APPENDIX E

RESEARCH NEEDS AND OPPORTUNITIES

RESEARCH AT MIDEWIN NATIONAL TALLGRASS PRAIRIE

The Midewin National Tallgrass Prairie (Midewin) represents the largest, most ambitious prairie restoration project in North America. As such, Midewin National Tallgrass Prairie offers unique and unprecedented opportunities for basic and applied research on the factors that contribute to the composition (species diversity) and dynamics (short- and long-term changes in relative abundance) of the tallgrass prairie ecosystem. This research will not only inform ecologists and land managers at Midewin National Tallgrass Prairie on the progress and effectiveness of their efforts, it will also have great application for restorations conducted elsewhere and with other ecosystems. In addition, research will aid in developing outreach programs to educate the public about how our restoration efforts are contributing to the establishment of the tallgrass prairie ecosystem, and what processes make a tallgrass prairie ecosystem work.

To facilitate research that will enhance restoration and management at Midewin National Tallgrass Prairie, the Forest Service (FS) and Illinois Department of Natural Resources (IDNR) staff, with recommendations from the FS North Central Experiment Station, jointly developed the comprehensive research plan presented here.

Submitting Valid Research Projects for Approval

Research projects may be submitted by any agency, organization, or university. The Forest Service at Midewin does not directly fund any research, but can approve for use of the land for approved research projects. Approved research projects may be conducted anywhere within the site. Valid research requests are encouraged by the Forest Service and will be given serious consideration. Interested researchers may submit proposals to the Prairie Supervisor. Approved projects will be implemented as specified in special-use permits or Memorandum of Understanding with Research Cooperators. Research relating directly to restoration and management needs, and the Goals, Objectives, Standards, and Guidelines identified in the Midewin Land and Resource Management Plan will be given highest priority. Such research will document both the processes underlying ecological interactions of the plants and animals inhabiting Midewin and the effects of restoration/ management practices on the plant and animal communities. Research will thereby allow management and restoration to proceed in an adaptive manner, in which techniques shown not to work well will be modified or abandoned, successful techniques will be expanded, and new techniques will be evaluated.

A VISION OF RESEARCH AT MIDEWIN NATIONAL TALLGRASS PRAIRIE

Our goal is to develop a unifying and integrative approach to research on the

factors that influence or determine the composition of the plant and animal communities inhabiting Midewin. Monitoring programs will be needed to track long-term trends in populations of plants and animals in areas undergoing large-scale restoration.

Research is an integral component of ecological restoration and is clearly given high priority by the enabling legislation, the Illinois Land Conservation Act of 1995 (PL 104-106). In particular, the legislation states that among the purposes of Midewin is "To provide opportunities for scientific, environmental, and land use education and research." The research program developed at Midewin will focus on how restoration and management activities affect the prairie, wetland, and aquatic (stream and pond) ecosystems and human resources occurring at Midewin and the greater region around it. The research program will thus be instrumental in determining the success of these activities, and it will serve as an important contributor to educational and other outreach programs both at Midewin and elsewhere.

GOALS AND OBJECTIVES OF RESEARCH AT MIDEWIN NATIONAL TALLGRASS PRAIRIE

The most fundamental goal of the Midewin research program is to understand how the tallgrass prairie ecosystem works within the context of modern human landscape use and alteration, including the “interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of man” (National Environmental Protection Act of 1969, Sec. 101 [42 USC § 4331]). To facilitate prioritizing research needs, each objective is classified according to short-term or long-term needs. Research addressing short-term needs may take precedence over research addressing long-term needs.

Goal 1: Conduct research that will enhance a population’s likelihood of persistence, and gain a basic understanding of all Threatened and Endangered species and Regional Forester’s Sensitive Species at Midewin.

> **Objective 1a:** Foster research identified by members of the Midewin Regional Forester’s Sensitive Species Expert Panel (see Conservation Assessments for Regional Forester’s Sensitive Species). *Short-term need*

Goal 2: Conduct research leading to more effective restoration strategies and practices for both terrestrial (prairie, savanna) and aquatic (stream, wetland) ecosystems.

Objective 2a: Determine how soil characteristics, such as parent material,
texture, and fertility, influence the ability to establish plant species that differ in key life-history characteristics, such as light, water, and nutrient requirements. *Short-term need*

Objective 2b: Determine efficacy of alternative restoration techniques (such as the mix of seeds initially sewn; use of "satellite" restorations; use of exclosures for browsers, grazers, and/or seed predators; etc.) on the success of prairie restoration. *Short-term need*

Objective 2c: Determine how management activities (e.g., fire, grazing, mowing) affect present and future plant and animal communities (focusing particularly on sensitive species). *Short-term need*

Objective 2d: Evaluate mature and stable prairie habitat restorations for capability to support viable populations of sensitive grassland birds species. *Short-term need*

Objective 2e: Gather data and information on the effects of bison of prairie natural resources and human activities and safety. *Long-term need*

Objective 2f: Relate life-history characteristics and requirements of individual organisms (e.g., reliance on arthropod pollen vectors) to current and future plant and animal community composition. *Long-term need*

Objective 2g: Determine whether pre-restoration soil manipulations (e.g., of pH, fertility, and/or hydrology) will enhance the establishment of desired plant species. *Long-term need*

Goal 3: Document the current condition and characteristics of prairie, savanna, and forest ecosystems and conduct research on how these ecosystems respond to management and restoration activities directly and indirectly.

Objective 3a: Determine existing composition of fauna and flora occupying prairie, savanna, and forest areas, and monitor their changes over time in relation to management and restoration activities both within and surrounding the target areas. *Short-term need*

Objective 3b: Determine how management and restoration activities affect soil characteristics, including fertility, and physical and chemical properties. *Long-term need*

Objective 3c: Determine importance and use of these areas for migratory bird species. *Long-term need*

Goal 4: Devise efficient and environmentally-sensitive methods for controlling or eliminating invasive species.

Objective 4a: Determine efficacy of standard restoration and management practices (fire, grazing, mowing) as control agents of invasive organisms. *Short-term need*

Objective 4b: Determine if standard restoration and management practices facilitate invasive organisms. *Short-term need*

Objective 4c: Determine whether introduction of aggressive native plant species may displace invasive plant species in both terrestrial and aquatic plant communities. *Long-term need*

Objective 4d: Explore the feasibility of introducing biological control agents. *Long-term need*

Objective 4e: Determine the efficacy of consumer-resource-based competition for the control of exotic plants in terrestrial and aquatic communities. *Long-term need*

Goal 5: Document the current condition and characteristics of wetlands and conduct research on how these wetlands respond to management and restoration activities directly and indirectly.

Objective 5a: Determine existing composition of fauna and flora occupying wetland areas, and monitor their changes over time in relation to management and restoration activities both with and surrounding the wetland areas. *Short-term need*

Objective 5b: Determine how water storage capacity of wetlands is affected by restoration activities, and relate this to biodiversity, water supply, and flooding frequency and extent, etc. *Long-term need*

Objective 5c: Determine how wetland areas are used by migratory birds, including waterfowl, waders, and shorebirds. *Long-term need*

Objective 5d: Determine how wetland restoration activities affect soil characteristics, including fertility, and physical and chemical properties. *Long-term need*

Goal 6: Document the current condition and characteristics of streams flowing

through Midewin and conduct research on how these streams respond to management and restoration activities.

Objective 6a: Establish long-term monitoring programs of stream conditions (bank vegetation; physical and biological resources; etc). *Short-term need*

Objective 6b: Develop cooperative relationships with landowners of upstream watershed properties to facilitate management, research, and restoration of these areas in ways that are beneficial for both the upstream landowner and Midewin. *Short-term need*

Objective 6c: Relate management and restoration activities to physical and biological properties of the streams. *Long-term need*

Goal 7: Determine how human alteration of the environment within Midewin affects terrestrial and aquatic management and restoration activities.

Objective 7a: Determine whether trails designed for different uses (e.g., bike, equestrian, hiking, multiple use) differentially affect the plants and animals in the vicinity of the trails. *Short-term need*

Objective 7b: Determine how recreational activities affect biodiversity of animals and plants. *Short-term need*

Objective 7c: Determine the status of populations of game and nongame fish species in Midewin's streams, and evaluate the potential impact of sport fishing. Would sport fishing likely lead to the introduction of exotic fish species, release of bait animals, or impact shoreline erosion? *Long-term need*

Objective 7d: Determine how water consumption for human and agricultural development (e.g., cattle used for grazing management) affects water quality and availability. *Long-term need*

Goal 8: Determine how the modern human-altered landscape surrounding Midewin affects terrestrial and aquatic management and restoration activities within Midewin.

Objective 8a: Develop cooperative relationships with landowners surrounding Midewin to facilitate management, research, and restoration activities that would be mutually beneficial to both these landowners and Midewin. *Short-term need*

Objective 8b: Determine how land-use practices and development on the borders of Midewin influence restoration success. *Long-term need*

Objective 8c: Document how the development of the County landfill affects plant and animal diversity both close to and far from the landfill. In particular, does the landfill attract pest species such as rodents and gulls; does the presence of these species negatively impact prairie species? *Long-term need*

Objective 8d: Determine how agricultural and other human activities outside of Midewin's borders affect water quality of Midewin streams, including nutrient enrichment, sedimentation, occurrence of toxins (metals, pesticides, etc.), etc. *Long-term need*

Objective 8e: Determine whether atmospheric deposition of human-generated air pollutants alters the dynamics of essential plant nutrients such as nitrogen in both terrestrial and aquatic (wetland/stream) habitats, or leads to acidification of certain soil types. *Long-term need*

Goal 9: Interpret and highlight research in public education and outreach programs.

Objective 9a: Develop educational programs illustrating how research conducted at Midewin increases basic ecological understanding, helps guide restoration activities, and helps evaluate effectiveness of different restoration and management activities. *Short-term need*

Objective 9b: Use results of research in training sessions for land managers at Midewin and nearby areas. *Long-term need*

Goal 10: Conduct research on the sociological perceptions of ecological restoration and management carried out at Midewin and the perceived benefits and costs to the Chicago metropolitan region and the rural communities surrounding Midewin.

Objective10a: Determine demographics of Midewin visitors and relate this to such issues as (1) frequency of visitation; (2) length of visit; (3) nature of visit (e.g., recreation, solitude, education, nature experience, etc.). *Short-term need*

Objective10b: Determine how educational attainment, economic status, and other sociological parameters reflect or predict expectations about the perceived benefits and/or costs of restoration activities at Midewin. *Long-*

term need

Goal 11: Conduct research to examine the role played by cultural traditions and legal precedents on the implementation of ecosystem management at Midewin.

Objective 11a: Combine and integrate historical, sociological, and environmental information and perspectives to craft more effective communication and implementation of ecosystem-based management, research, and restoration goals of Midewin within the socio-economic context of northeastern Illinois. *Short-term need*

Objective 11b: Determine the impact of legal mandates, such as the Endangered Species Act (ESA), the National Environmental Policy Act (NEPA), National Forest Management Act (NFMA), and Federal Land Policy Management Act (FLPMA), on implementation of ecosystem-based management, research, and restoration at Midewin. *Long-term need*