area lies within the Northeastern Morainal Natural Division (NMND).

Southeast Glacial Plains Ecological Landscape

This ecological landscape makes up the bulk of the noncoastal land area in southeast Wisconsin. It is primarily composed of glacial till plains and moraines. Soils are lime-rich tills overlain in most areas by a silt-loam loess cap. Agricultural and residential interests throughout the landscape have significantly altered the historical vegetation. Most of the rare natural communities that remain are associated with large moraines or in areas where the Niagara Escarpment occurs close to the surface. Historically, vegetation in the Southeast Glacial Plains consisted of a mix of prairie, oak forests, savanna, and maple-basswood forests. Wet-mesic prairies, southern sedge meadows, emergent marshes, and calcareous fens were found in lower portions of the landscape. End moraines and drumlins supported savannas and forests. Fire suppression has allowed many existing forest patches that were formerly savannas to succeed to hardwood forest (Wisconsin Department of Natural Resources [DNR], 2005).

The Southeast Glacial Plains Ecological Landscape has the highest aquatic productivity for plants, insects, invertebrates, and fish of any Ecological Landscape in Wisconsin. Most riparian zones have been degraded through forest clearing, urban development, and intensive agricultural practices. Kettle lakes are common on end moraines and in outwash channels. In addition to Horicon Marsh, this Ecological Landscape contains important fens, tamarack swamps, wet prairies, and wet-mesic prairies that contain rare plants and animals. However, most wetlands have experienced widespread ditching, grazing, and infestation by invasive plants. Watershed pollution in the Ecological Landscape is about average

according to rankings by Wisconsin DNR, but groundwater pollution is worse than average compared to the rest of the state (Wisconsin DNR, 2005).

Northeastern Morainal Natural Division

This natural division is the most recently glaciated in Illinois. Drainage is poorly developed, thus abundant marshes, natural lakes, and bogs are distinctive features. With diverse wetland, prairie, forest, savanna, and lake communities, this northeastern section of Illinois hosts the greatest biodiversity in the state and the largest human population. As is true statewide, natural land cover has been extensively altered, though urbanization is considerably more extensive than elsewhere (Illinois DNR, 2005).

3.3.3 Plants and Animals

The Wisconsin Wildlife Action Plan contains a list of Species of Greatest Conservation Need (SGCN) for the Southeast Glacial Plains Ecological Landscape. All vertebrate, native wildlife species in Wisconsin were evaluated for their level of risk using the following seven criteria: global relative abundance, global distribution, global threats, global population trend, state rarity, state threats, and state population trend. Within each of the **vertebrate** major taxonomic groups (i.e., birds, fish, herptiles, and mammals), each species was ranked based on scientific literature and the best professional judgment of a team of experts and then selected as SGCN. **Invertebrates** were assessed using a modified process that incorporated information on the status of knowledge for different invertebrate taxa groups. Although a considerable amount of information has been gathered over the last decade, data on invertebrate species distribution, occurrence, population trend, and life history are insufficient to conduct the type of detailed evaluation that was carried out for vertebrates.

The Illinois Wildlife Action Plan contains a list of critical species for the Northeastern Morainal Natural Division. These SGCN should be managed within a natural division if they are to be effectively conserved in Illinois. The following criteria were used to select the SGCN:

- Threatened or endangered in Illinois or federally and within the state, global conservation rank indicator of G1, G2, or G3
- Rare, significantly declining in abundance or distribution from historical levels, dependent upon a rare or vulnerable habitat for one or more life history needs
- Endemic to Illinois or disjunct from the rest of its range

The Illinois portion of the population represents a significant proportion of its global population, representative of a broad array of other species found in a particular habitat. Status is poorly known, but available evidence suggests conservation concern. The following species descriptions were taken from these two state plans and their respective landscape or division groupings mentioned above unless otherwise noted.

Plants

The plant species within the Study Area are too numerous to list and have not all been documented. However, within and near the Study Area, the Nippersink Creek Watershed contains 790 native plant species while Glacial Park contains 416 species. Many of the plants in both of these conservation areas are state-threatened or endangered. One of those species of particular note is the eastern prairie fringed orchid (wet prairie, sedge meadow, marsh habitat), which is federally-threatened. Also within the Study Area and McHenry County, the Alden Sedge Meadow contains 362 native plant species and Lake

Elizabeth contains 217 species, again with several that are state-threatened or endangered. Two other conservation areas within McHenry County, North Branch (217 species) and Winding Creek (197 species), both have a good diversity of native plant species with several that are state-endangered.

Hackmatack – Tamarack

The American tamarack tree has been known by different names to different people over the centuries including eastern larch, American larch, red larch, black larch, takmahak, and hackmatack. It is from this tree that the Study Area gets its name, Hackmatack, a Native American word for the tamarack. While tamarack trees are more common in northern Wisconsin, Minnesota, and Michigan; they reach as far south as the Study Area, in southeast Wisconsin and northeast Illinois. The Study Area contains a few remaining stands of tamarack representing relics of a time in the geologic past, thousands of years ago, when northeastern Illinois and southeastern Wisconsin lay in the grip of a massive continental glacier. It is but one of dozens of rare species and globally significant natural communities that can be found in this area.

Mammals

Mammals are generally abundant within and near the Study Area. Some of the common mammals include Virginia opossum, coyote, common raccoon, striped skunk, northern flying squirrel, American beaver, white-tailed deer, and eastern cottontail rabbit (Macdonald, 1984). However, the Wisconsin Wildlife Action Plan lists the following SGCN: Franklin's ground squirrel; eastern red, hoary, northern long-eared and silver-haired bats; prairie and woodland voles; and water shrew. The Illinois Wildlife Action Plan lists only the Franklin's ground squirrel as a critical species. The Franklin's ground squirrel is most often found in dense grassland vegetation, while the water shrew prefers cold-water streams, bogs, and swamps.

Birds

The Study Area is also home to many common species of breeding and migratory birds. The diverse array of habitat, especially wetlands and grasslands, supports a diverse group of bird species. Therefore, the Wisconsin Wildlife Action Plan lists the following as SGCN:

- Forest, woodland, savanna: Acadian, Least and Willow Flycatchers, Yellow-billed Cuckoo, **Black-billed Cuckoo**, Blue-winged Warbler, Black-throated Blue Warbler, Canada Warbler, Yellow-throated Warbler, Kentucky Warbler, Golden-winged Warbler, Prothonotary Warbler, Hooded Warbler, Cerulean Warbler, Brown Thrasher, Louisiana Waterthrush, **Red-headed Woodpecker**, Wood Thrush, Bell's Vireo, **Loggerhead Shrike**, Veery, Whip-poor-will, Red Crossbill, Red-Shouldered Hawk, and Bald Eagle
- Wetland or waterfowl: **American Bittern**, American Golden Plover, American Woodcock, **Common Tern**, **Forster's Tern**, **Black Tern**, Blue-winged Teal, Canvasback, Dunlin, Hudsonian Godwit, Marbled Godwit, King Rail, Lesser Scaup, Redhead Grebe, Red-necked Grebe, and Horned Grebe, Rusty Blackbird, Short-billed Dowitcher, Whooping Crane, Solitary Sandpiper, Buff-breasted Sandpiper, **Upland Sandpipers**, Snowy Egret, Whimbrel, Yellow-crowned Night-heron, American Black Duck, Osprey, Trumpeter Swan, and **Wilson's Phalarope**
- Grassland: **Bobolink**, Dickcissel, Eastern and Western Meadowlark, Grasshopper, Field, Vesper, Lark, **Henslow's Sparrows**, Northern Bobwhite Quail, **Northern Harrier**, Barn Owl, and Short-eared Owl

Similarly, the Illinois Wildlife Action Plan lists species bolded above plus the following as critical species:

- Woodland: Northern Flicker
- Wetland or waterfowl: Least Bittern, Black-crowned Night-heron, Piping Plover, Yellow and Black Rail, Common Moorhen, Sandhill Crane, Greater Yellowlegs, and Yellow-headed Blackbird
- Grassland: Swainson's Hawk

Of particular note is the federally-endangered Whooping Crane, which has been seen in the Hackmatack Study Area. As the eastern migratory population of whooping cranes expands, the marshes and bogs of this region may become increasingly important to this critically imperiled species. Also, many of the bird species that rely on prairie grasslands, including Henslow's Sparrow, Short-eared Owl, Bobolink, and Dickcissel are threatened, endangered, or in steep population decline across their range. The Hackmatack Study Area presently contains a patchwork of wetlands and grasslands, which, if connected, could greatly enhance habitat for these species of conservation concern. Throughout the Study Area both public and private lands are home to significant species such as Cooper's Hawks (dense deciduous forest habitat) and nesting pairs of Sandhill Cranes (open, fresh water wetland habitat). Migrating Ospreys and Bald Eagles use the Fox River and nearby Chain 'O' Lakes area during spring and fall.

Fish and Mussels

Fish and mussel populations are specific to individual streams, lakes, and rivers within the Study Area. The Fox River supports a modest fishery with many different forage and game species present. There is also a diverse and relatively abundant mussel population in the Fox River. Some of the common fish species in the local lakes include channel catfish, carp, crappie, largemouth bass, muskellunge, northern pike, bluegill, walleye, smallmouth bass, and pumpkinseed. Many of the non-game species in the Study Area waters are listed as SGCN in the Wisconsin Wildlife Action Plan. These include: gravel chub, greater redhorse, **lake chubsucker**, **lake sturgeon**, least darter, longear sunfish, Ozark minnow, redbfin shiner, redbside dace, river redhorse, slender madtom, **starhead topminnow**, **banded killifish**, black buffalo, **pugnose shiner**, western sand darter, and American eel. Similarly, the Illinois Wildlife Action Plan lists species bolded above plus the following as critical fish species: Iowa darter, blacknose shiner, blackchin shiner, longnose sucker, bowfin, and critical mussel species: creek heelspitter, rainbow, black sandshell, salamander mussel, slippershell, spike, and purple wartyback.

The waters of Nippersink Creek and its tributary streams, as well as the numerous glacial lakes within the Study Area, support eighteen of these fish species of critical or SGCN including the Iowa darter, blacknose shiner, blackchin shiner, starhead topminnow, banded killifish, bowfin, lake chubsucker, river redhorse, redbfin shiner, large scale stoneroller, mottled sculpin, southern redbelly dace, blacknose dace, brook stickleback, brown bullhead, American brook lamprey, central mudminow, and pugnose shiner.

Additionally these same aquatic resources also support eight mussel species identified as critical in the Illinois Wildlife Action Plan. These eight, the **creek heelsplitter**, **rainbow**, **black sandshell**, **slippershell**, **spike**, **fluted shell**, **ellipse** and **purple wartyback** are among 22 varieties of native mussels found in the Nippersink Creek watershed in Illinois.

Reptiles and Amphibians

The Hackmatack Study Area, with its many diverse wetland habitats, is home to a truly diverse group of reptiles and amphibians. This is especially unique and noteworthy in an area with so much intermixed development and cultivation. McHenry County Conservation District areas alone are home to 29 species including three salamanders, nine frogs, 10 snakes, and seven turtles (McHenry County Conservation District Biological Database, 2011).

Several of these species are listed as SGCN in the Wisconsin Wildlife Action Plan and/or as critical species in the Illinois Wildlife Action Plan. That Wisconsin list includes: **Blanding's turtle**, butler's garter snake, **eastern massasauga rattlesnake**, four-toed salamander, northern ribbon snake, pickerel frog, queen snake, mudpuppy, yellow-bellied racer, northern cricket frog, and **western ribbon snake**. The Illinois list includes the bolded species above plus the following: smooth green snake and Blanchard's cricket frog.

The more common frogs and toads occurring across the Study Area include spring peepers, green frogs, leopard frogs, bullfrogs, chorus frogs, Cope's gray tree frogs, Eastern gray tree frogs, and American toads. Important populations of the Blanding's Turtle, which is state-listed in both Wisconsin and Illinois are known to occur throughout the Hackmatack Study Area. (McHenry County Conservation District Ecological Database 2011).

Insects

Similar to many of the other species groups, the Study Area is home to a diverse group of insects. These invertebrates help form the base of the food chain that sustains higher forms of life within the native ecosystems of the Study Area. Six conservation areas in McHenry County have species lists for butterflies. The Alden Sedge Meadow has 33 species, Winding Creek has three species, Glacial Park has 57 species recorded, Hebron Peatland has 17 species, North Branch Preserve has 21 species, and Lake Elizabeth has 34 species. These range from fritillaries, swallowtails, and monarchs to sulphurs, skippers, and hairstreaks found within prairie, savanna, sedge meadow, and barren habitat types amongst others (McHenry County Conservation District Biological Database, 2011). While the Wisconsin Wildlife Action Plan lists 450 insects as SGCN for the entire state, it did not break the species down by Ecological Landscapes. However, the Illinois Wildlife Action Plan for the Northeastern Morainal Natural Division area lists the following species as critical: hoary elfin (woodland edge habitat), swamp metalmark (moist, open area habitat), Karner blue (open, sandy lupine habitat), elfin skimmer dragonfly (bog and fen habitat), Hine's emerald dragonfly (calcareous spring-fed marsh and sedge meadow habitat), silver-bordered fritillary (wet meadow habitat), and silvery checkerspot (woodland edge, roadside, marsh habitat).

A number of remnant-dependent butterflies have been identified by the Illinois Wildlife Action Plan as occurring in the prairies, wetlands, and savannas within the Hackmatack Study Area. These are those species most in need of conservation. These include the **silver bordered fritillary**, **Aphrodite fritillary**, **Edward's hairstreak**, **purplish copper**, **silvery blue**, **dion skipper**, **broad-winged skipper**, **mottled duskywing**, and **two-spotted skipper**. (Source: McHenry County Conservation District Ecological database)

Threatened and Endangered Species

The proposed Study Area provides habitat for 109 species of concern that include federal- and state-threatened and endangered species and FWS Birds of Conservation Concern. The list includes 49 birds, five fishes, five mussels, one amphibian, two reptiles, and 47 plants. Many of these are listed in their respective groupings above. Sixty-five separate populations of state-listed plants and 92 individual populations of state-listed animals are known to occur in the Illinois section of the Study Area alone.

Several federally-protected species in this Study Area occur in McHenry County and include the threatened prairie bush-clover and eastern prairie fringed orchid as well as the endangered whooping crane. Prairie bush-clover is endemic to midwestern prairies and prefers moist microenvironments; therefore, it is often outcompeted by woody competition (U.S. Fish and Wildlife Service *Lespedeza leptostachya* Recovery Plan; U.S. Fish and Wildlife Service, Twin Cities, Minnesota; 1988). The eastern prairie fringed orchid requires full sun and occurs in tallgrass silt-loam or sand prairies, sedge meadows, fens, and occasionally sphagnum bogs. (U.S. Fish and Wildlife Service Eastern Prairie Fringed Orchid Recovery Plan; Fort Snelling, Minnesota; 1999).

Once extirpated from most of its historic breeding range, whooping cranes predominately nested in the northern tallgrass prairie but also depended on highly productive wetland ecosystems for nesting, overwintering, and migratory stopover. Today, a newly established flock of over 60 birds, originating from captive-reared birds, use the Study Area during migration and possibly for breeding in the future.

3.4 Land Use and Management Status

The rich geologic past that sculpted the landscape leaving behind a great diversity of habitats, which house an even greater diversity of plant and animal species, gives the area a unique ecological value. The Study Area also has a long growing season, rich soils, and close proximity to Lake Michigan, Milwaukee, and Chicago, which gives the area a high economic value. Understanding land use and ownership is important for assessing the impact of conservation actions including establishing a new refuge. Over half of the Study Area is either cultivated crops (43 percent) or hay/pasture (12 percent), while nearly one-fifth is developed (18 percent). A similar amount of the Study Area is forest or wetlands (20 percent) with open water covering an additional four percent.

3.4.1 Ownership and Management

The vast majority of the Study Area is in private ownership. However, the area encompasses over 60 publicly- and privately-owned parks, preserves, and conservation areas with natural ecosystems totaling about 23,000 acres. Many of the parks and preserves in the Study Area primarily conserve natural ecosystems (as opposed to developed, multi-use recreational parks). Lake County Forest Preserve District, McHenry County Conservation District, Illinois DNR, and Wisconsin DNR own and manage the bulk of these natural areas.

In addition, private land trusts are active in the Study Area. The Land Conservancy of McHenry County has protected approximately 2,000 acres of land in McHenry County through private conservation easements and fee title acquisition. The Geneva Lakes Conservancy, Kettle Moraine Land Trust, and Liberty Prairie Conservancy are also active in the area.

Natural Areas and Nature Preserves

Both Wisconsin and Illinois have programs that designate Natural Areas (WI) or Nature Preserves (IL). These programs assist private and public landowners in protecting high-quality natural areas and the habitats of endangered and threatened species. The State Natural Areas protect outstanding examples of native communities, significant geological formations, and archeological sites. The natural areas are surviving islands of native ecosystems that once existed across the area and offer visitors a chance to experience a variety of intact wetland, prairie, and glacial landscapes. Collectively, the Study Area contains 24 state-designated natural areas totaling about 3,444 acres.

Significant lands and facilities within the Study Area include Chain O'Lakes State Park, Bong State Recreation Area, Glacial Park, Lakewood Forest Preserve, Moraine Hills State Park, and Bloomfield Wildlife Area. The Richard Bong State Recreation Area is one of the largest open, undeveloped areas left in southeast Wisconsin.

Audubon Important Bird Areas

The Audubon Society's Important Bird Areas (IBA) Program is a global effort to identify and conserve areas that are vital to birds and other biodiversity. An IBA provides essential habitat for one or more species of birds and often comprises a mixture of public and private land. IBA designation is special recognition that these sites provide critical habitat for sensitive birds. The Study Area contains or is nearby to two IBAs:

1. Located in northeastern Illinois, the Lake-McHenry Wetlands Complex IBA comprises one of the state's largest concentrations of natural wetlands and glacial lakes. The IBA includes the Grass, Marie, Nippersink, Bluff, Fox, Pistakee, Channel, Petite, Catherine, and Redhead Lakes along with the Fox River and the surrounding lands that interconnect them.
2. Richard Bong State Recreation Area supports significant populations of grassland birds, such as Bobolink, Eastern Meadowlark, Henslow's Sparrow, Field Sparrow, and Savanna Sparrow.

Natural Area Inventory Sites

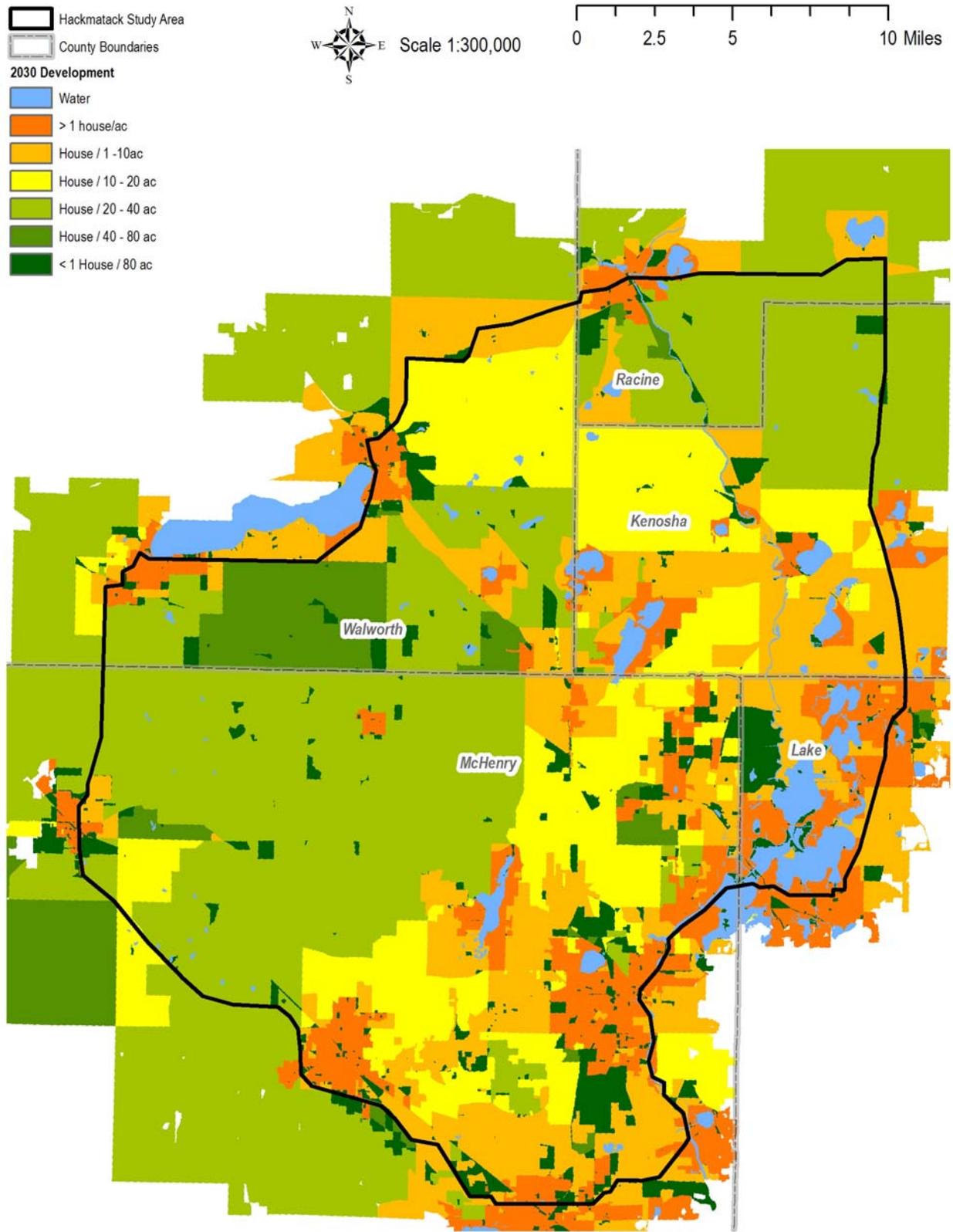
Both Illinois and Wisconsin have assembled an inventory of high-quality natural areas that support rare natural communities and endangered species. The sites identified within Illinois and Wisconsin include a rich diversity of native flora and fauna on both public and private lands. Information from the Natural Area Inventory is used to guide and support land acquisition and protection programs by all levels of government as well as private landowners and conservation organizations. The natural communities inventoried include bogs, fens, marshes, prairies, meadows, oak savannas, and woodlands. The Study Area includes 230 natural area inventory sites.

3.4.2 Land Use Trends

Residential Development

Less than two hours from the growing urban centers of Chicago and Milwaukee, the Study Area and its surroundings face steady development pressure. The State Wildlife Action Plans for both Wisconsin and Illinois cite fragmentation as a leading threat to the integrity of the area's habitats. Even though there is a strong conservation heritage and a good base of conserved lands, the area's habitats are still at risk of becoming islands in a rising sea of development (Figure 8). As these lands become increasingly fragmented and degraded, the wildlife that depend on them decline, as do the opportunities for experiencing such places.

Figure 8: Projected Residential Housing Development, 2030 (Source: Hammer et al., 2004)



According to a 2007 report in the Chicago Tribune, “[T]he population of the seven-county Chicago metro area experienced a growth rate of 63 percent between 1950 and 2006, and that rate jumps to 261 percent by removing the city of Chicago from the equation .” The article notes, “Scott Goldstein, housing expert for the Chicago-based Metropolitan Planning Council, said he believes Rockford won’t be the last stop [in Chicago’s sprawl], I absolutely think it’s going to expand for many, many more miles.” (Fermata, Inc., 2010).

A 1999 Openlands report, *Under Pressure: Land Consumption in the Chicago Region 1999-2028*, examined likely future development patterns in a 13-county area around Chicago including portions of Indiana and Wisconsin. According to the report, residential and commercial development is expanding faster than the population growth of the region. The report indicates that more than 50 percent of the Hackmatack Study Area is at medium to high risk of being developed by the year 2028 (Fermata, Inc., 2010).

The October 2010, *Go To 2040 Comprehensive Regional Plan* by the Chicago Metropolitan Agency for Planning (CMAP), describes significant demographic changes for the seven county region around the city of Chicago in the coming decades. Between 2010 and 2040, the region’s population is expected to grow more than 25 percent. Historically this growth has happened rapidly in the outlying areas of the region. The demographics will also change in terms of age distribution, racial and ethnic background, and where people choose to live.

Between 1990 and 2000, McHenry County’s population grew 42 percent. While that growth slowed to 18.7 percent between 2000 and 2010 to a total of 308,760 people, the *McHenry County 2030 Comprehensive Plan* adopted April 20, 2010 anticipates a projected population of 495, 000 by 2030. The plan recognizes the need for planning efforts that recognize the importance of groundwater use and recharge, protection of streams, rivers, lakes and wetlands and the wealth of McHenry County’s natural resources. (<http://www.mchenrycounty2030plan.com/>)

Critical natural lands that surround Chicago such as Indiana Dunes, the Kankakee River, and the Hackmatack Study Area are directly in the path of this surge. While the economic recession has slowed this rate of growth, it is likely to return to full force with economic recovery. Some land within the Hackmatack Study Area has already been slated for development (Fermata, Inc., 2010).

Agriculture

As previously mentioned, over 50 percent of the Study Area is in agricultural land use. McHenry County, which includes the majority of the Study Area, is deeply rooted in agriculture, where it dominates the landscape. The 2030 Comprehensive Plan for McHenry County included a goal “to preserve the most productive farmland as a source for viable agricultural activities that will enhance the County’s economy and contribute to its rural character.” The plan also states that, “The County should encourage small-scale farming as a means of creating a larger degree of agricultural self-sufficiency around the large urban areas.” Agriculture, and all the input businesses it supports, is important for the economy of McHenry County as well as other portions of the Study Area.

Aggregate Resources

The mining and production of crushed stone, sand, and gravel is an important use of the land in portions of the Study Area as well, especially McHenry County in Illinois. The 2030 Comprehensive Plan for McHenry County included a goal to “protect productive and valuable aggregate resources ensuring their availability for future generations” and states that “[t]he county has a generous supply of natural

aggregates....that are used to supply several industries including construction and agriculture.” The mining industry, and the related industries it supports, is important for the economy of McHenry County as well as other portions of the Study Area.

3.4.3 Land Use Planning

Due to land use trends of the past (cultivation of natural areas) and the current land use trends mentioned above (urban sprawl development), landscape-level conservation has become a focus. As both the Illinois and Wisconsin Wildlife Action Plans note, landscape-level conservation that connects protected but fragmented landscapes (parks and preserves) is one key to ensuring long-term sustainability of native flora and fauna populations. Ecological corridors connecting sites both small and large maintain paths for migration and dispersal. Biodiversity also depends on restoration and management of native ecosystems. When landscapes are reconnected and restored, the result is a whole that is far greater than the sum of its parts (Fermata, Inc., 2010).

Protected lands within the Study Area exist within the much larger matrix of unprotected public and private lands that support natural systems in the region. Various groups have plans in place to further protect this landscape. The Chicago Wilderness collaboration has a Biodiversity Recovery Plan “to protect the natural communities of the Chicago region and to restore them to long-term viability, in order to enrich the quality of life of its citizens and to contribute to the preservation of global biodiversity.” The Chicago Wilderness Green Infrastructure Plan was developed to bring the Biodiversity Recovery Plan to life and provide “a visionary, regional-scale map of the Chicago Wilderness region that reflects both existing green infrastructure—forest preserve holdings, natural area sites, streams, wetlands, prairies, and woodlands—as well as opportunities for expansion, restoration, and connection.” The Regional Greenways and Trails Plan (2009) for northeastern Illinois and the Natural Areas Plan for southeastern Wisconsin (SEWRPC, 1997) identify actions to protect and manage critical habitats for plants and animals and generally improve ecosystems.

The CMAP regional land use plan was the result of significant public input that consistently called for protection of the region’s network of parks and open space. *Go To 2040* calls for an additional 150,000 acres of land to be preserved across the region over the next 30 years. The goal is to conserve a network of land and water that protects biodiversity, follows waterway corridors, expands existing preserves, and creates new preserves in the region. (http://goto2040.org/parks_open_space).

A few other organizations are focused on sensible development and expansion of local communities. Metropolis Strategies, formerly Metropolis 2020, promotes principles of economic development, redevelopment, and open space preservation. Metropolis Strategies has proposed actions to help the region develop in a manner that will protect its economic vitality, while maintaining its high quality of life.

In the Centennial Celebration of The Burnham Plan of Chicago in 2009, twenty-one green legacy projects were identified as critical to protect the green infrastructure of the region. The proposed Hackmatack NWR was recognized for its ability to preserve some of the region’s most dramatic landscapes (<http://www.openlands.org/special-projects/89-burnham-plan-centennial.html>).

The regional growth strategies of the CMAP and the SEWRPC seek to reduce the region’s excessive rate of land consumption, preserve important open spaces (especially environmental corridors), and promote improved water quality.

3.5 Socioeconomic Environment

3.5.1 Local Culture

The local culture of the Hackmatack Study Area is primarily focused around farming. However, with development over the years and urban sprawl from Chicago and Milwaukee, an urban culture has been introduced as well. And yet, the history of this area throughout the twentieth century demonstrates a prevailing public interest in preserving nature and its associated benefits for ecosystems, recreation, and innovative economic development.

3.5.2 Archeological and Cultural Resources

Native American History and Early Settlement

The earliest evidence of human activity near the Study Area dates to approximately 12,000 years ago, when highly nomadic Paleo-Indian clans came primarily to hunt larger animals at upland bogs and sloughs. These clans were followed by Archaic-Indians, Woodland-Indians, and Mississippian-Indians. By 2,000 years ago, there was a gradual shift from total dependence on hunting and gathering to a more settled culture that incorporated agriculture. These people lived in total dependence on the local ecosystems and helped shape the character and health of natural communities through practices, such as setting fires that supported their procurement of food, medicine, and materials important to their daily lives (Sullivan, 1997).

Eventually, the Illini and Potawatomi people inhabited the area. During the summer most of them inhabited “towns” near rivers or lakes, but during the winter they would move away to “hunting camps.” But then, with the arrival of French-Canadian and European settlers, came disease that practically eliminated most Native Americans. Eventually trading of goods, trapping, and fur trading became popular in the area. Over time, with more settlement and development, Europeans dominated the area, fires were suppressed, forest and prairies were cleared, and wetlands were drained (Sullivan, 1997).

Archeological and Geological Sites

Southeastern Wisconsin has a significant geologic heritage that has played an important role in both scientific research and in the industrial and architectural development of the area. The geologic sites on which this heritage is founded are few in number and disappearing rapidly. Nearly all remaining sites, even those on public land, are threatened, in large part because their basic value and importance are unrecognized (SEWRPC, 1997).

A variety of inventories and surveys of historic sites have been conducted by various units and agencies of government in the southeast region of Wisconsin. The Study Area includes seven counties, most notably: Walworth, Racine, and Kenosha. These inventories and surveys have resulted in more than 14,000 historic sites in the region. As of 1985, 254 sites and 20 districts were listed on the National Register of Historic Places. Seven of these sites are within or adjacent to the Study Area (SEWRPC, 1997). One such site is Wehmhoff Mound in Kenosha County. This lone effigy mound was listed on the National Register of Historic Places in 1985.

Three significant geological areas exist within the southeastern Wisconsin portion of the Study Area as well. The Burlington Crevasse Fillings in Racine County is a good example of crevasse fill. The Voree Quarry in Walworth County is an old, water-filled quarry, exposing the unusual Brandon Bridge Formation of dolomite rock. The Lyons Glacial Deposits in Walworth County are outstanding examples of kettle and kame topography. All three sites are owned by a private conservancy (SEWRPC, 1997).

3.5.3 Human Population

The population base within a two-hour drive of the Hackmatack Study Area is estimated to be over 12 million. However, according to the 2010 US Census, the approximate population of the Study Area itself is 170,000. Increases in population from 1990-2000 varied across the Study Area ranging from zero to 7.3 percent, with an average of 2.6 percent for the decade. The population increase from 2000-2010 had less variability across the Study Area ranging from 0.32 to 4.19 percent and an average of 1.7 percent for the decade. The predicted change in population from 2010-2015 ranges from a decrease of 0.14 percent to an increase of 1.93 percent with an average of a 0.9 percent increase for the decade. The area immediately to the southeast of the Hackmatack Study Area has experienced dramatic growth and density in population. Growth patterns predict a more dramatic impact on the surrounding areas in the near future.

In addition, McHenry County's Hispanic population currently stands at 11 percent. It rose by 4 percent in the last 10 years. This trend is expected to continue. Two school districts in the Study Area indicate that between 40 and 50 percent of their kindergarten populations are of Latino origin.

3.5.4 Economic Activities and Trends

The average household size across the Study Area ranges from two to three people with a median age of 35-45 years old. The majority of the Study Area has a median household income between 41,000 and 70,000 dollars per year with part of the southern portion of the Study Area earning between 70,000 to 84,000 dollars per year. A few isolated spots have a median household income between 84,000 to 110,000 dollars per year. However, the unemployment rate across the Study Area in 2010 was between 8 and 15 percent, with only a few areas between 4 and 8 percent (US Census, 2010).

In McHenry and Walworth Counties, of which portions occupy the majority of the Study Area, most employment is in manufacturing; educational, health, and social services; and retail trade. Fifty-four percent of the population has a high school diploma. Slightly more of the population (55 percent) has a high school diploma or has attended some college with no degree. An additional 20 percent and 15 percent of the population has a bachelor's degree, respectively (US Census, 2010).

Important economically and near the Study Area, Lake Geneva has been recognized as one of the nation's distinctive destinations (one of the 2009 Dozen Distinctive Destinations listed by the National Trust for Historical Preservation, with Woodstock listed in 2007). Furthermore, Chicago-O'Hare and Milwaukee Airports offer global air connections, and both are less than one hour's drive from the Study Area. Finally, rail service via Metra connects the Study Area and Chicago (Fermata, Inc., 2010).

3.5.5 Recreational Activities and Trends

Both Illinois (2009) and Wisconsin (2005) Statewide Comprehensive Outdoor Recreation Plans (SCORP) have documented that opportunities for outdoor recreation are in short supply in the densely populated regions of northeastern Illinois and southeastern Wisconsin.

The Illinois SCORP reports that the total amount of outdoor recreation land in Illinois is low in comparison to other states. Although Illinois has the fifth highest population of all states, the state ranks in the bottom 10 percent for the per-capita amount of lands and facilities for outdoor recreation among all states.

The Wisconsin SCORP divides the state into regions. The Hackmatack Study Area falls within the Lower Lake Michigan Coastal Region. According to Wisconsin's SCORP, nature-based and viewing/learning opportunities in this region are inadequate in proportion to the size of the population. The SCORP also identifies the top five Land Legacy Areas in each region—areas thought to be critical in meeting the state's present and future conservation and recreation needs. Two of the five areas are within the Hackmatack Study Area: Bong Grassland and Illinois Fox River. The SCORP states, “These sites should be considered the highest priority recreation areas to preserve and protect in each region.” Lastly, the Wisconsin SCORP identifies the recreation supply shortages in each region. Within the Lower Lake Michigan Coastal Region, the plan cites shortages in campgrounds, parks, mountain bike trails, water trails, wildlife areas, boat launches, fishing piers, and nature centers (Fermata, Inc., 2010).

It is not surprising, then, that according to the Service report titled, *Wildlife Watching Trends: 1991-2006*, the most populated states have participation rates below the national average for wildlife watching. Illinois ranks 42nd in the percent of population that participates in wildlife watching while Wisconsin ranks 21st. In 2006, Illinois and Wisconsin residents spent, on average, seven to eight days wildlife watching. And, on average, those participants spent 36-47 dollars per day on trips away from home to watch wildlife (Fermata, Inc., 2010).

Demographically, the majority of wildlife watchers in Illinois and Wisconsin are from rural areas; female, over 35 years old; and white, with a high school education or greater. The spread of participants across income levels is proportional to the population as a whole. This implies that wildlife watching appeals to people of all income levels (Fermata, Inc., 2010).

Currently within and near the Study Area, Glacial Park provides equestrian, snowmobile, and cross-country ski trails. Big Foot Beach State Park and Chain O'Lakes State Park offer quality boating, fishing, and camping opportunities. The Fox River and many other lakes within the project area provide great fishing and boating opportunities as well. Paddlers can canoe and kayak on the Nippersink Water Trail, while Wisconsin DNR Wildlife Areas and some McHenry County Conservation District sites offer hunting opportunities. The Richard Bong State Recreation Area and the White River State Trail provide horse riding and snowmobiling opportunities. And all of these areas offer great wildlife viewing. The wide range of managing entities within the Study Area increases visitors' recreational choices, as each offers its own suite of outdoor activities (Fermata, Inc., 2010).

Furthermore, the Chicago Wilderness Leave no Child Inside initiative is working in the Chicago metropolitan area to raise awareness of the issue that fewer children experience nature today than in the past. They have developed teacher and parent resources; and public events, programs, and sites where parents can discover nature with their children.

3.6 Conclusion

Data from the McHenry County Conservation District, the Illinois and Wisconsin DNRs and SEWRPC suggest that the Hackmatack Study Area supports richly diverse flora and fauna, including many species listed as state- or federally-threatened or endangered. In addition, the Service has identified numerous local bird species as Birds of Conservation Concern, a designation meant to stimulate conservation efforts to prevent these species from becoming threatened and endangered.

Two extensive studies support and expand upon these findings. In 2005, both Illinois and Wisconsin completed State Wildlife Action Plans. These plans inventoried the states' natural habitats and wildlife populations, and identified threats to those habitats and species, as well as conservation opportunities for keeping common species common and reversing the decline of sensitive species. These plans provide a

scientifically rigorous ecological framework with which to assess the biological implications of creating Hackmatack NWR.

Both the Illinois and Wisconsin State Wildlife Action Plans note that conserving sensitive species requires the protection and restoration of high-quality habitats. Connecting these high quality habitats helps sustain an interdependent web of species and natural communities. Chicago Wilderness (a consortium of 250 regional businesses, conservation organizations, and public agencies in Wisconsin, Illinois, and Indiana) and SEWRPC have identified ecological corridors throughout the Hackmatack Study Area that will, if protected and restored, help ensure the long-term sustainability of local ecological systems and sensitive species (Fermata, Inc., 2010).

Chapter 4: Alternatives and Environmental Consequences

In this chapter

4.1 Environmental Consequences Related to Natural Resource Concerns

4.2 Environmental Consequences Related to Socioeconomic Environment, Outdoor Recreation, and Local Land Use

The following chapter examines the potential environmental consequences, or impacts, of implementing each alternative. Service Planners heard a wide variety of issues, concerns, and opportunities during the public scoping for this plan (Table 3). However, the issues discussed in detail in this chapter were deemed by the plan authors to be of primary relevance to Refuge establishment.

Table 3: Summary of Environmental Consequences Identified in Public Scoping by Alternative

Issues/Opportunities	Alternative A: Current Direction	Alternative B: Refuge and Landscape Conservation Area	Alternative C: Cores and Corridors (Preferred Alternative)	Alternative D: Partnership Initiative
Habitat/Species				
General State of the Environment	Stable to decreasing. Existing public and private conservation programs will continue.	Improved through habitat restoration, reduced land development, and environmental education.	Same as B.	Same as B.
Wetland Preservation and Restoration	Steady to gradual increase due to local efforts.	Increased by up to 1,300 acres from current cover.	Increased by up to 880 acres from current cover.	Increased by up to 800 acres from current cover.
Grassland Preservation and Restoration	Steady to gradual increase.	Increased by up to 23,800 acres from current cover.	Increased by up to 8,150 acres from current cover.	Increased by up to 6,100 acres from current cover.
Habitat Fragmentation	Steady to gradual improvement through existing programs.	Connecting corridors increase.	Five new corridors connect new habitat blocks.	Same as C but using private and public partnerships.
Biodiversity	Reduced due to habitat loss.	Stable to slight increase if new species pioneer.	Same as B.	Same as B.
Endangered Species	Steady to gradual decrease in endangered plant populations.	Increased protection for known plant populations on new Refuge	Same as B.	Same as B.

Issues/Opportunities	Alternative A: Current Direction	Alternative B: Refuge and Landscape Conservation Area	Alternative C: Cores and Corridors (Preferred Alternative)	Alternative D: Partnership Initiative
		lands.		
Recreation and Education				
Recreational Opportunities	Stable to slight increase due to demand and ongoing programs.	Moderate increase in wildlife dependent recreation on Refuge lands.	Slight to moderate increase in wildlife dependent recreation on Refuge lands.	Slight increase in wildlife dependent recreation on Refuge lands in coordination with partners.
Snowmobile Use	Nominal reduction as land changes ownership and/or development occurs.	Same as A. Also, Refuge and county will work with local clubs if a conflict is identified.	Same as B.	Same as A.
Horseback Riding	Nominal reduction as land changes ownership and/or development occurs.	Same as A. Also, Refuge and county will work with local clubs if a conflict is identified.	Same as B.	Same as B.
Hunting	Nominal reduction as land changes ownership and/or development occurs.	Increased opportunities due to future opening of Refuge lands.	Increased opportunities due to future opening of Refuge lands.	Stable to nominal reduction as land changes ownership and/or development occurs.
Environmental Education	New opportunities focus on existing conservation lands.	Increased due to new programs on Refuge lands.	Same as B.	Same as A.
Societal Issues				
Federal Government	Refuge designation has no effect on the rights, privileges, and responsibilities of adjacent private landowners.	Refuge designation has no effect on the rights, privileges, and responsibilities of adjacent private landowners.	Same as B.	Same as B.
Property Taxes	Stable to slight increase. Will follow local economic needs based on land development.	Stable to slight increase. Undeveloped lands do not require new services.	Stable to slightly less than B. Undeveloped lands do not require new services.	Stable to slightly less than C. Undeveloped lands do not require new services.

Issues/Opportunities	Alternative A: Current Direction	Alternative B: Refuge and Landscape Conservation Area	Alternative C: Cores and Corridors (Preferred Alternative)	Alternative D: Partnership Initiative
Sand and Gravel Deposits	No impact.	Little to no impact. Land purchased for Refuge may include deposits. Refuge will consider inclusion of rehabilitated lands.	Same as B.	Same as B.
Economy and Tourism	Slight increase due to ongoing programs.	Moderate increase in nature-based tourism.	Slight to moderate increase in nature-based tourism due to NWR status.	Slight increase in nature-based tourism.

4.1 Environmental Consequences Related to Natural Resource Concerns

Migratory Birds

The protected and/or restored habitats within each Refuge action alternative will have positive benefits for many migratory birds (Table 4). As discussed in Chapter 3, grassland-dependent birds will receive the most benefits from the restored prairies areas. However, oak savanna and wetland habitats will also provide unique or rare habitat for birds in this region.

Table 4: Current and Future Potential for Select Migratory Bird Species Populations

Bird Species (Examples)	Alternative B						
	Current Potential				Future Potential		
	FWS (Core)	FWS (Corridor)	Con. Land	Total	FWS (Core)	FWS (Corridor)	Total
<i>Grassland</i>							
Henslow's Sparrow	720	0	175	895	6040	0	6215
Short-eared Owl*	0.5	0	0.5	1	125	0	125.5
Upland Sandpiper	35	0	10	45	310	0	320
Dickcissel	1870	0	460	2330	15725	0	16185
<i>Savanna</i>							
Red-headed Woodpecker	310	0	175	485	330	0	505
<i>Wetland</i>							
Pied-billed Grebe	18	0	30	48	555	0	585
Least Bittern	15	0	25	40	400	0	425
Total Potential Benefit over Existing Condition (All Species)							20517

Bird Species (Examples)	Alternative C						
	Current Potential				Future Potential		
	FWS (Core)	FWS (Corridor)	Con. Land	Total	FWS (Core)	FWS (Corridor)	Total
<i>Grassland</i>							
Henslow's Sparrow	435	730	180	1345	2190	3711	6081
Short-eared Owl*	0.5	0.5	0.5	1.5	45	75	120.5
Upland Sandpiper	20	35	10	65	110	190	310
Dickcissel	1130	1900	470	3500	5700	9660	15830
<i>Savanna</i>							
Red-headed Woodpecker	190	330	185	705	195	425	805
<i>Wetland</i>							
Pied-billed Grebe	15	1	25	41	365	255	645
Least Bittern	10	1	15	26	265	185	465
Total Potential Benefit over Existing Condition (All Species)							18573

Bird Species (Examples)	Alternative D						
	Current Potential				Future Potential		
	FWS (Core)	FWS (Corridor)	Con. Land	Total	FWS (Core)	FWS (Corridor)	Total
<i>Grassland</i>							
Henslow's Sparrow	440	110	200	750	1525	460	2185
Short-eared Owl*	0.5	0	0.5	1	30	10	40.5
Upland Sandpiper	20	5	10	35	80	25	115
Dickcissel	1150	285	515	1950	3970	1205	5690
<i>Savanna</i>							
Red-headed Woodpecker	215	60	195	470	250	85	530
<i>Wetland</i>							
Pied-billed Grebe	1.5	2	30	33.5	255	160	445
Least Bittern	1	1.5	20	22.5	185	115	320
Total Potential Benefit over Existing Condition (All Species)							6064

All species listed above are Birds of Conservation Concern for FWS Region 3, Habitat. "Block Size" was not incorporated into calculations.

* Typically 1 breeding pair per 182 acres (used above); however, can use areas as small as 70 acres if located close to blocks of contiguous grassland.

Current Potential = Potential number of existing breeding pairs, based on 2006 National Land Cover Data, **Represents No Action Alternative within the spatial area of each Action Alternative.**

Future Potential = Potential number of breeding pairs added to the population with implementation of the given Alternative, Based on Potential Natural Data derived from soil type.

FWS (Core) = Primary Area for Refuge Land

FWS (Corridor) = Secondary Area for Refuge Land

Con. Land = Existing conservation estates adjacent to proposed Refuge land; all public ownerships included, assumed no change for future potential

4.2 Environmental Consequences Related to Socioeconomic Environment, Outdoor Recreation, and Local Land Use

4.2.1 Impact on Local Taxes and Economy

Alternative A – Current Direction (No Action)

There would be no expected change in the local economy under the No Action alternative, as current development rates, tax revenues, and business revenues would remain subject to market influence. Any changes would be due to existing influences and market forces and would not be associated with federal activities. A potential, but unsubstantiated, economic outcome of not having a refuge in the region would be loss of refuge visitor expenditures at local businesses and establishments and increased local costs to provide roads, schools, and other infrastructure as development increases.

Alternative B-D – Refuge Establishment

The fiscal impact to McHenry County and its townships, if a refuge is established, would depend on both the quantity of land acquired and the rate of acquisition. While land owned by the U.S. Government is not taxable by state or local authorities, the federal government has a program in place to compensate local governments for foregone tax revenues. The Refuge System typically makes an annual payment in lieu of taxes to local governments. The amount of the payment depends on the final Congressional budget appropriations for the Service for that year. Recently, the payment has been less than what the state or local government may have received through normal taxation. It should be noted that the parcels with the highest assessed value within the Study Area (i.e., residential, industrial, and retail) are parcels that have the least desirable characteristics for conservation.

Recreational use on refuges generated almost 1.7 billion dollars in total economic activity during fiscal year 2006 (FWS, 2006). The report, titled *Banking on Nature 2006: The Economic Benefits to Local Communities of National Wildlife Refuge Visitation* was compiled by Service economists. According to the study, nearly 35 million people visited refuges in 2006, supporting almost 27,000 private sector jobs and producing about 543 million dollars in employment income. In addition, recreational spending on refuges generated nearly 185.3 million dollars in tax revenue at the local, county, state, and federal levels. The economic benefit is almost four times the amount appropriated to the Refuge System in Fiscal Year 2006. About 87 percent of refuge visitors travel from outside the local area (FWS, 2006). This information gives an indication of how the creation of a Hackmatack NWR could be of economic benefit to the local economy.

4.2.2 Snowmobile Use

Alternative A – Current Direction (No Action)

Currently, there are several dozen marked snowmobile trails in the Study Area (Figure 9). Most of these trails cross public and private lands and are maintained by local snowmobile clubs through informal

agreements with landowners. The seasonal use period for these trails is dependent upon the weather and snow depth. Local conditions can vary widely throughout the Study Area.

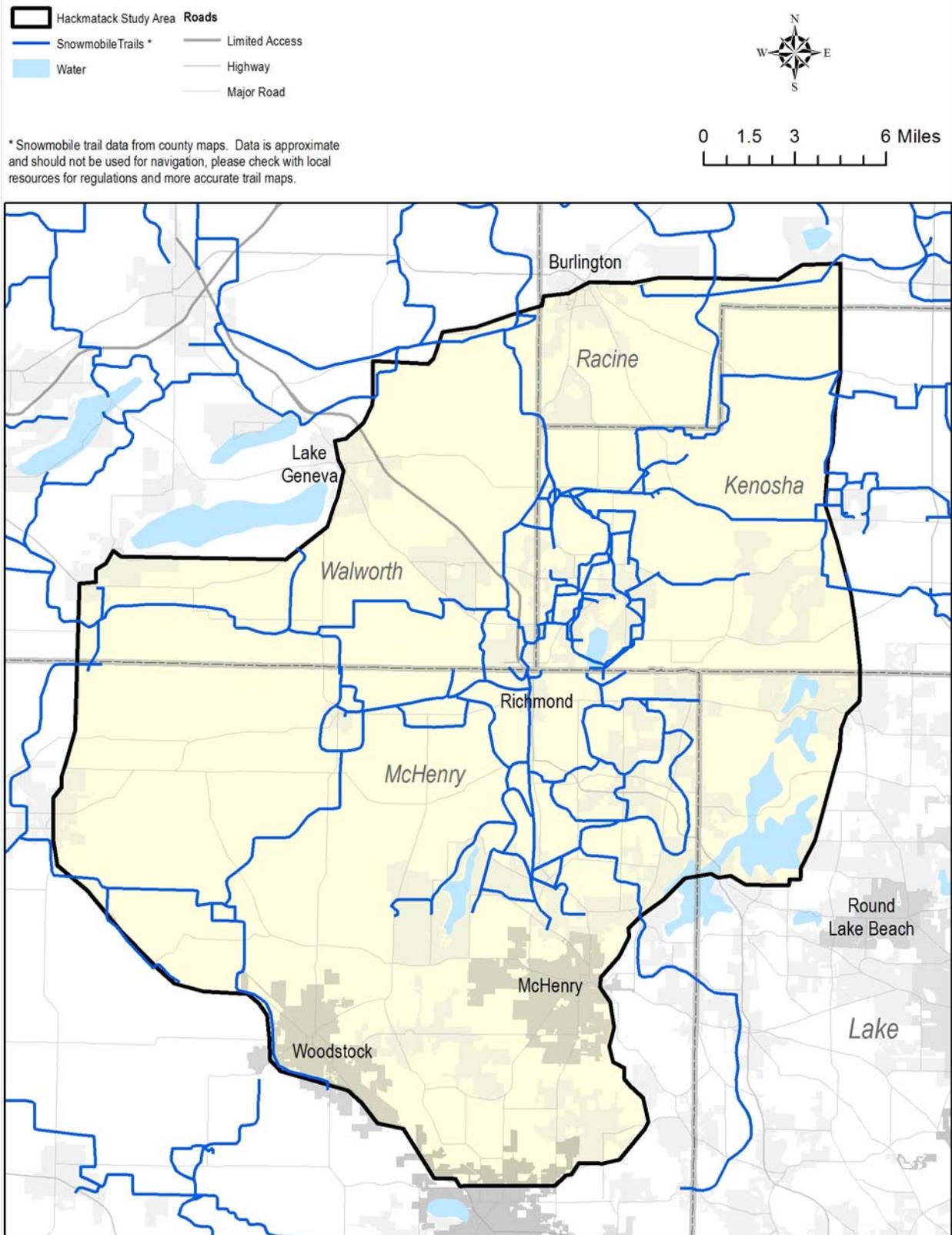
It is reasonable to expect that the number and length of snowmobile trails in the Study Area will see a nominal reduction as land changes ownership and/or development occurs. Local land use ordinances determine whether snowmobile use is compatible with residential expansion.

Alternative B-D – Refuge Establishment

Motorized vehicles on refuges are generally permitted only on designated roads during specified times of the year. Off-road vehicle use, including ATVs and snowmobiles, is generally not permitted due to impacts on vegetation, disturbance to wildlife and other refuge users, and safety and liability issues. However, the Service objective is not to eliminate or interrupt existing snowmobile trails.

It is possible that at some time in the future a landowner would offer land for sale to the Refuge that contains a portion of an existing snowmobile trail. We do not expect this situation to occur very often. The Service would work with the landowner and snowmobile clubs to either reroute the trail or encourage a third party to obtain a permanent trail easement prior to the federal purchase. McHenry County Conservation District has expressed an interest in working with landowners and the Service to secure trail easements if the situation arises. The DNR in Illinois and Wisconsin, the respective county governments, and local snowmobile clubs may also choose to be involved to secure an existing trail.

Figure 9: Location of Snowmobile Trails Drawn from Local Snowmobile Club Maps, 2010



4.2.3 Cultural Resources

Alternative A – Current Direction (No Action)

The No Action alternative could have a slight negative effect on the protection of historic and cultural resources, principally due to the lack of a continuous federal presence, which provides a clear responsibility for protection of these resources. Existing laws create an expectation on landowners and developers to take necessary precautions to ensure that no sites or structures on the National Historic register would be affected by their activities in the region. However, any undocumented sites, especially prehistoric sites, may not be protected under existing laws.

Alternative B-D – Refuge Establishment

The Service's protection of habitat would benefit cultural resources by ensuring that none of the substantial impacts related to development for residential or commercial uses would affect known or undiscovered cultural and historic resources on those lands. As with all federal activities, any activities involving soil disturbance will be reviewed by the Illinois or Wisconsin State Historical Preservation Office (SHPO) prior to any excavation work to ensure protection of cultural resources. Refuge staff would also promote archaeological research on refuge lands and add language from the Archaeological Resources Protection Act (ARPA) to appropriate public use materials to warn visitors about illegal looting, and maintain law enforcement personnel trained in ARPA enforcement.

4.2.4 Wildlife-dependent Recreation

Alternative A – Current Direction

The network of public and private conservation areas in the Study Area provide an array of recreation opportunities that would continue without refuge establishment. Glacial Park provides equestrian trails and camping. Lake Geneva and Chain O'Lakes State Park offer boating and fishing for residents and visitors. Long-distance hiking and bicycling are available on the Prairie Trail. Paddlers can canoe and kayak on the Nippersink Water Trail, and Wisconsin DNR Wildlife Areas offer hunting opportunities. The wide range of managed entities within the Study Area increases the visitor's recreational choices, as each offers its own suite of outdoor activities. However, opportunities for wildlife-dependent activities would continue to decrease on private lands as the region is developed.

Alternative B-D – Refuge Establishment

Each action alternative envisions core parcels, with a limited suite of recreational opportunities permitted under its management directives, working in concert with an interconnected network of publicly accessible lands that offer a broad range of recreation choices. However, refuges are required to emphasize wildlife-dependent recreation activities such as hunting and fishing, when compatible with wildlife, which may not be allowed on all nearby natural areas.

Beyond improving the Study Area's biological integrity, the conserved corridors connecting larger conserved areas offer potential recreational corridors, allowing visitors a less fragmented experience of the natural world. Increased access to parks and open space can improve activity levels among both residents and travelers.

Each of these alternatives envisions a connecting corridor between core Refuge units and/or existing conservation lands. The establishment of recreational trails along these corridors could be an ideal method

to get visitors out into the environment. Future trails may be paved or unpaved and would need additional planning in order to be compatible with the terrain and Refuge purposes.

The proposed Refuge sits on the doorstep of literally millions of people who enjoy nature-based recreation. Both Illinois and Wisconsin Statewide Comprehensive Outdoor Recreation Plans have documented that opportunities for outdoor recreation are in short supply in the densely populated regions of northeastern Illinois and southeastern Wisconsin.

Designating a refuge in the Study Area would further diversify the region's recreational assets, protect quality natural habitats, and provide additional opportunities for wildlife-dependent recreation.

4.2.5 Environmental Education and Outreach

Alternative A – Current Direction (No Action)

The McHenry County Conservation District's Lost Valley Visitor Center, located in Glacial Park near McHenry, Illinois, opened to the public in August 2010. This 28,450 square foot facility hosts a number of environmental education programs, workshops, camps, and special events. An exhibit room, drop-in library, and research library (available by appointment) are open daily. The facility is also a regional center for the study of natural resources, housing under one roof the District's Natural Resource Management Department and Environmental Education Staff; the Research Field Station; the District's ecological data bases, resource library and map room; Restoration Internship Program, and the Ecological Restoration Certificate Program. In addition, the Illinois Nature Preserves Commission and the McHenry County Conservation Foundation have offices in the building.

Glacial Park has long been considered one of the jewels of the county's open space holdings, characterized by its rolling prairie, wetlands, delta kames, oak savanna, and the tranquil presence of Nippersink Creek. Encompassing 3,200 acres, Glacial Park is the District's most well-known conservation area, visited annually by more than 64,000 individuals. It supports nine miles of snowmobile trails, six miles of hiking trails, and four miles of horse trails; contains a five mile segment of the regional Prairie Trail, and offers canoeing and fishing in Nippersink Creek.

Alternative B & C – Refuge Establishment

The establishment of a refuge would bring new visibility and destination for local school groups and others wanting to learn about the natural environment. Initially, the Refuge land base will be small and the opportunities for onsite outdoor classroom locations may be limited. However, each of the Refuge alternatives envisions a connecting corridor between core Refuge units and/or existing conservation lands. The establishment of recreational trails along these corridors could be an ideal method to get students out into the environment.

The construction of a full-scale visitor or environmental education center may warrant consideration in the future as the Refuge grows. Another possibility is a smaller classroom/shelter to be placed on one or more of the Refuge units or development of facilities in conjunction with other conservation partners. Construction and operation costs can be substantial for any type of public building. Therefore, the need for any new facilities will have to be based on careful study of the market for environmental education destinations.

If a refuge is established, a Visitor Services Plan will be written to help guide the growth of an environmental education and outreach program.

Alternative D – Partnership Initiative

This alternative would have an outcome similar to Alternative A. The McHenry County Conservation District's Lost Valley Visitor Center located in Glacial Park would continue to be a focal point for onsite environmental education. However, the presence of some Refuge lands, and the connecting corridors, would open the possibility of some Refuge-connected education and outreach programs.