CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1. Introduction **(Boldface are links)**

CHAPTER 3

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1. INTRODUCTION

Chapter 3 combines two chapters often published separately in environmental impact statements: “The Affected Environment” and “Environmental Consequences”. The primary purpose is to describe the affected resources and to disclose the environmental consequences or effects of each alternative. This chapter is organized around the major issues described in Chapter 1. Other environmental components and topics, such as heritage resources, and social and economic environment, follow the discussion of the major issues. Some additional items were screened out of the detailed analysis process. Reasons for eliminating them include: a) analysis of the item was not considered important to the integrity of the environment, b) analysis of the item would not disclose direct or indirect effects to the environment, or c) analysis of the item was not acknowledged or required by law.

Information provided in this chapter allows readers to measure or evaluate the alternatives. The relevant resource components of the existing environment are reviewed to give a baseline from which to compare the six alternatives.

The analyses and disclosures in Chapter 3 were developed under the guidance of the National Environmental Policy Act and the National Forest Management Act that require disclosures of direct, indirect, and cumulative effects, mitigation measures, provisions for monitoring, and appropriate consideration of sensitive species, soil and water resources, recreational resources and opportunities, and other important resources.

3.11. SELECTION OF ACTIONS AND EFFECTS FOR ANALYSIS

In the initial stage of analysis of effects, the relationships between management activities and environmental factors were studied to assess whether the effects might be significant or not. If a management activity greatly changes the amount or quality of an environmental factor, the effect qualifies as significant. Significant effects of some management activities may be unavoidable, have different short and long-term consequences or involve irreversible changes. Some effects may be mitigated to a level of insignificance. Significant effects may be positive or negative.

3.12. MITIGATION MEASURES AND MANAGEABLE EFFECTS

Some potentially significant adverse environmental effects can be foreseen, and activities can be managed to avoid or compensate for the effects. In such cases, the controlling guidance or provisions are known as mitigation measures. For example, mitigation measures could include modification of the location of trails to soften the effects on scenery, or providing habitat in one area to compensate for loss of habitat in another area.

Midewin will follow key laws, regulations, policies, and the Standards and Guidelines identified in the Plan in order to minimize and mitigate potential effects. Key resource mitigation measures should be viewed in a programmatic context. The FEIS includes mitigation measures required by the Plan, which will reduce environmental impacts. These mitigation measures will be implemented as required by the Plan, or the Plan will be amended. Additional mitigation measures will be implemented on a site-specific, individual project basis.

3.13. DEPTH OF ANALYSIS

In order to adequately disclose the effects of the alternatives, the analysis of effects must be pursued with an appropriate depth and method. By the purposes of Midewin and the existing conditions, Alternatives 2 to 6 will produce net beneficial effects on many resources of concern. For some resources, such as local economic conditions, the action alternatives do not differ substantially in their potential to produce effects, and the anticipated effects are minor beneficial effects. In such instances, the depth and method of analysis presented in this FEIS is limited to the extent necessary to describe the effects and compare the alternatives.

3.14. RELATIONSHIP BETWEEN PROGRAMMATIC AND SITE-SPECIFIC EFFECTS ANALYSIS

This FEIS is a programmatic document; it discusses alternatives and effects for a broad program; the overall management of Midewin National Tallgrass Prairie. Environmental consequences for individual, site-specific projects are not described or disclosed here. But further site-specific environmental analysis for individual projects will comply with NEPA prior to project decisions implementing the Plan.

3.15. ENVIRONMENTAL CONSEQUENCES

This section describes the direct, indirect, and cumulative effects. Direct environmental effects are those that occur at the same time and place as the initial action. Indirect environmental effects are caused by the action, but occur later or in a different location, such as downwind effects from a prescribed fire. Most effects described would probably occur over the next 10 years, the planning period. Actions taken together to achieve the goals of a particular alternative,

along with past, present, and reasonably foreseeable activities undertaken either by the Forest Service or other parties, are called cumulative effects on the environment.

3.16. FRAMEWORK OF ANALYSIS

Listed below are the proposed management activities that are planned for Midewin, and the environmental elements that may be directly or indirectly affected by the listed management activates. A more complete description of the management activities are provided in Chapter 2, Description of the Alternatives.

Management Activities

- Native habitat restoration
- Grassland management
- Prescribed burning
- Grazing and mowing for habitat management.
- Watershed management
- Integrated Pest Management
- Trail development and maintenance.
- Recreation facilities construction and operation.
- Arsenal clean-up
- Transportation and access management
- Wildlife management

Environmental Elements

- Water quality
- Streamflow
- Wetlands
- Floodplains
- Adjoining drainage
- Soils
- Air quality
- Biological diversity
- Vegetation
- Threatened, endangered and sensitive species
- Noxious weeds and invasive species
- Other wildlife species
- Recreation and interpretation
- Scenery
- Heritage resources
- Socio-economic conditions

3.2. General Environment

This section provides information on the historical and geographical conditions of Midewin and the surrounding area. Later sections of the chapter describe the affected resources in greater detail and analyze the effects that each alternative will have on each resource.

3.2.1. HISTORICAL PERSPECTIVE

Many Native American cultures have lived or were living in the tallgrass prairie region in the 12,000 years before the arrival of Euro-Americans. During the Paleo-Indian Period (12,000 to 8,000 years ago) and Archaic Period (8,000 to 2,500 years ago), the region's inhabitants depended largely on hunting and gathering activities for subsistence. Later Native American people became semi-sedentary with seasonal villages. The later Native American cultures continued to hunt and gather, but their cultures became more complex as populations grew. Native Americans had incorporated agriculture into their subsistence activities by approximately 900 A.D.

The first recorded accounts of the Illinois Country were from the French explorers Louis Joliet and Father Marquette, who traveled on the Des Plaines River in 1673. By the time of their travels, members of the twelve nations of the Illiniwek (the Illinois Confederacy) occupied a number of villages in the region. None of the Illiniwek villages were located within the current boundaries of Midewin.

Early European influence in the region occurred through fur trade and early trading confederations among other Native American groups in the Great Lakes region. During the late 18th and the early years of the 19th century, European and American settlers began moving into southern Illinois and making their way north into the Great Lakes region.

After the Black Hawk large numbers of settlers moved into northern Illinois. The construction of the Illinois and Michigan Canal also encouraged the early immigration of settlers. Euro-American settlers established homesteads and agricultural use patterns that continued, with modernization, until establishment of the arsenal.

Early farmers built farmsteads near the prairie-forest boundaries to take advantage of both wooded and prairie environments. Wood was necessary for housing, fuel, and tools, and the prairie plowed under for agriculture. Roads were generally laid out along section lines, commonly on half-section lines. Schools, churches, and stores were located near roads, especially crossroads, for easy access during the rural period. The land was highly productive under cultivation

when the steel plough and drainage technology were applied. Areas that were too wet or rocky were used as pastures.

3.2.1.1. Arsenal Construction and Operation

In 1940, the Joliet Army Ammunition Plant (JAAP) was authorized by the federal government to produce ammunition and explosives for the U.S. military. During WW II, the Joliet facility was considered the largest, most sophisticated munitions facility in the world. At peak production during WW II, over 10,425 people were employed on site. The facility loaded over 926,000,000 bombs, shells, mines, detonators, fuses, and boosters, and set a national record by producing over one billion pounds of TNT.

To complete construction, 45% of the landscape was modified to some degree. Farmsteads were demolished or moved off the property, thousands of buildings and utility sites were rapidly constructed, and systems were built to include over 200 miles of roads, 118 miles of railroad, and networks for water, electricity, and telephones. Most of the site was later enclosed with 37 miles of security fence. Miles of meandering creeks and streams were routed into straight channels and large ditches were constructed for drainage.

Operations were placed on standby in 1945. The facility was, however, reactivated during the Korean and Vietnam Wars. TNT production stopped in 1976, and by the late 1970's, most operations at JAAP had ceased.

3.2.1.2. Arsenal Decommissioning

In 1992, the Army declared the JAAP as excess federal property and initiated studies and plans for decommissioning. As described in Chapter 1, the Joliet Arsenal Citizens Planning Commission (JACPC) was formed to develop a plan for the arsenal. Eventually, the recommendations of the JACPC became the basis for the Illinois Land Conservation Act of 1995, which established Midewin and other uses for the former arsenal.

Properties created from the formal arsenal that now adjoin Midewin include Deer Run Industrial Park, which is currently being developed as a major new intermodal railway facility by CenterPoint Properties, Ltd. Development plans for Island City Industrial Park and the Will County Sanitary Landfill are less certain. The Abraham Lincoln Memorial Cemetery opened in November 1999. The Joliet Army Training Area remains Army property and is still used for Army National Guard training.

Midewin has become the focal point for a large and diverse group of volunteers dedicated to restoring the prairie at the former Joliet arsenal. Over 600 people from many different communities volunteer their time and skills to Midewin. Volunteer activities include seed collection, planting, tour guides, fence repair, plant and wildlife monitoring, heritage Passport in Time projects, and environmental education projects. A number of organizations focused on land

stewardship have been created since Midewin establishment, including the Midewin Tallgrass Prairie Alliance, the Midewin Corporate Council, Prairie Parklands, and the Prairie Creek Preservation Group.

3.2.2. LANDS OF MIDEWIN

3.2.2.1. Acquisitions to Date

Midewin received the first transfer of land, 15,080 acres, from the Army DOD in March 1997. Since then, Midewin has acquired 72 acres through purchase and 75 acres through a land exchange with Joliet Arsenal Development Authority (JADA). (See Figure 1, Midewin NTP and Prairie Parklands). Approximately 400 acres of lands may be acquired from non-federal parties through purchase, donation or exchange within the next year.

The Illinois Land Conservation Act designated particular tracts of land (1,635 acres) that may become part of Midewin when the sites are adequately remediated of hazardous materials. Per ILCA Section 2914.b.3, this legislated land, once transferred, may be managed in accordance with the Plan without requiring an Amendment to the Plan. Several other tracts (2,090 acres) have not been legislated but may be offered to Midewin at a later date. Currently, these tracts pose a significant risk due to unresolved hazardous waste issues. Remediation will be necessary.

3.2.2.2. Past Land Uses

As with lands of the Central Till Plains and northeastern Illinois in general, lands of Midewin or the former arsenal have been greatly modified by rural, agricultural, and related developments since the mid-1800s. The environmental effects of Euro-American settlement began immediately with settlement in the 19th century and escalated with growing populations and advancing technology. Past activities that have affected natural resources in the region include:

- Native prairie was plowed and converted to row crop fields and agricultural grasslands (pastures and hayfields).
- Widespread use of industrial pesticides and fertilizers began in the 1900s.
- Conversion of wetlands to agricultural and industrial uses.
- Construction of drain tile and ditch systems and stream channelization.
- Alteration of wetlands and riparian areas by agricultural and urban runoff.
- Extirpation of bison and elk, and persecution or eradication of predatory mammals.
- Conversion of permanent, large pastures and hayfields to row crops during the middle and late 1900’s.
- Fragmentation of large tracts of wildlife habitat.
- Suppression of natural fire.
- Introduction of non-native plants and animals and displacement of native species.
- Planting hedgerows, windbreaks, orchards, and farmstead groves.

- Harvesting wood from forests, savannas, and prairie groves.
- Removal of fencerows, hedgerows, and native trees to expand crop fields.
- Construction of underground pipelines.
- Construction of roads, highways, railroads, homes, schools, churches, stores, overhead lines and other structures in the rural environment.
- Division and conversion of open land for developed or urban uses.
- Quarrying and mining (e.g., rock, coal, gravel).
- Commercial (market) hunting of prairie chickens, waterfowl, and shorebirds.
- Subsistence, supplementary, and recreational hunting, fishing, trapping, and preferential use of some native plants or animals.

All of these activities occurred on land now Midewin National Tallgrass Prairie before development of the arsenal and during arsenal operation. Development of the arsenal brought different landscape changes on the site. Agricultural uses continued on a large portion of Army lands, but extensive excavation, fill, and construction of arsenal facilities significantly changed the landscape including:

- Continued cropping, grazing, and installation of drain tile systems.
- Hunting, fishing, and trapping.
- More extensive channelization of streams and construction of drainage ditches.
- Construction of impoundments in marshy or wet areas.
- Maintenance of large, permanent pastures and hayfields.
- Construction of over 1000 buildings and structures, including four bunker fields for storage of explosives, four complexes for loading and assembly of munitions, and four warehouse areas.
- Construction of a denser web of road and rail lines to interconnect all facilities, often with fill or excavation of beds to depths of 8 feet.
- Installation of denser network of water lines, sewer lines, water towers, and telephone and electricity poles and lines.

3.2.2.3. Existing Landscapes and Land Uses

These actions left prominent marks on the landscape of Midewin that now must be managed in order to fully meet the goals of providing habitat for native species as well as offering recreational, educational, and research opportunities. The following list provides a partial inventory of manmade landscape features that will be managed as restoration and recreational development during Plan implementation proceeds:

- 9592 acres of agricultural lands, including row crops, pastures, and hayfields.
- 118 miles of roads, including 34 miles with paved surface, and 116 miles of railbed.
- 44 trestles, bridges, and major culverts.

- 362 bunkers, 42 warehouses, 75 other buildings, 39 foundations, 67 magazines, and other structures or developed lots of various size and design.
- 45 miles of security fence.
- Over 4500 telephone poles.
- Estimated 100 to 300 miles of drain tile systems and an extensive ditch network.
- Kemery Lake dam, a 10-foot structure spanning Prairie Creek.
- Doyle Lake, a complex of three artificial impoundments.
- 30 homestead sites and 2 acres in cemeteries.
- Heritage sites.
- The current administrative site.

The Army leased much of the arsenal land for agricultural uses during years of inactivity. Upon transfer of lands, current Army leases were converted to Forest Service Special Use permits, and the original lease terms and conditions were honored as authorized by law.

Interim restoration projects are under development for approximately 1,000 acres of former agricultural land. 210 acres of former cropland have been converted to seed production beds and fields for native prairie species in order to support future restoration. Seed production is underway at the River Road Seed Production Area, a four-acre tract along Chicago Road, and approximately 600 linear feet of seed production beds at Midewin's Administrative Site.

3.2.2.4. Hazardous Materials

The former arsenal includes numerous sites still owned by the Army that require remediation for hazardous materials, including two Superfund sites. The Army retains possession of these sites that require remediation and controls designated groundwater management zones. Clean up proceeds under the management of the Army, U.S. EPA, and other parties.

Midewin lands may include hazardous materials that remain from arsenal activity. Very localized areas of soil, particularly along perimeter fences, were contaminated with arsenic during past applications of pesticides. Final clean-up levels and background levels have not been determined for arsenic, which occurs naturally in soils and is relatively immobile. Standards for soil and sediment remediation that affects lands now owned by the USDA Forest Service will be defined in the final Army DOD Record of Decision for the former Joliet Army Ammunition Plant. Other potential hazardous substances include transite building materials (containing asbestos), which can be hazardous when improperly handled. Finally, numerous telephone poles and rail ties that have not been removed from Midewin lands contain creosote.

3.3. Physical Environment

3.3.1. Landscapes and Geology

The landscape of northeastern Illinois was formed by repeated glaciations during recent geological time, with subsequent erosion by wind and water, localized sedimentation on floodplains and shorelines, and stabilization of soil by vegetation. Landscape features include broad glacial moraines or till plains, the valleys of the Kankakee and Des Plaines Rivers, glacial outwash formations. The region in general has little relief, gentle slopes, and poorly developed natural drainage. Bedrock outcrops occur infrequently, and soils are generally deep, heavy, and highly productive.

Midewin lies between the Kankakee and Des Plaines Rivers near their confluence. The eastern two-thirds covers a gently rolling glacial moraine that is slightly dissected by creeks and drainages. The western third lies on broad, level outwash plain where a variety of local landscape features occur, including sand ridges, stratified bodies of glacial outwash, oxbows or channel traces, and areas of exposed or shallow bedrock.

Soils on Midewin are derived from glacial materials, predominantly clay and silt. All soils are alfisols (forest soils) or mollisols (prairie soils). Mollisols are most prevalent. Extensive areas on Midewin have hydric soils, i.e. soils that develop with an absence of oxygen in lower horizons, which can be attributed to prolonged, or recurrent saturation (wetlands or wet prairies).

Midewin is underlain by dolomite bedrock that is an important local aquifer and contributes to rare ecological communities where soils are thin over the bedrock. Elevations on Midewin range from 525 feet in the west to 650 feet in the east. Slopes generally do not exceed 2 percent on the outwash plain and 8 percent on the moraine in the east.

3.3.2. Climate

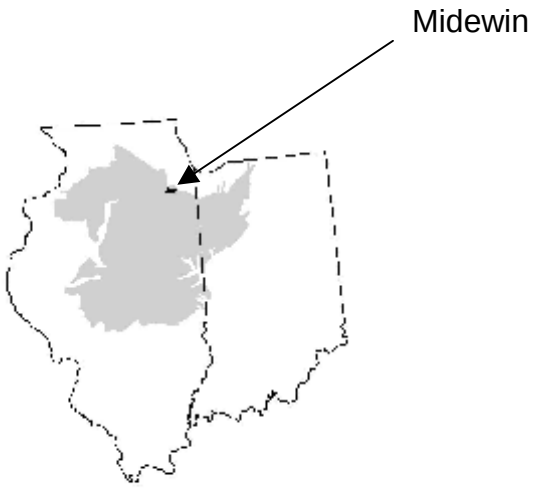
Northeastern Illinois has a temperate continental climate marked by cold winters and hot, humid summers. The annual precipitation averages 36 inches; 23 inches occur during the growing season of April through September. Annual snowfall averages about 16 inches. Most precipitation occurs due to frontal interactions of cold and warm air masses that often produce violent summer thunderstorms with strong winds and lightning. Dominant winds are from the south or west in spring and summer and north or west in fall and winter. The length of the growing season is about 200 days.

3.3.3. ECOLOGICAL CONDITIONS

3.3.3.1. Regional Ecological Conditions

Midewin is located in the northeastern portion of the Central Till Plains Section as described by Keys, et al. (1995). This ecological unit includes the Grand Prairie Natural Division of both Illinois (Schwegman et al, 1973) and Indiana (Homoya et al. 1985), see map below. An ecological unit is a major, generalized unit of the landscape with a distinctive group of natural features. It is part of a classification system that includes several natural features in identifying a natural region including climate, soils, glacial history, topography, and plant and animal distribution.

The tallgrass prairie ecosystem, including associated savannas, woodlands, and wetlands, dominated the Central Till Plains until the mid 1800s, when agriculture and urban developments began to replace and fragment the native landscape. It is estimated that less than 1/100 of 1% of relatively undisturbed prairie is left in Illinois.



Central Till Plains is in gray; Midewin is in black.

Early records and surveys indicate that the area was primarily prairie in pre-settlement times, with trees restricted to a few areas along the streams and in scattered prairie groves and savannas. The natural vegetation on Midewin was typical within the Central Till Plains, with widespread vegetation types being upland typic prairie, wet typic prairie, sedge meadow, savanna, and smaller inclusions of woodland, forest, marshes, and seeps. One rare natural vegetation type present on Midewin is dolomite prairie, which is extremely restricted in the

Central Till Plains Section, and in Illinois; most occurrences were concentrated along major river valleys.

3.3.3.2. Midewin Ecological Conditions

Most lands of Midewin have vegetation that is directly dependent on human activities for persistence (row crop fields and agricultural grasslands), or sites from which all vegetation has been removed and replaced with buildings, roads, or other infrastructure. Larger portions of Midewin are covered with wetlands, woodlands, shrublands or grasslands that have developed from severely degraded natural vegetation or as seral vegetation on highly disturbed land. These areas are usually dominated by disturbance-tolerant or adapted native plant species mixed with non-natives. In some cases, however, certain non-native species or disturbance-tolerant native species may completely dominate the vegetation.

Less than 3% of Midewin is comprised of small remnants of natural plant communities, including the rare and unique plant associations found on dolomite prairie. These remnants are not in pristine condition, and have been degraded by fire suppression, exotic species invasion, woody encroachment, hydrological alterations, poor livestock management, and other impacts.

Even in its degraded condition, Midewin provides habitat for a broad assemblage of plants and animals, including 26 species listed as Forest Service Region Nine sensitive species and three federally listed species, including the federally endangered leafy prairie clover. Midewin also hosts Illinois' largest breeding populations of upland sandpipers, bobolinks, and other bird species dependent on open, unfragmented grasslands. A total of 104 bird species are known to breed at Midewin and an additional 68 species are known to utilize Midewin either during migration or as a winter range.

Midewin also supports populations of 15 species of reptiles, 9 species of amphibians, 27 species of mammals, 53 species of fishes, 9 species of freshwater mussels, over 100 native insect species of concern (limited to prairie remnants and other sensitive habitat), and over 570 species of vascular plants. See the sections below on "Biological Diversity", "Threatened, Endangered, and Sensitive Species", "Vegetation", "Noxious Weeds and Invasive Species" and "General Wildlife" for detailed descriptions of historic, existing, and potential habitat, vegetation types, and species of interest.

3.4. *AIR, SOIL, AND WATER RESOURCES*

3.4.1. INTRODUCTION

This section provides background information to support later sections that describe the effects of the alternatives on air, soil, and water resources. Wetlands, floodplains, stormwater runoff, water quality, soil quality, prime farmland, and air quality are all subject to federal law, executive orders, or other regulations. Other public concerns include:

1. Effects on adjoining lands that may result from wetland restoration, e.g. inundation.
2. Effects of upstream watershed areas on the ability of Midewin to meet its goals and objectives for aquatic and wetland environments.
3. Effects of the Prairie Plan on existing aquatic communities.

Midewin lies between the Kankakee and Des Plaines Rivers near their confluence, and drainage from Midewin is divided approximately equally between the two sub-basins. The Kankakee and Des Plaines Rivers are fourth-order hydrological units within the Upper Illinois River in the USGS accounting system (Hydrological Unit Codes of 07120001 and 07120004 respectively). Both rivers supply municipal drinking water and support intensive fishing and recreation. The Illinois/Des Plaines River waterway is used for transportation between the Mississippi River and the Great Lakes and receives stormwater and wastewater effluent from much of the Chicago metropolitan area.

The streams and wetlands of Midewin are organized into four drainage systems (watersheds): Jackson Creek, Grant Creek, Prairie Creek, and Jordan Creek/Lower Forked Creek. The trunk channels of each of these watersheds are perennial streams with varied, permanent aquatic communities including fish. Figure 13 is a map of the watersheds, and summary information on watershed areas is presented in the table, below. Midewin watershed delineation is based upon delineation by the Illinois State Water Survey, also used by the Illinois Environmental Protection Agency and Illinois Department of Natural Resources. The delineation was modified slightly to more closely reflect local drainage routes.

Table 3.1 - Midewin Watershed Areas

Watershed	Illinois Watershed Code	Total Acres	MNTP Acres	% of Watershed in MNTP	% of MNTP in Watershed
Jackson	ILGC02, ILGCB01	33,384	638	2	3
Grant	ILGA01	10,278	4052	40	21
Prairie	ILFA01	31,375	10,923	35	58
Jordan/Lower Forked	ILFB02	25,517	3368	13	18

Watersheds of Midewin are characterized by low slopes and deep, fine-grained soils that are generally poorly drained. Saturation and shallow inundation occur frequently and extensively in the unaltered landscape. Perennial grasses control overland flow on the low slopes, but surface erosion is apparent on roads and barren surfaces.

The water table is generally shallow across Midewin, commonly less than 5 feet deep. The water table usually lies within a shallow Ordovician dolomite formation or overlying glacial deposits. Rates of movement in the two formations are generally low with localized zones of higher permeability. The general gradient of groundwater is westward toward the outwash plain.

The soils and hydrological functions of the four watersheds have been greatly modified on Midewin and elsewhere. Vegetation or surface conditions have largely been modified or replaced in all watersheds, particularly in wetlands and riparian areas. Large percentages of each watershed have been converted to cropland. Urban and industrial developments have added impervious surfaces to the watersheds. The channel system has been greatly extended by drainage ditches, roads, and rail lines. Each of the natural trunk channels of the four Midewin drainages has been altered, and tributaries to the trunk channels have generally been straightened and deepened or relocated. An extensive system of drain tiles was installed to drain agricultural lands.

Several regional water issues are relevant for Midewin. Regional land use development threatens water resources with urban runoff. The alteration of floodplains, riparian areas, and wetlands destroys aquatic habitat, reduces water quality, and aggravates flood damage. Regional water quality also suffers from runoff from agricultural lands and discharges of municipal and industrial wastewater. There is strong regional interest in the protection of aquatic communities, and streams and wetlands are highly valued for hunting, fishing, and recreation. Another regional water issue is the depletion of a deep Cambrian sandstone aquifer that supplies water to many wells of the Chicago metropolitan area and lack of other high-quality groundwater supplies.

All four watersheds on Midewin receive runoff from upstream sources that include croplands and other agricultural areas, roads and transportation facilities, and areas of industrial and urban development. Intensive urbanization is projected upstream from Midewin, particularly in the Prairie Creek and Jackson Creek watersheds.

Air quality is a regional issue. Midewin lies within an “ozone non-attainment zone” that surrounds the Chicago area. Ozone pollution in the zone results from a combination of plentiful sunshine and various pollutants, principally those from automobile exhaust. Ozone concentrations exceed air quality standards for one-hour concentrations during summer afternoons.

3.4.2. Water Quality

This section describes effects of the alternatives on water quality, including surface water in streams and marshes and groundwater. Water quality refers to specific measurable parameters, including temperature, sediment, oxygen concentrations, nutrients, and toxic pollutants, and the general suitability of the water for its designated uses, including support of native aquatic communities. See “Threatened, Endangered, and Sensitive Species” for information on the ellipse, a mussel on the Illinois watch list.

3.4.2.1. AFFECTED ENVIRONMENT

Designated water uses for the streams of Midewin under the Clean Water Act include habitat for aquatic organisms and incidental recreational contact. Surface waters on Midewin are not known to supply any use out of the channel except watering of livestock. The downstream waters of the Des Plaines, Kankakee, and Illinois Rivers are used for drinking water, industrial process, water-contact recreation and fishing.

Two streams at Midewin have special regulatory status. Jackson Creek has been designated a “highly valued aquatic resource” by the Illinois Environmental Protection Agency, which requires some special protection to the stream. Prairie Creek was identified by the State of Illinois as a water body that failed to meet water quality standards for ammonia, metals, and non-priority organic pollutants (303-d list).

Midewin has several shallow ponds but no natural lakes. Ponds and marshes on Midewin (including those in ditches) are small, shallow or seasonal, and the aquatic communities are limited by water availability.

Water quality in the streams of Midewin has been monitored with macroinvertebrate and fish surveys, which show that aquatic communities are fairly diverse and stable. Long-term records and chemical data are incomplete. Prairie Creek has been monitored on a five-year schedule by the Illinois Department of Natural Resources and the Illinois Environmental Protection Agency for reporting under section 305(b) of the Clean Water Act.

Past inventories on Jackson Creek have given the creek a high rating for biological integrity (a Biological Stream Characterization index of “B”, Illinois EPA). Prairie Creek has scored slightly lower than Jackson Creek (index of “C”). Grant Creek and Jordan Creek (rated “C”) show stronger signs of distress in their aquatic communities due to insufficient flow, poor water quality, or both. Records for Lower Forked Creek are not available, but visual indicators suggest water quality and aquatic communities are similar to those of Prairie Creek (rated “C”).

Some degradation of stream water quality occurs due to loading by sediment and organic waste that may result from agricultural and urban nonpoint sources. Organic waste and fertilizers can be dangerous to aquatic life by causing depletion of oxygen, particularly in late summer as water temperatures rise due to a combination of low water levels, high air temperatures, and plentiful sunshine. Visual observation of ponds and marshes and their contributing areas indicate that occasional or low-level loading by sediment or nutrients occurs in some areas.

Three aquifers provide groundwater for Midewin -- a shallow dolomite aquifer (Kankakee Formation) is connected to the overlying aquifer of glacial till (Chadron Till), and both are separated from a deep sandstone aquifer by a thick shale formation (Manquoketa Formation). Groundwater from shallow wells generally has high concentrations of sulfur and other dissolved solids that reduce its palatability for human consumption, but the water is commonly used for livestock. Past arsenal activities contaminated localized areas of the shallow aquifers, and these contaminated areas remain under control of the Army for long-term remediation. The former arsenal water system included several large capacity wells in a Cambrian-Ordovician sandstone aquifer over 1,000 feet deep. Water from the aquifer is regarded as high quality and palatable. Arsenal activities are not known to have caused contamination of the deeper aquifer.

3.4.2.2. ENVIRONMENTAL CONSEQUENCES

3.4.2.2.1. Direct and Indirect Effects

Implementing the action alternatives will cause long-term net improvements in surface water quality on-site and downstream. All action alternatives have similar potential for beneficial effects. However, greater improvements in water quality will probably be obtained in areas restored to native vegetation with complementary improvements in soils and hydrology. The alternatives differ in their potential to cause adverse effects to water quality. Minor adverse effects on water quality will occur due to trails, roads, facilities, and uses. Also, restoration activities will cause minor short-term adverse effects in some situations.

Sediment concentrations, sediment loads, and turbidity in streams and marshes will be reduced under all action alternatives by eliminating cropland, drainage ditches, tile systems, and runoff problems on roads, railroads, or impervious surfaces. Controlling human and livestock access will reduce sediment loads from present levels to riparian areas according to Plan Standards and Guidelines. Channel erosion will be reduced by channel restoration projects and removing trestles, bridges, culverts, or other floodplain spans.

Nutrient concentrations and biological wastes (BOD) in runoff to streams and marshes will be reduced under all action alternatives. Eliminating fertilizer

application as row crops are converted to grasslands will reduce nitrates in runoff. The exclusion of livestock access to streams will reduce loads of organic waste. Nutrient and organic waste loads will be reduced as runoff through ditches and drain tiles is eliminated or reduced.

All action alternatives have equal potential to affect late summer water temperatures, but the effects are not clearly foreseeable. Removing riparian trees (invasive woody species) that provide shade to perennial channels will increase late summer temperatures, but removing woody vegetation from riparian areas in general will also decrease late summer evapotranspiration, thereby increasing streamflow and decreasing temperatures. Restoring wetlands and drainage systems will improve summer baseflow conditions, which will decrease late summer temperatures (See “Streamflow”). Stream management will tend to create more sinuous channels with deeper pools, and beaver ponds will be protected on some stream reaches for channel improvement purposes, which will provide late summer refugia of cooler water. Future channel conditions will probably include more abundant pools, and (stable) undercut banks that provide shade and cover, and stable habitat structures as woody debris is incorporated into channel forms.

The potential for pollution of surface waters will be reduced under all action alternatives. Pesticide concentrations will be reduced under all alternatives by reducing and eliminating applications to cropland and by reducing or eliminating rapid drainage from agricultural fields. Removing infrastructure and impervious areas, retaining runoff from roads, and applying Plan Standards and Guidelines to any new construction, will reduce urban and automobile pollutants. Plan Standards and Guidelines require consulting with the Army for all projects that may affect the hydrology of sites under remediation.

All action alternatives have equal potential to cause minimal long-term improvements of water quality of groundwater by reducing infiltration of pollutants from cropland or developed sites. The high mineral content or other natural water quality characteristics of local groundwater will not be affected by the alternatives. Alternatives with more facilities have higher potential to cause localized groundwater contamination from septic systems. With proper project design and mitigation, pollution from septic systems should be insignificant.

Adverse effects may occur due to grazing, prescribed fire, crop production, restoration activities, and roads and trails under all action alternatives. Prescribed burns may result in flushes of sediments or nutrients into surface waters. The ground disturbance or exposure associated with restoration activities, crop production, and construction of roads, trails, and facilities may cause short-term increases in sediment loading into surface waters. Crop production will cause loading of fertilizers or pesticides into waters. Effects can be mitigated through application of Standards and Guidelines (Special Uses) in the Prairie Plan.

Pesticide use for managing pests, restoring habitat, and producing crops may result in pollutant loading in waters. Reducing and eliminating cropland will reduce potential contamination of groundwater by pesticides and nitrates under all alternatives. The possible use of pesticides for control of noxious weeds and invasive species will be analyzed under a separate environmental analysis and does not vary by alternatives for the Prairie Plan.

The no-action alternative may result in net beneficial effects to water quality at a lower level than the action alternatives. Converting cropland to perennial cover (albeit invasive species) will reduce loadings of sediment, nutrients, and organic waste. Some areas of aggravated erosion, such as some streambank sites, would gradually stabilize, but lack of maintenance of roads, ditches, and drain tile systems would result in the formation of other sites of aggravated erosion. The effects on stream temperature are not clearly foreseeable, as under the action alternatives.

3.4.2.2.2. Cumulative Effects

Activities on Midewin will have beneficial cumulative effects on the water quality of surface waters by decreasing sediment loads, organic waste loads, and concentrations of nutrients and toxic chemicals in runoff. Under all action alternatives, incremental beneficial effects will achieve greater reductions in pollutants than the potential (mitigated) adverse effects. The cumulative effects may be significant improvements for each of the four watersheds of Midewin. Recent and future actions in other areas of the watershed include urbanization and agricultural production, which may offset improvements on Midewin.

Because Midewin represents just a small portion of the Kankakee and Des Plaines River basins, and because other portions of these basins will continue to be dominated by agriculture and expanding urbanization, actions on Midewin are unlikely to result in significant beneficial effects on water quality of the Kankakee and Des Plaines Rivers.

3.4.2.3. MITIGATION

All potential adverse effects on water quality must be minimized by mitigation. Offsetting improvements caused by restoration will not be regarded as mitigation for sediment loads, organic wastes, nutrient loads, or other pollutants.

Sediment loading resulting from ground disturbance for roads, trails, facilities, crop production, and restoration can be minimized by proper location, design, timing, or use of erosion control measures. Mitigation measures are described in the Forest Service Manuals and Handbooks and Standards and Guidelines of the Prairie Plan. Applicable Best Management Practices for erosion control are described in the “Urban Manual” (NRCS) and publications of the Northeastern

Illinois Planning Commission. The Army Corps of Engineers Section 404 permit process for wetland restoration projects requires protective measures.

Potential effects on late summer stream temperatures cannot be clearly foreseen. Mitigation would be appropriate if significant increases in temperature occurred due to actions on Midewin. However, existing data on stream temperatures is inadequate to provide a baseline, and upstream watershed influences may affect stream temperatures on Midewin, so requirements for mitigation cannot be based on detectable increases in temperature. The requirement for mitigation will be triggered if stream temperatures violate state water quality standards for temperature. Mitigation will consist of reforestation with native trees or shrubs to improve stream temperatures. This condition does not require that Midewin provide mitigation for upstream influences. Mitigation will not be required if it can be shown that aquatic communities have improved despite measured increases in stream temperature.

The offsetting effects of watershed and channel restoration constitute a form of mitigation for removing riparian vegetation. Plan Standards and Guidelines include guidelines for managing riparian vegetation to maintain or improve shade.

Standards and Guidelines of the Prairie Plan require consulting and coordinating with the Army prior to initiating hydrological modifications to ensure that polluted sites under remediation will not be affected.

3.4.2.4. MONITORING

Late summer water temperatures in perennial streams should be monitored to provide a baseline and apply state water quality standards. Project files will record sites where shade trees are removed from streambanks.

Midewin will routinely monitor macro invertebrate communities and fish communities, which will suffice as monitoring of water quality for the Prairie Plan. Periodic sampling of nutrient loads and Biological Oxygen Demand is recommended, primarily to assess upstream influences on the ability of Midewin to achieve the goals and objectives of the Prairie Plan.

The natural variability in sediment loads and turbidity in streams requires that meaningful monitoring be frequent within short-term and long-term frameworks, which is impractical for Prairie Plan monitoring. Erosion-control measures and project designs will be monitored on a project basis to detect sediment loading to streams. Project files will provide records of other significant measures of sediment reductions, including acres restored to perennial vegetation, miles of reconstructed channels, miles of road removed, and acres of restored drainage systems.

3.4.3. Wetlands and Aquatic Resources

This section describes the effects of the alternatives on wetlands and streams as aquatic resources addressed by section 404 of the Clean Water Act. This section focuses on the physical integrity of soils and hydrological processes of wetlands, although the definition of wetland here is based upon the presence of wetland vegetation as well as appropriate soils and hydrology. Other sections of this FEIS disclose the effects on wetland vegetation and animal species.

3.4.3.1. AFFECTED ENVIRONMENT

The fine-grained glacial soils of Midewin generally have low saturated conductivity. Surface ponding occurs frequently in areas of low slope or enclosed drainage. The level topography and poor soil drainage produce extensive areas with persistent saturation at shallow depth. The high water table is critical for the support of wetlands. Maps of hydric soils indicate that 41% of Midewin was probably wetlands before drainage and land use changes that began in the mid-1800s. Under native conditions, most wetlands on Midewin were probably wet prairies and sedge meadows inundated periodically or seasonally.

Approximately 1,050 acres of Midewin (6.4 %) have been classified as wetlands (Hammon) using the National Wetland Inventory approach (Cowardin, 1979). Most wetlands on Midewin are part of the palustrine system (see the table below), and the remainders are riverine. Palustrine wetlands with emergent communities or unconsolidated bottoms cover approximately 320 total acres on Midewin, and most other palustrine wetlands are forested or shrub/scrub wetlands. Midewin has few permanent bodies of open-water and no natural lakes (lacustrine environments).

Table 3.2 - Palustrine Wetlands on Midewin (Cowardin classification)

Watershed	Wetlands (acres)			
	Saturated or Temporarily Flooded	Seasonally or More Frequently Flooded	Total Wetlands	Altered Wetlands*
Jackson	59	77	136	35
Grant	128	197	325	51
Prairie	181	222	405	98
Jordan/Lower Forked	71	115	186	69
Total	439	611	1052	253

*Wetlands that are excavated, diked, drained, or farmed.

Jurisdictional wetlands of Midewin have not been delineated with the federal (Corps of Engineers) manual. Midewin also uses a wetland classification system from the Illinois Natural Areas Survey which recognizes wet prairies, sedge meadows, deep and shallow marshes, seeps, and streams.

Jackson Creek qualifies as a “High Quality Aquatic Resource” under the Army Corps of Engineers Chicago District 404 Permit Program based upon the Illinois EPA Biological Stream Characterization. Midewin has one or more seep areas that qualify as “High Quality Aquatic Resources” based upon the presence of particular species of forested wetland vegetation. Other “High Quality Aquatic Resources” on Midewin include sedge meadows, wet prairies, ephemeral pools, and wetlands that support endangered or threatened species.

All marshes on Midewin are less than 35 acres in size. Most natural marshes were drained or reconstructed in the past, and some marshes were added to the landscape. Important marshes occur on the outwash plain in depressions or impounded areas, including a 4-acre open-water marsh within a 50-acre complex of marshes. Kemery Lake, created by damming Prairie Creek, has largely filled with sediment and now constitutes a shallow marsh. Doyle Lake consists of three shallow ponds created by excavation and impoundment along the Doyle branch of Jordan Creek. Other marshes have formed in remnants of stream meanders cut off during channel alteration.

The planning area for Midewin (excluding Army inholdings) includes approximately 21 miles of perennial streams. Tributaries to these streams include approximately 33 miles of intermittent channels, 60 miles of intermittent or ephemeral “swale” drainages (no channel), and 70 miles of ditches that drain cropland and building sites. This inventory excludes Army inholdings connected by the drainage system. The wider perimeter of Midewin includes approximately 25 miles of perennial streams, 40 miles of intermittent channels, 66 miles of intermittent or ephemeral “swale” drainages (no channel), and 88 miles of ditches.

The existing channel network is substantially different from the native system. Notable changes in the channel network and associated wetlands include:

1. Many of the existing intermittent channels have been created or enlarged by excavation or gully erosion. Some of these channels sustain seasonal or semi-permanent surface water sufficient to support aquatic plants and animals on a seasonal or semi-permanent basis. Wetland birds, other wetland species, and upland species utilize some of the channels. The aquatic communities have not been fully inventoried; fish use some of these channels for foraging and possibly breeding or rearing.
2. Roads, rail lines, or associated ditches function as ephemeral channels.
3. In some cases, the water supply to swales or channels has been reduced by diversion of flow by ditches or drain tiles.

4. Each of the trunk streams of the four Midewin watersheds were straightened, which altered the habitat conditions and reduced the total length of perennial channels by approximately 3.2 miles.

3.4.3.2. ENVIRONMENTAL CONSEQUENCES

3.4.3.2.1. Direct and Indirect Effects

All action alternatives manage existing wetlands and restore additional native wetlands. The action alternatives differ in the quantity of restored wetlands (see Management of Native Wetlands Table below). Total wetland acres will include wet prairie, sedge meadow, and marshes, probably in that order of abundance. See “Vegetation Communities” for projected acres of different wetland communities in each alternative.

Some site-specific effects may be beneficial, adverse, or both. Beneficial effects will result from restoring soils, hydrological patterns, and vegetation in former wetland areas. Watershed management practices will improve water quality from contributing areas, however, adverse effects may result from disturbing sites for restoration projects and building trails or other facilities. In some cases, existing wetlands, such as drainage ditches, will be modified to restore larger wetland areas, e.g. marshes. All action alternatives result in net beneficial effects to existing wetlands and former wetland areas.

Restoration activities in existing or former wetland areas will include the use of heavy machinery to remove woody vegetation, modify drain tiles or ditches, and plant desirable species. Adverse direct effects could include soil compaction, temporary loss of ground cover, soil erosion, and runoff from disturbed sites, all of which will be controlled with Prairie Plan Standards and Guidelines and Best Management Practices.

Constructing roads and trails in wetlands or in close proximity to wetlands can produce adverse effects by eliminating wetland vegetation, compacting or disturbing soils, or altering drainage. Potential effects will be minimized or eliminated by application of Plan Standards and Guidelines and the Forest Service Handbooks and Manuals. Existing roads and facilities will be removed from wetland areas or corrected to minimize negative effects as considered above for habitat and watershed restoration. The management of roads, trails, and facilities in all action alternatives will produce net positive effects on wetlands through net reductions in total miles and improvements in location and design.

Grazing in wetland areas can cause detrimental soil compaction or displacement. Prescribed burns in the contributing areas for wetlands can have adverse effects by allowing soil erosion of exposed areas or rapid runoff. See “Vegetation Communities” for further consideration of the integrity of wetland communities and the effects of grazing and prescribed fire.

Some hydric soil areas that lie within grassland habitat will not be restored as wetlands (See Estimated Minimum Channel Impacts Table below). Some existing ditches, drain tiles, and other drainage features will be retained in order to maintain the grassland habitat. Riparian areas may be enhanced or protected without complete restoration of native conditions. Because complete restoration will not occur in grassland habitat, there may be limited effects on hydrology and soils.

Table 3.3 - Management of Native Wetland Areas on Midewin

Activity	Alternative					
	1	2	3	4	5	6
Total wetlands (acres)	1670	3350	3850	4980	5750	5750
Hydric soil areas maintained or restored as wetlands (percent of total on MNTP)	15	49	56	69	83	83
Trails through hydric soil areas (approximate, miles)	0.3	26	31	16	20	9

The channel network on Midewin will be systematically restored. Perennial and intermittent streams will be improved by channel restoration, but restoring perennial streams to native configurations might not be feasible. Some ditches will be eliminated or reconstructed under all alternatives to support wetland restoration. In some cases, ditches will be backfilled and the land drained by the ditches will become Palustrine Emergent wetland (a broad, level area of seasonal or periodic inundation). In other cases, a channel (e.g. a gully) may be reconstructed, generally to create a shallower, more sinuous, less entrenched channel. Other treatments may be applied, with the effect of improving or protecting the physical integrity of wetland areas. The restoration activities will probably change the wetland functions and values of the drainage features; the restored features will function differently and support different types of aquatic or terrestrial species. The following table shows the estimated minimum levels of anticipated effects on the channel network.

Table 3.4 - Estimated Minimum Channel Impacts

Channel type and activity (miles)	Existing (miles)	Alternative (miles)					
		1	2	3	4	5	6
Ditches—elimination of drainage in areas under restoration to native vegetation	70	0	18	22	32	49	49
Intermittent channels—Reconstruction of gullies and ditches in swales for restoration to native vegetation	33	0	9	10	19	29	29
Perennial streams-- Restoration of native riparian vegetation	21	0	11	13	16	17	17
Perennial and intermittent streams-- Channel stabilization or improvement (without reconstruction)	54	0	45	44	35	25	25

Drainage restoration may have indirect effects on wetlands that depend upon site-specific conditions. Restoration of drainage patterns may increase water supply to channels, flats, or basins that presently support wetlands, which would require the existing wetland to adjust to the increased water supply. In some cases, drainage restoration may diminish the timing or quantity of water supply to wetlands, particularly marshes, ponds, or streams that receive waters through ditches or drain tile systems. As disclosed in the section on “Streamflow,” perennial and intermittent streams will tend to have higher base flows and lower peak flows. Also, the impoundment structures at Kemery Lake, Doyle Lake, and other ponds will be removed or improved under site-specific planning.

The potential effects of these actions, with the net beneficial improvements in wetlands, will not occur under the no-action alternative. Drain tile systems and drainage ditches will become less effective due to sediment and vegetation, and existing wetlands or wetland areas may benefit from the increases in water detention. Some ditches will continue to erode in gully form, with permanent loss of wetland soils, before natural stabilization occurs. Woody species will invade palustrine wetlands and uplands, which may reduce the supply of water to wetlands due to greater evapotranspiration. Also, dams or outlet structures at Kemery Lake, Doyle Lake, and smaller impoundments will probably fail, resulting in loss of existing marshes, damage to property and habitat downstream.

3.4.3.2.2. Cumulative Effects

Activities under any action alternative will have beneficial cumulative environmental effects on the wetlands in the four watersheds of Midewin. Large percentages of each of the watersheds will be restored to wetlands. See the two tables below.

Table 3.5 - Restoration of MNTP Wetlands by Watershed

Watershed	Alternative (Acres)				
	1	2	3	4	5, 6
Jackson	20	340	340	340	340
Grant	80	1470	1540	1720	1550
Prairie	570	1630	2060	2130	1980
Jordan/Lower Forked	0	0	0	630	980
Total	670	3440	3940	4820	5830

Table 3.6 - Wetlands as a Percent of Total Watershed

Watershed	Alternative (%)				
	1	**2**	**3**	**4**	**5, 6**
Jackson	2	3	3	3	3
Grant	4	7	8	8	11
Prairie	13	27	27	29	27
Jordan/Lower Forked	2	2	2	4	6

Actions on Midewin may have minor beneficial cumulative effects on wetlands of the Kankakee and Des Plaines Rivers.

3.4.3.3. MITIGATION

Mitigation measures are included in Prairie Plan Standards and Guidelines. These include protection of existing and restored wetlands and guidance for construction of roads, trails, and facilities in proximity to wetlands. Potential effects on existing wetlands will be analyzed for site-specific projects and mitigated if necessary. Mitigation rules for wetlands under the Clean Water Act apply.

3.4.3.4. MONITORING

Monitoring of the effects of any action alternative is necessary only at a basic level, i.e. to continue to inventory the number of acres of different types of wetlands on site as implementation of the plan proceeds. More detailed monitoring may occur in conjunction with site-specific restoration projects or research.

3.4.4. Streamflow

This section describes the effects of the alternatives on peak (flood) flows and base flows in the streams of Midewin.

3.4.4.1. AFFECTED ENVIRONMENT

Peak flows are the annual high flows or overbank flows. Peak flows most commonly occur in response to intense, prolonged thunderstorms of late spring or summer. Watershed conditions such as impervious areas and drainage ditches affect the magnitude and timing of peak flows. If actions on Midewin caused higher peak flows, downstream properties could be flooded more frequently or severely. Base flows are the low flow conditions that occur in streams under dry conditions, e.g. late summer, by the slow seepage of groundwater into channel beds. If actions on Midewin reduced base flows, aquatic species or communities could be lost or diminished in affected stream reaches.

Estimated current peak and base flows for the four trunk channels of Midewin streams are listed below. Prairie Creek and Jackson Creek usually discharge less than 3 cfs (cubic feet per second) during late summer, and some reaches of the streams commonly become disconnected pools. Grant Creek and Jordan Creek usually discharge less than 1 cfs in late summer and become dry on Midewin in some summers; the creeks sustain higher baseflows downstream from Midewin.

Table 3.7 - Existing Streamflow Conditions

Stream	Streamflow Conditions (cubic feet per second)		
	Low Flow*	**2-Year Flood****	**100-Year Flood*****
Jackson Cr.	< 1.0	1420	5050
Grant Cr.	< 1.0	450	1700
Prairie Cr.	< 1.0	1220	4240
Jordan Cr.	< 1.0	230	830

* 7-Day, 10-Year Low Flow (the lowest 7-day average flow that will probably occur only once in every 10 years). Based on Singh et. al., 1993.
**The peak annual discharge that has a 50% probability of occurrence in any given year. Based on Curtis, 1987.
*** The peak annual discharge that has a one percent probability of occurrence in any given year. Based on Curtis, 1987.

3.4.4.2. ENVIRONMENTAL CONSEQUENCES

3.4.4.2.1. Direct and Indirect Effects

All action alternatives include management practices to improve watershed conditions across Midewin under native and non-native vegetation. However, the improvements will be implemented with greater intensity or completeness in areas supporting wetland restoration, which varies by alternative. On this basis, it is assumed that all action alternatives have similar potential to produce the effects described below, but the magnitude of effect will vary somewhat in proportion to the amount of restored native habitat in each alternative.

Watershed management practices will cause changes in the interception and infiltration of precipitation, detention and storage, evapotranspiration, overland (surface) flow, and the extent of the channel system, all of which affect the mechanisms of runoff from watersheds. See Leopold, Wolman, and Miller (1964), Maidment (1993), etc. for description of the connections between watershed conditions and streamflow. Important actions and effects include:

1. Reduction of impervious or hardened surfaces and elimination of cropland will reduce the rate runoff leaves the watersheds, and will retain more water in the watersheds for long-term storage, e.g. reduce the time and magnitude of peak flows and increase baseflows that occur between storms.
2. Modification or elimination of drainage from ditches, drain tile systems, roads, rail lines, cropland, and impervious areas will reduce the rate runoff leaves the watersheds and retain more water in the watersheds for long-term storage.
3. Changes in evapotranspiration are not predictable with certainty. Replacement of row crops with perennial grasses will tend to increase evapotranspiration, particularly during springs months (times of crop emergence), resulting in lower streamflows. Removal of invasive trees may reduce mid or late-summer evapotranspiration from some upland and riparian areas with a resulting increase in baseflow.
4. Removal of obstacles or constrictions on channels and floodplains (such as sidecast levees and railroad grades) will improve the passage of waters onto floodplain areas for retention or storage, e.g. reduce the flood peaks that occur in downstream areas and increase baseflows that occur between storms.

The action alternatives include differing amounts of roads, trails, and facilities. Construction of roads, trails, and facilities can cause rapid runoff from compacted, barren, or impervious areas, i.e. quicker and higher peak flows. Temporary adverse effects of the same nature will occur in restoration areas and construction areas where work sites are temporarily cleared or used for

transportation, staging, etc. However, net beneficial effects are expected in all action alternatives, because road and rail removal exceeds road and trail construction. Plan Standards and Guidelines include provisions to control runoff from roads, trails, facilities, and sites of temporary disturbance.

All action alternatives include prescribed burning. Prescribed burns over large areas can cause watersheds to produce greater volumes of runoff more rapidly when storms follow the burn. Very hot prescribed fires can reduce the ability of soils to retain water, i.e. cause higher peak flows and lower base flows. Prescribed fires in riparian areas will have a higher potential to cause adverse effects. Provisions in Standards and Guidelines and the Forest Service Manual and Handbook minimize or eliminate adverse effects.

Important watershed changes are summarized below. As a net effect of actions on Midewin, watersheds will respond more slowly to precipitation and flood peaks that result from any given storm. Base flows in all creeks should improve, e.g. intermittent stream channels will continue to flow or remain wet for longer periods between rainfall, or perennial channels will maintain deeper water between pools during dry conditions. Improvements in peak flows and base flow may be slight or undetectable with no baseline to compare from, but the improvements may be significant for aquatic communities.

Table 3.8 - Indicators of Watershed Changes

Effective Actions	**Alternative**					
	1	**2**	**3**	**4**	**5**	**6**
Revegetation of cropland (acres)	0	3,000	3,000	3,000	3,000	3,000
Revegetation-- net reduction in facilities, lots roads, trails, and railbeds, (acres, estimated)	0	290	280	310	310	330
Drainage restoration-- net reduction in roads and railbeds (miles)	0	219	222	224	224	221
Drainage restoration— minimum ditch and tile reconstruction (acres, estimated as restored wetland plus 50% of associated prairie)	0	2,520	3,300	5,140	6,920	6,920
Net change in successional woodlands (acres)	+6900	-1400	-1400	-1400	-1400	-1400

Some existing channels (i.e. ditches) with aquatic or wetland communities will be modified or eliminated entirely to allow restoration of larger wetland areas. In such cases, the flow of the channel will become a more dispersed inundation, e.g. “sheetwater,” or persistent saturation that supports a wetland. See “Wetlands and Aquatic Resources” for additional information. Such conditions will produce lower peak flows and higher base flows in downstream areas.

Dimissie and Khan (1993) present data and mathematical models for northern Illinois that show watersheds with higher percentages of wetlands have proportionately higher baseflows and lower peak flows. This study allows estimation of the potential range of effects on streamflow that will result from wetland restoration on Midewin, presented below. The estimates are based upon

the projected increases in wetlands in each alternative (see “Wetlands and Aquatic Resources”) and data on existing conditions from the National Wetlands Inventory (USFWS). The estimates represent changes at the mouth of each creek.

Table 3.9 - Effects of Wetlands on Streamflow

Watershed	Alternative				
	1	2	3	4	5, 6
	Increase in Base Flow, %*				
Jackson Cr.	Na	20	20	20	20
Grant Cr.	Na	285	300	330	300
Prairie Cr.	Na	100	127	130	185
Jordan Cr.	Na	0	0	50	76
	Decrease in Peakflow/Rainfall Ratio, %**				
Jackson Cr.	Na	8	8	8	8
Grant Cr.	Na	110	120	130	120
Prairie Cr.	Na	39	50	52	73
Jordan Cr.	Na	0	0	19	30

**Percent increase in Q99, the flow that will probably be exceeded by 99 percent of all flows, measured as inches per day from the whole watershed area.
**Percent decrease in ratio of peak storm discharge (cubic feet per second per acre) to average storm precipitation.

Alternative 1 will result in net beneficial effects to streamflow at a lower level than the action alternatives. Alternative 1 includes completion of wetland restoration projects that are currently under development, particularly in Prairie Creek and Grant Creek. Drain tile systems and ditches would eventually become plugged with sediment or vegetation. Natural channel stabilization processes would gradually reduce the effects of past alteration and erosion of sidecast spoil banks. Vegetation and weathering would gradually reduce the impermeable nature of developed surfaces such as roads and parking lots. In sum, watersheds would retain more water, peak flows in streams would be reduced, and base flows would improve.

3.4.4.2.2. Cumulative Effects

Recent and future actions in the watersheds include further development and urbanization, which result in decreases in base flows and increases in peak flows. The actions on Midewin will cause significant beneficial effects on the four trunk channels of Midewin, i.e. peak flows will be reduced and base flows will increase. If watersheds upstream of Midewin are either improved or kept in stable condition, the cumulative effects of Midewin actions will be significant and beneficial. Alternatively, if upstream watersheds are modified adversely, the beneficial effects of Midewin management are less likely to be noticeable.

Lower peak flows will reduce the tendency for flooding in downstream areas. Modifications of floodplain areas on Midewin will have the same effect downstream. See the section on “Floodplains” for discussion of the actions and effects.

Because Midewin represents just a small portion of the Kankakee and Des Plaines River basins, and because other portions of these basins will continue to be dominated by development and expanding urbanization, actions on Midewin are unlikely to result in significant beneficial effects in terms of decreased peak flows and increased base flows of the Kankakee and Des Plaines Rivers.

3.4.4.3. MITIGATION

Mitigation measures are included in Plan Standards and Guidelines and the Forest Service Manual and Handbooks. These include protections of riparian and floodplain areas. No additional mitigation measures are necessary.

3.4.4.4. MONITORING

Monitoring the effects of the Plan on streamflow is recommended but not required because the beneficial effects are reasonable foreseeable. The effects of the Plan will be monitored through records of drainage modifications, vegetation restoration, conversion of croplands, and other actions described above that will be recorded for site-specific projects.

Mitigation measures for prescribed fire, roads, trails, and restoration sites will be monitored for implementation and effectiveness at the project level and will be equivalent to monitoring for soil conservation. Standards and Guidelines and the watershed management prescriptions, include mitigation measures such as the use of detention basins and silt fences. Evidence of rapid runoff, such as formation of rills or movement of litter, will indicate that mitigation is inadequate.

Streamflow in the creeks of Midewin may be monitored for research, education, or other reasons. The Forest Service routinely monitors channel conditions that may be affected by changes in streamflow. Changes in streamflow may not be recognizable given the absence of adequate long-term records and the continuing modification of upstream watershed areas.

3.4.5. Floodplains

This section describes effects of the alternatives on the extent or condition of floodplains. The term “floodplain” is used in a general sense to denote areas that receive and store floodwaters. The term “regulatory floodplain” is used to denote the floodplain areas for the 100-year flood as delineated by the Federal Emergency Management Agency for regulatory purposes. Effects of the alternatives on flood discharges are described in the section on Streamflow.

3.4.5.1. AFFECTED ENVIRONMENT

3211 acres of Midewin (19 percent) are included within a FEMA floodplain. Much of the western part of Midewin falls within the interconnected regulatory floodplains of the tributaries of the Kankakee and Des Plaines Rivers. (See Regulatory Floodplain Table below). On the western part of Midewin regulatory floodplains lie as narrow bands along small drainages and wider bands along the trunk valleys of Prairie Creek, Jackson Creek, Grant Creek, and Jordan Creek.

Table 3.10 - Regulatory Floodplain Areas of Midewin

Watershed	Total Watershed Area, Acres	Extent of 100-year Floodplain		
		Total Acres	Acres on Midewin	Percent on Midewin
Jackson Creek	33,384	4613	427	9
Grant Creek	10,730	3925	1145	29
Prairie Creek	33,670	4771	1400	29
Jordan/Lower Forked Creek	25,740	3254	239	7

The floodplain of the Jordan/Lower Forked Creek drainage below Midewin includes agricultural lands, urban homes, roads and bridges, commercial and residential areas of the city of Wilmington, and the proposed Will County Landfill and Island City Industrial Park. Prairie Creek floodplain below Midewin includes two bridges and part of the Des Plaines State Conservation Area. The Grant Creek floodplain downstream from Midewin is largely occupied by Des Plaines Conservation Area and also includes rail lines, roads, Interstate 55, agricultural lands, and rural homes. The downstream floodplain of Jackson Creek is largely occupied by the Joliet Army Training Area and also includes part of Exxon-Mobil petroleum refinery, rail lines, and a bridge. Illinois Route 53 crosses floodplain areas of Grant Creek and Prairie Creek or their tributaries downstream from Midewin property.

Broad areas of Midewin are prone to inundation by two processes. Overbank flow occurs when streamflow rises over channel banks and the silt-laden floodwaters disperse across the surrounding floodplains. Ponding or “sheetwater”

occurs when rain and snow accumulate in level areas because of the low infiltration capacities or high water tables and poor drainage. The regulatory floodplains and additional areas on lesser tributaries are susceptible to inundation by both processes. Some areas on the outwash plain function as floodplains for both Jackson Creek and Grant Creek, or both Prairie Creek and Grant Creek.

Overbank flow and ponding are interconnected, and both have been greatly modified on Midewin. Construction of drain tiles and ditches reduced detention of water in wetlands and other areas and increased the response of receiving streams to storms. Channelization of streams reduced the tendency for overbank flow by making channels deeper and faster, and spoil banks placed along channels have prevented overbank flow at normal flood stages. The dispersal and storage of floodwaters in floodplains has been reduced by fill, excavation of ditches, and construction in floodplains. Floodwater storage was added on site by the construction of Kemery Lake, Doyle Lake, and other small ponds.

3.4.5.2. ENVIRONMENTAL CONSEQUENCES

3.4.5.2.1. Direct and Indirect Effects

Restoration efforts will aim at reversing the effects of past actions described above, i.e. restoring patterns of flooding and inundation. Restoration actions as described in the Prairie Plan apply across Midewin under all action alternatives. However, floodplains will probably be restored to higher levels of integrity in areas allocated for restoration of native habitat. Restoration actions effects include:

1. Removing drain tiles and drainage ditches, which will increase detention and storage on drained floodplains, i.e. increase the frequency or extent of inundation, particularly in “sheetwater” areas.
2. Improving channelized streams and cut-off meanders, which will increase the occurrence of overbank flooding along creeks on Midewin.
3. Removing roads, rail beds, bunkers, ditches, spoil banks or other structures from floodplain areas, which will increase storage on floodplains, i.e., allow greater dispersal and retention of floodwaters on floodplain areas.

Some restoration efforts on Midewin will involve placement of fill in the regulatory floodplain, e.g. to fill ditches, road or rail bed cuts, etc. Compensatory removal of floodplain material may be required to satisfy regulatory requirements. (See #3 above).

Some actions on Midewin have the potential to produce undesired effects on floodplains. Constructing roads, trails, and facilities on floodplains will reduce the extent of floodplains or their functionality. Permanent adverse effects will be minor (see Mitigation). Temporary effects will occur during restoration efforts as

floodplains are disrupted for removing facilities, drain tiles, roads and rail beds, etc. Temporary effects will be minor or insignificant (See "Mitigation" below). All action alternatives propose net reductions in the extent of roads, trails, and facilities on floodplains, i.e. net beneficial effects on floodplains.
The actions and effects described here will indirectly cause flooding to occur less frequently or extensively in downstream areas because floodplains on Midewin will have greater capacity to store floodwaters and release them more slowly. (See also the section on Streamflow). Such effects may be regarded as beneficial by downstream landowners.

Alternative 1 may result in the same net effects to floodplains at a lower level and rate than the action alternatives. Drain tile systems and ditches would eventually become plugged with sediment or vegetation. Natural channel recovery processes would gradually reduce the effects of past channelization and floodplain modifications, erosion of sidecast spoil banks, and erosion of floodplain spans or obstacles. In sum, floodplain areas would be broader or more accessible to overbank flow and floodplains would retain water for longer periods.

Table 3.11- Floodplain Condition Indicators

Indicator	Alternative					
	1	2	3	4	5	6
Regulatory floodplain under restoration to native vegetation (acres)	65	200	210	290	275	275
Channel restoration (see also "Wetlands and Aquatic Resources")	No	Yes	Yes	Yes	Yes	Yes
Approximate floodplain crossings (bridges, culverts)	200	50	55	35	38	20
Floodplain facilities or building sites	35	0	0	0	0	0

3.4.5.2.2. Cumulative Effects

Under all action alternatives, floodplain areas on Midewin will be expanded, inundation and overbank flooding will occur more extensively or frequently, and floodplains will drain less rapidly. Those effects are desirable for restoring and managing wetlands and other habitats. The increases in inundation on Midewin will reduce the tendency for flooding in downstream areas. Modifications of peak flows will have the same effect downstream as disclosed in the section on "Streamflow."

Recent and future actions in other areas of the watersheds include limited development of floodplain areas under regulations that require restoring floodplain functions to compensate for losses to development. Modifications of floodplains upstream can partially offset the potential effects of management on Midewin, but regulatory controls should prevent upstream losses that are comparable to gains. The incremental improvements on floodplains of Midewin can add up to changes in flood patterns that have significant beneficial ecological

and economic consequences for Midewin and downstream areas within the four watersheds of Midewin.

Because Midewin represents just a small portion of the Kankakee and Des Plaines River basins, and because other portions of these basins will continue to be affected by expanding urbanization, actions on Midewin are unlikely to result in significant beneficial effects on floodplain functions of the Kankakee and Des Plaines Rivers.

3.4.5.3. MITIGATION

Prairie Plan Standards and Guidelines protect floodplain areas to minimize or eliminate the potential effects of building new roads, trails, and facilities by favoring locations outside of floodplains, favoring permeable surfaces, and encouraging designs that maintain floodplain storage capacity. Potential effects on floodplains will be analyzed for site-specific projects and mitigated if necessary according to floodplain regulations.

3.4.5.4. MONITORING

Monitoring of the effects of the plan on floodplains is not required. Effects on floodplains will be analyzed at the site-specific level.

3.4.6. Adjoining Drainage

This section describes direct and indirect effects on adjoining properties that could result from modifying drainage and wetlands on Midewin. Responses to scoping included concern that wetland restoration or alteration of drainage systems could cause adverse effects on adjoining lands, particularly agricultural lands that share ditch or tile systems with lands of Midewin.

3.4.6.1. AFFECTED ENVIRONMENT

Midewin is adjoined by properties in upstream and downstream locations. Several small drainage areas on the east side collect waters from cropland, home sites, and roads and discharge the waters onto Midewin through ditches or tiles. One small drainage area on the east side discharges onto adjoining agricultural property. Midewin includes the upper portions of drainages that enter the proposed landfill and Island City Industrial Park, and later discharge across roads and private agricultural or residential property. Jordan Creek, the Doyle branch of Jordan Creek, Prairie Creek or its minor tributaries, Grant Creek, and Jackson Creek, all discharge from Midewin across roads or onto private property.

3.4.6.2. ENVIRONMENTAL CONSEQUENCES

3.4.6.2.1. Direct and Indirect Effects

The effects of the alternatives on streamflow are covered in the sections on “Floodplains” and “Streamflow”. It is projected that wetland restoration and related activities on Midewin will reduce peak flows and flooding in downstream channels (or tile lines) and increase base flows in channels.

Drainage restoration projects will consist of one of the following actions: (1) Filling or regrading a ditch, (2) Reconfiguring a ditch or creek channel, or (3) Breaking a tile line to route water to the surface. If a channel or tile line is modified near an upstream property, the capacity of the drainage line at the property line may be reduced if the drainage modification reduces the slope of the water surface (the hydraulic gradient), under flood conditions. Without mitigation measures, the reduction in drainage capacity could result in upstream property damage, such as more prolonged soil saturation in cropland, more frequent flooding of roads following heavy precipitation, more discharge and erosion in roadside ditches, or more frequent drainage problems around homes.

Within these drainage areas, modifications of channels or lines on branches (tributaries) that drain only Midewin properties will have no potential for adverse effects on upstream lands. Any modifications on these drainage features that reduce drainage into trunk lines will have no adverse effect on properties that adjoin Midewin upstream on trunk lines.

Modifications of channels or tiles at sites on Midewin that are far removed (downstream) from upstream properties also will have no potential to affect upstream lands. To be “far removed”, the slope and configuration of the drainage line must remain intact from the property boundary downstream an adequate distance so that the capacity of the drainage line is not reduced. Analyses for site-specific projects will determine where and how a modification may occur to maintain desired drainage from upstream properties.

Plan Standards and Guidelines require consulting with landowners for drainage modifications that could produce effects on neighboring lands. Site-specific project designs will avoid adverse effects. With mitigation measures, the modification of drainage systems under any action alternative will have no effect on adjoining lands upstream.

The no-action alternative includes no wetland restoration or modification of drainage systems. Under such an alternative, ditches and drain tile systems would fall into disrepair. The lack of maintenance, particularly on tile systems, would eventually reduce the effective drainage from adjoining upstream properties.

3.4.6.2.2. Cumulative Effects

Programmatic modification of drainage systems will have no cumulative effects on upstream properties. As disclosed sections on “Streamflow” and “Floodplains”, restoration activities on Midewin will reduce peak floods and flooding downstream and increase base flows in streams.

3.4.6.3. MITIGATION

Ditches and tile lines from upstream properties may not be modified without the consent of upstream property owners, if the modification would potentially cause adverse effects to the effective drainage of upstream properties. Site-specific analyses for projects that affect tile lines or ditches that enter Midewin from upstream areas will determine what modifications may be performed without impacting the upstream properties.

3.4.6.4. MONITORING

Monitoring will consist of recording analyses and consultations performed for drainage projects, that affect drain tile systems or ditches that drain areas upstream from Midewin. Project records will establish that the project would clearly result in no effect on upstream drainage or to establish agreement and understanding with upstream landowners of potential effects.

3.4.7. Water Uses and Facilities

This section describes the effects on water uses, supplies, and facilities.

3.4.7.1. AFFECTED ENVIRONMENT

Water on Midewin is used for aquatic life habitat and livestock watering. There are presently no wells or surface withdrawals on site that produce water for human consumption. Temporary diversions from creeks have been used occasionally to provide water outside of the channel for cattle. Projected uses under action alternatives also include human consumption at administrative and recreational sites.

Midewin currently maintains 7 wells to provide water to livestock; all are less than 6 inches in diameter and less than 220 feet deep, and produce 500 to 2000 gallons per day. Six other wells of comparable size formerly existed on site, but have been closed or plugged. A well at the administrative site produces groundwater for domestic, non-potable uses and landscape maintenance. Other water facilities of the former arsenal are or will become property of Midewin, but will not be operable and will not be restored, including a water treatment plant, wastewater treatment plant, and the water and sewer distribution systems. Midewin has no other water facilities.

Communities and private enterprises in the region rely on groundwater or the larger streams (i.e. the Kankakee and Des Plaines Rivers) for water supplies. Many small-capacity wells obtain groundwater from a shallow dolomite aquifer or overlying glacial material. A deeper sandstone unit is an important aquifer for the region, and water levels in the aquifer have declined dramatically in recent decades. Water levels in wells in the Wilmington area have declined through the past several decades.

3.4.7.2. ENVIRONMENTAL CONSEQUENCES

3.4.7.2.1. Direct and Indirect Effects

The action and no-action alternatives will not affect surface water facilities, supplies, or uses. See “Streamflow” for a discussion of effects on base flow in streams.

Groundwater will be utilized to provide water to livestock. Under all alternatives, it will be necessary to construct and operate wells. If continuous groundwater withdrawals from the shallow aquifer cause drawdown of the local water table, nearby wetlands may lose their hydrological integrity. Some wetlands may be sensitive to minor (inches) fluctuations in groundwater levels.

Present withdrawals of groundwater for livestock watering (i.e., Alternative 1) average approximately 500 to 2000 gallons per day. Given an effective porosity of 30% in the aquifer and an affected area of 10 acres, the withdrawal is roughly equivalent to a draw down of the water table of 0.6 to 2.4 inches over a span of 100 days. This determination oversimplifies the actual processes of well-draw down and recharge, but provides an indicator of the magnitude of effects. The actual area (and depth) of an aquifer affected by well drawdown or recharge will usually be much larger, and the measure of equivalent depth of water should accordingly be much smaller. Given the typical quantities and intervals between summer precipitation, it may be assumed that such withdrawals can be easily recharged (0.2 to 0.8 inches equivalent precipitation). All action alternatives will include widely spaced wells that will produce similar quantities of water.

Drainage and wetland restoration in Alternatives 1 to 6 will result in greater storage (recharge) of groundwater in the shallow aquifers, which will help to stabilize groundwater levels. However, the most intensive and regular grazing will occur in areas on non-native grasslands, where wetlands may not be fully restored and groundwater withdrawals for livestock will be greater.

3.4.7.2.2. Cumulative Effects

The alternatives will have no cumulative effects on water uses, supplies, or facilities in the watersheds of Midewin or the watersheds of the Kankakee and Des Plaines Rivers.

3.4.7.3. MITIGATION

Plan Standards and Guidelines include the following: to prevent adverse effects to groundwater levels and wetlands, construct and operate livestock wells to yield less than 2000 gallons per day; prefer many low-production wells (less than 1000 gallons per day) rather than a few high-production wells. Deeper wells will generally tap larger recharge areas and have less potential to cause fluctuations in wetland hydrology; do not locate wells in wetland areas.

3.4.7.4. MONITORING

Monitoring of the effects of the Prairie Plan on existing water uses, supplies, and facilities is not required, except that any new water facilities or uses will be properly recorded.

3.4.8. Soils

This section describes the effects of the alternatives on the soils of Midewin. This section focuses on the physical integrity of the soils within the watershed environment.

3.4.8.1. AFFECTED ENVIRONMENT

Thirty-three soil series have been mapped on Midewin excluding borrow pits and man-made land. The till plain (east side) is dominated by the Elliot Series in upland areas, the Ashkum series along drainages, and connected areas of the Varna Series. The Drummer Series (the state soil of Illinois) and the associated Brenton Series dominate the outwash plain, and the similar Millsdale, Channahon, and Joliet Series occur extensively on the outwash plain in areas of shallow depth to bedrock. The outwash plain has a greater variety of soils than the till plain due to the presence of many small inclusions with sand or gravel deposits.

The silt and clay components of the soils are easily transported by water or the strong local winds. Rapid soil erosion by water occurs on streambanks, roads, and ditches. Evidence of past sheet erosion or soil deposition is observable in sloping cropped fields. Rill erosion is presently rare on Midewin because low slopes or vegetation limit the power of overland flow and soil conservation practices have been implemented in the most vulnerable areas. Gully erosion has occurred in the past and continues in excavated ditches, gullies below drain tile outlets, and similar sites. Cultivated fields have been exposed to wind and water for many decades with noticeable soil loss or deposition in some areas.

Past uses and disturbance of soils on Midewin have changed the soil landscape in ways that may be irreparable or reversible only through many decades of recovery. Soils and subsoils were excavated, filled, and compacted for construction of roads, rail lines, buildings, ditches, borrow pits, pipelines, and other infrastructure. Most areas were drained and converted to agriculture decades ago, with consequential soil loss by erosion as well as changes in soil structure, organic matter, and biological communities. Pesticides and industrial fertilizers have been used through several decades.

3.4.8.2. ENVIRONMENTAL CONSEQUENCES

3.4.8.2.1. Direct and Indirect Effects

All of the action alternatives will have beneficial effects on soils as a result of restoration. The watershed management components of ecosystem restoration provide for restoring and protecting soils across Midewin under all alternatives.

However, a higher degree of improvements in soil conditions will probably be obtained in areas restored to native vegetation, so Alternatives 5 and 6 have the greatest potential for beneficial effects, followed by 4, 3, and 2, respectively. Relevant actions that will produce beneficial effects include:

1. Eliminating croplands and establishing perennial vegetation will reduce erosion, halt compaction, eliminate agricultural chemicals, and allow recovery of soil properties.
2. Rehabilitating impervious areas, e.g. parking lots and buildings, by restoring perennial vegetation will restore productivity, reduce erosion, allow reversal of some compaction, and allow recovery of soil properties.
3. Reconstructing or improving channels, ditches, and floodplains, will reduce erosion of riparian soils.
4. Correcting designs, disturbances, or drainage problems in roads, ditches, or other sites will reduce erosion of soils.
5. Reconstructing topography, by replacing excavated material or removing fill and establishment of perennial vegetation, will reduce erosion and allow recovery of soil properties.

Long-term beneficial effects will occur under all action alternatives. Existing levels of erosion will be reduced in many areas. In some areas, existing soil compaction will be alleviated through time by root growth of vegetation, burrowing animals, frost action, and shrink-swell processes. Soils will regain organic content, bulk structure and density, and drainage properties. Without disturbance or continued grain crops, highly disturbed soils may begin to develop or redefine their horizons under the action of precipitation and drainage, rooting vegetation, and burrowing animals. The Table on Soil Improvements below provides indicators of the potential for beneficial effects under each alternative.

Table 3.12 - Soils Improvements

Activities	Alternative					
	1	2	3	4	5	6
Soil series with native vegetation (no. of series)	25	31	31	31	33	33
Soils restored to native vegetation (acres)	0	6,510	7,560	10,140	12,920	12,920
Revegetation of cropland (acres)	0	3,000	3,000	3,000	3,000	3,000
Revegetation-- net reduction in facilities, lots roads, trails, and railbeds, (acres, estimated)	0	290	280	310	310	330

The restoration of soils under perennial vegetation provides necessary conditions for recovery of native physical and chemical soil properties that may be important for soil formation and small-scale ecological processes. Fire, grazing, and poor drainage were components of the natural landscape and soil formation processes. Restored or stabilized soils will acquire and retain specific conditions of reduction-oxidation potential, pH, temperature, nutrient levels, cation exchange processes, transport of clays and colloids, storage and transport of water, and

the formation of micropores or other microstructures. Some of these physical and chemical conditions may be necessary for recovery of the microbial, invertebrate, and plant life of the native soil communities. The many possible relationships between soil conditions and prairie communities are not documented for analysis here. It is assumed that the effects of soil restoration will be beneficial to the native communities, by increasing the extent of soil conditions within the natural range of variability.

All action alternatives will also have adverse effects on soils. Construction of roads, trails, and facilities will cause soil disruption, compaction, and erosion. Permanent developed sites eliminate soil productivity. Restoration activities will cause soil disturbance, compaction, or erosion in order to find or disable drain tiles, reconstruct topography, restore channelized creeks or ditches, and remove woody vegetation. Grazing can cause detrimental soil compaction, displacement, or erosion. Prescribed fire can expose soils to erosion or reduce soil quality by "baking" under intense heat. (Note that disturbance by grazing and prescribed fire occurred under natural conditions). Continuing crop production will cause soil erosion and compaction. The table below provides indicators to compare the potential for adverse effects under the alternatives.

Table 3.13 - Indicators of Adverse Effects on Soils, Estimated

Activities	Alternative					
	1	2	3	4	5	6
Permanent roads, trails, railbeds (acres)	368	81	90	54	58	39
Permanent facilities, lots (acres)	29	11	11	9	8	4
Site disturbance for restoration (acres, total)	0	480	500	510	540	630
Site disturbance by livestock (acres, annual)	3	10	9	6	4	4
Cropland (acres, long-term)	3000	0	0	0	0	0
Total (acres, estimated)	3390	570	600	570	600	670

The magnitudes of adverse effects depend strongly on location, design, manner, and timing of construction or other activity in a site-specific project. All of the actions named above are subject to Plan Standards and Guidelines to control effects on soils. With application of Plan Standards and Guidelines as mitigation, adverse impacts are minor. Notably:

1. Guidelines for riparian areas limit or exclude grazing, road and trail development, and visitor uses in riparian areas.
2. Guidelines emphasize using existing road and rail beds for roads and trails, designated work areas for restoration activities, and monitoring and mitigating rutting, erosion, or other adverse conditions.
3. The maps of the alternatives present only conceptual locations for roads, trails, and facilities. The distribution of soils on Midewin allows

opportunities to locate, design, or mitigate adverse effects at the site-specific level.

The No-action Alternative may result in net beneficial effects to soils at a lower level or rate than the action alternatives. Some areas of aggravated erosion, such as some streambank sites, would gradually stabilize, but lack of maintenance of roads, ditches, and drain tile systems would result in the aggravated erosion at other locations. However, some mollisols and alfisols, which formed under prairie and forest vegetation respectively, and some hydric soils, which formed under persistent saturation, would not regain their native properties under the invasive vegetative covers and altered hydrological conditions that persist in Alternative 1; resulting in a long-term decline in the ability of the soils to support native vegetation.

3.4.8.2.2. Cumulative Effects

All action alternatives will have net positive cumulative effects on the soils of each of the four watersheds of Midewin. Relevant recent and future actions in the watersheds include continued crop production and expanding urbanization. Agricultural uses continue to employ existing or new soil conservation techniques or habitat restoration practices. Soils in the watersheds are increasingly lost to urbanization. Soil improvements and protections will occur across Midewin under any alternative, and Midewin includes large percentages of the soil resources of each watershed.

3.4.8.3. MITIGATION

Mitigation will be necessary at the site-specific level to ensure that projects avoid and minimize detrimental effects. Required mitigation measures are included in the Forest Service Manual, the Prairie Plan, and wetland permit requirements, including Best Management Practices.

3.4.8.4. MONITORING

Monitoring of the effects of any action alternative is necessary only at a basic level, i.e. to continue to inventory the number of acres of different types of land uses as the Prairie Plan is implemented. The number of acres in cropland, roads, impervious surfaces, and perennial vegetation will be the principal measures of effects on soils. Site-specific projects, e.g. grazing and trails, will be monitored for erosion or effects on soils to meet Standards and Guidelines of the Prairie Plan. More detailed monitoring may occur in conjunction with site-specific restoration projects or research.

3.4.9. Air Quality

This section discloses the effects on air quality that may result from activities on Midewin, particularly prescribed burns. This EIS does not analyze the effects of surrounding air quality or pollution sources on Midewin.

3.4.9.1. AFFECTED ENVIRONMENT

Midewin shares air resources with agricultural, residential, commercial, and industrial users in a broad surrounding area. Towns and rural homes lie downwind from Midewin and roads and rail lines cross Midewin or lie in close proximity.

Midewin and all of Will County lie within a designated ozone non-attainment area (nna) surrounding greater Chicago. Ozone concentrations in the nna tend to exceed one-hour National Ambient Air Quality Standards for ozone during mid-afternoon hours of summer days.

Ozone is a secondary pollutant resulting from reactions of primary air pollutants. The key ingredients for near-surface ozone pollution are automobile exhaust, [oxides of nitrogen (NOx), volatile organic compounds (VOC)], and the energy from sunshine. The concentrations of the ingredients tend to fluctuate with daily traffic patterns. Ozone concentrations usually peak during mid-afternoon hours on summer days in conjunction with high levels of solar input, warm temperatures, and relatively stagnant air movement conditions.

The Illinois Environmental Protection Agency enforces air quality regulations in the nna under the Clean Air Act. Midewin does not presently have any regulated point emission sources of air pollution (major or stationary sources). Proposed activities on Midewin that may contribute to air pollution include; prescribed fire and piling and burning of woody vegetation, operation of vehicles and agricultural machinery, use of agricultural chemicals, road maintenance, and domestic activities. Of these, combustion of vegetative matter represents the greatest potential and only significant contributor of air pollution by Midewin. Therefore, only prescribed fire and piling and burning of woody vegetation will be considered in this assessment.

3.4.9.2. ENVIRONMENTAL CONSEQUENCES

3.4.9.2.1. Direct and Indirect Effects

Actions on Midewin under all action alternatives include prescribed burning of grasslands and piling and burning of woody vegetation. Both actions aim at creating or maintaining open grassland habitat. The combustion of vegetation on

Midewin will release nitrogen oxide compounds (NOx), volatile organic compounds (VOC), and particulate matter. Prescribed burns will also release ash and noxious fumes that may have local effects such as low visibility or respiratory stress.

All action alternatives include using prescribed fire for habitat management across Midewin. Prescribed fire will be used more frequently restored prairie. For this analysis, it is assumed that maximum number of acres to be burned in one year under any alternative is equal to 50% of the restored native prairie and 30% of the non-native grassland area.

Alternatives 2 to 6 remove undesired woody vegetation from a variety of habitats, particularly unfragmented tracts. It is assumed that the alternatives do not vary in the potential amount of pile burning that may occur. Woody vegetation may be disposed by pile burning, chipping for mulch, trail or other construction, firewood, etc.

Due to the high daily variability in diurnal ozone production potentials, meteorological conditions, and long-range transport of pre-fire ground level ozone concentrations, a high level of variability will exist regarding the production of ozone by activities at Midewin. Even so, the effects of burning on ozone pollution strongly depend on how much burning is completed in any given year, and the season and hour when burning is done. Plan Standards and Guidelines include the mitigation measure that burning will be performed only during spring, fall, and winter months (to achieve habitat goals as well as to control air pollution).

The table below presents estimated emissions of VOC, NOx, and particulate matter that result from prescribed and pile burning under the alternatives, with and without mitigation. It is assumed that the prescribed burn of any given acre of grassland or any given volume of woody vegetation will release a certain amount of particulate matter, NOx, and VOC. Guidelines from the Illinois EPA provide a basis for determining whether Midewin qualifies as a major source of pollution that requires regulatory oversight (35 IAC Part 211 and 237.120). At this time and in the foreseeable future, burning at Midewin will not be designated as a major source. However, Midewin will adhere to the regulations of the Illinois EPA's State Implementation Plan managing pollutants resulting from burning vegetation.

Emission factors for VOC and particulate matter were compiled from the EPA's AP-42 guide on wildfires and prescribed burning. Studies have shown that emission factors for some emissions depending on fuel and fire conditions (McMahon 1983). Generally, the NOx emission factor for a prescribed fire is between 1-9 lbs/ton (RX-450 1994). This NOx emission factor range is not specific to fuel arrangement, type, intensity of burn, or rate of spread.

Information about nitrogen dioxide produced from burning forest fuels is limited and somewhat inconclusive (McMahon 1983). Specific information on NOx emissions from the burning of grasslands and piled forest residue is not available. For this assessment, an average of 4.5 lbs/ton NOx emissions for grassland and piled forest fuels are used to estimate (worse case) the annual/daily emissions of NOx production through the use of prescribed fire at Midewin, although this may be an over estimate. A baseline estimate is needed to compare future NOx emissions produced at Midewin, with those of the stationary NOx emissions produced in the ozone nna's within northeast Illinois, northwest Indiana, and southeast Wisconsin.

Assumptions to develop Table 3.14:

1. No prescribed fire will occur under the no-action alternative.
2. No prescribed fire or pile burns will occur in the months of May through September with the mitigation measures in place.
3. 2,870 to 7,170 acres of grassland will be prescribe burned in a year of extremely high activity (i.e., worst-case).
4. To estimate maximum daily emissions for summer months in the absence of mitigation, it is assumed that in an unfavorable year, annual prescribed burns are completed on just five days, one of which falls within the period when ground level ozone may exceed standards. (The actual number of burn days will likely be much higher. This five-day assumption increases the estimated maximum daily emissions by dividing the emissions among fewer days.)
5. The emission rates for prescribed burns at Midewin are .0301 tons/acre for VOC Methane and Non-Methane, .00675 tons/acre for NOx (estimated), and .0301 tons/acre for particulate matter (Smoke Management Techniques RX-450, 1994)
6. Midewin will clear 100 acres of woody vegetation in a year and pile burn all of it over a five day period in a year of extremely high activity (i.e., worst-case).
7. The emission rates for unspecified forest residues (pile burning) are .0234 tons per acre for VOC Methane, .00675 tons/acre for NOx (estimated), and .078 tons/acre for particulate matter (EPA AP-42, 1999).

Table 3.14 - Air Pollution from Prescribed and Pile Burning

Alternative	Estimated Pollutant Emissions					
	Annual Maximum (tons) With Mitigation			Daily Maximum, May to Sept. (tons)*Without Mitigation*		
	VOC	NOx	Particulate Matter	VOC	NOx	PM
No-action alternative	0	0	0	0	0	0
2	184.9	42.7	190.4	37	8.5	38.1
3	191.4	44.1	196.9	38.3	8.8	39.4
4	207.3	47.5	212.7	41.5	9.5	42.5
5	222.4	50.9	227.9	44.5	10.2	45.5
6	222.4	50.9	227.9	44.5	10.2	45.5

** Includes the usual period of ozone non-attainment.

The estimates represent worst-case conditions that are unlikely. Annual emissions will probably range from 50 to 85 percent of the values (annual totals) presented above.

In addition to effects on regional air quality, particularly ozone, prescribed burns adversely affect local air quality. Smoke from prescribed fires will drift downwind and may reduce visibility or cause distraction on roads and highways. Smoke may cause unpleasant odors, carry ash, or cause respiratory stress in some individuals, particularly the young, the elderly, or others with respiratory ailments.

The local effects of burning depend strongly on variables are controlled in site-specific burn plans, particularly wind speed, wind direction, temperature, humidity, and fuels conditions at the time and place of the burn. Local effects of burning will be mitigated with design components in site-specific burn plans

The most favorable conditions for burning will be clear skies with a light breeze (unstable, slightly unstable, and neutral atmospheric conditions with a favorable thermal gradient.) Regional weather patterns generally include winds from the southwest, west, or northwest when the most favorable conditions occur. Prescribed burns under these conditions may result in smoke being dispersed over Midewin, Illinois Route 53, Abraham Lincoln National Memorial Cemetery, local properties that include homes and industries, and the villages of Manhattan, Symerton, Wilmington, or Elwood. Given the unfavorable conditions that accompany eastern winds, it is unlikely that smoke from prescribed burns will affect Interstate 55.

3.4.9.2.2. Cumulative Effects

Relevant recent or future actions in the Chicago-area ozone non-attainment zone include: (1) On-going urbanization, with increasing automobile traffic and other disperse combustion sources, (2) Initiatives to reduce vehicle and other disperse

emissions through the use of zero-emission or low-emission vehicles, cleaner fuels, restrictions on traffic or other activities, and (3) Diminishing grasslands and agricultural crops.

The table below presents estimated relative emissions from Midewin as percentages of all loads from the Ozone Non-Attainment Areas in northeast Illinois, extreme southeast Wisconsin, and northwest Indiana. The percentages were calculated as the ratios of the values from the table to values for total loads obtained from (EPA AIRS DATA, 1999), which are: (1) 240.2 total tons daily emissions of VOC, (2) 536.8 total tons daily emissions of NOx, (3) 356.2 total tons daily emissions of particulate matter.

Table 3.15 - Cumulative Effects of Air Pollutants from Midewin

Alternative	Estimated MNTP Emissions in Ozone Non-attainment Area, %					
	Annual With Mitigation			Maximum during period of ozone non-attainment (May to Sept.) Without Mitigation		
	VOC	NOx	Particulate Matter	VOC	NOx	Particulate Matter
No-action alternative	0	0	0	0	0	0
Alternative 2	0.211%	0.022%	0.146%	15.4%	1.58%	10.7%
Alternative 3	0.218%	0.023%	0.151%	15.9%	1.64%	11.1%
Alternative 4	0.236%	0.024%	0.164%	17.3%	1.77%	11.9%
Alternative 5	0.254%	0.026%	0.175%	18.5%	1.9%	12.8%
Alternative6	0.254%	0.026%	0.175%	18.5%	1.9%	12.8%

The calculations in the two tables above indicate that emissions from Midewin during a year of high fire activity will be a minor source of the pollutants in the ozone non-attainment areas in Illinois, Wisconsin, and Indiana. The total emissions of the ozone precursors are not directly proportional to total increases in ground level ozone concentrations. In addition, if the appropriate mitigation measures are in place, the managed fire components of any of the alternatives will not cause any increase in emissions of the pollutants that are the ingredients for ozone pollution during late summer months.

3.4.9.3. MITIGATION

Standards and Guidelines include provisions to control the seasonal timing of burns. Planning of prescribed burns will follow protocol in the Forest Service Manual to control potential adverse effects.

3.4.9.4. MONITORING

Monitoring of air quality in general, including NOx or VOC emissions, is not required beyond the annual plans and records of prescribed burns. Monitoring of smoke from prescribed burns is required on a site-specific project basis to insure that adverse effects on health or safety do not occur downwind.

3.5. *VEGETATION*

3.5.1. INTRODUCTION

Vegetation on Midewin consists primarily of woody plants (trees, shrubs, and woody vines) and herbaceous plants (including perennial, biennial, and annual herbs). Various bryophytes (mosses and liverworts), lichens, and algae are present, but are only predominant on certain substrates, primarily on exposed rock and tree bark. At present, the vegetation of Midewin is comprised of approximately 600-620 species of vascular plants. Approximately 25% of these plant species are not native to Midewin or immediately adjacent areas.

Vegetation can be described as plant species associations, plant communities, natural communities, or by structure and habitat characteristics. The classification used here is one for natural communities based on White and Madany (1978) with suggested additions by White (1995). The classification of cultural communities (White and Madany 1978) have been expanded to reflect the diversity of structural types present on Midewin; some of these types provide important habitat for plant or wildlife species of conservation concern or public interest.

Current vegetation at Midewin includes small remnants of the original native vegetation (<2.5% of total vegetation cover); however, most of the landscape (>97.5%) is covered by vegetation types that are the direct or indirect result of human activities, including planting.

3.5.2. AFFECTED ENVIRONMENT

3.5.2.1. Terrestrial Natural Communities (Native Vegetation)

These are surviving remnants of the original pre-1830 natural vegetation of the area now contained within Midewin. Approximately 2.3% of Midewin is comprised of intact natural communities. The table below displays the various natural communities with their corresponding acreages. Natural communities were identified using two criteria:

1) the physical habitat is natural, not artificial or severely disturbed, and
2) the site is dominated by native plants.

A total of 18 different natural communities were identified and categorized into nine broad natural community classes: floodplain forest, upland forest, woodland, savanna, seep, marsh, sedge meadow, typic prairie, and dolomite prairie (Ecological Services 1995). Other natural communities may have been present, but were destroyed or degraded beyond recognition. Nearly all native vegetation

remnants on Midewin have been disturbed or degraded to varying degrees, primarily from lack of suitable management (fire suppression), disturbance by ordnance production activities, agricultural use, hydrological alterations, and encroachment by non-native and native invasive plant species. These native vegetation remnants are described in greater detail in Appendix A of the Plan.

Table 3.16 - Natural Communities of Midewin

Natural Community	Acreage	TNC Ranking[1]
Wet Floodplain Forest	0.125	G3/S3
Wet-mesic Floodplain Forest	4.093	G3/S3
Mesic Floodplain Forest	0.229	G3/S3
Wet-mesic Upland Forest	10.001	G3/S4
Mesic Upland Forest	85.956	G3/S4
Mesic Woodland	49.208	--
Dry-mesic Woodland	0.432	--
Wet-mesic Savanna	2.193	G1/S1
Mesic Savanna	22.772	G1/S1
Seep	0.619	G2/S2
Marsh	57.949	GU/S2
Sedge Meadow	20.355	G3/S2
Wet Typic Prairie	15.739	G3/S1
Wet-mesic Typic Prairie	10.580	G2/S1
Mesic Typic Prairie	3.702	G2/S1
Wet Dolomite Prairie	39.410	G3/S2
Wet-mesic Dolomite Prairie	71.787	G1/S2
Mesic Dolomite Prairie	4.989	G1/S2
Total Natural Communities	400.139	N/A

3.5.2.2. Cultural and Successional Communities

This classification includes all vegetation on Midewin that is not an identifiable remnant of the original (pre-1830) natural vegetation or restored native vegetation. The most modified examples include cropland, lawns, and other intensively managed vegetation. This category also applies to areas where intensive human uses (e.g. agriculture) have ceased and the vegetation has been allowed to change without management. The latter situations may include some remnants of native vegetation that been degraded beyond recognition. Approximately 97.7% of Midewin consists of cultural or successional vegetation types. Among the categories present on Midewin are developed land, cropland, agricultural grassland, wet meadow, disturbed emergent wetlands, successional native grasslands, and successional non-native vegetation; the latter type can be divided into forb land, non-native grassland, shrubland, successional woodland, and tree plantations. On Midewin, some types of successional and cultural

[1] TNC Ranking is based on an organism's or community's rarity and endangerment. "G" rankings are global or range-wide while "S" rankings are state-wide. The smaller the number, the greater the rarity and endangerment (NatureServe 2000). Woodlands are a new community classification suggested by Ecological Services (1995) and do not have corresponding TNC rankings in Illinois.
Source: Midewin National Tallgrass Prairie GIS database

vegetation provide habitat for certain wildlife and plants, includes grassland birds and raptors.

3.5.2.3. Restored Native Vegetation

Approximately 312 acres of former agricultural grassland are being restored to prairie communities, including some dolomite prairie. These tracts are at or adjacent to the Drummond Dolomite Prairie area, were formerly grazed, but do support a mosaic of prairie vegetation within a matrix of non-native grasses and weedy forbs. Livestock have been excluded from these areas since 1997, and prescribed burning is planned.

Two areas west of Illinois Route 53 are in early stages of restoration to native vegetation. These sites include former crop fields, forb lands, and fencerows (326 acres). The eventual vegetation would be restored wet typic prairie, dolomite prairie, upland typic prairie, sedge meadow, and marsh. The desired future condition for these vegetation types is discussed in detail in Prairie Plan.

3.5.2.4. CAUSE AND EFFECT RELATIONSHIPS/RESOURCE PRESSURES AND RESPONSES

3.5.2.4.1. Terrestrial Natural Communities/Native Vegetation Remnants:

1. The most important adverse impact to all terrestrial natural communities is direct destruction, as native vegetation remnants are converted to agricultural, residential, commercial, and industrial land uses.
2. The second most adverse impact on native vegetation remnants is lack of appropriate management. Appropriate management activities in native vegetation remnants include, but are not limited to prescribed burning, woody species removal, exotic plant control, and livestock grazing. There are four specific adverse impacts resulting from the lack of appropriate management:
   a. Vegetation structure may change as woody plants (both native and non-native species) invade the habitat, resulting in suppression or disappearance of species requiring full sunlight through shading, allelopathy, or competition from nutrients and water.
   b. Non-native plant species (both herbaceous and woody) may invade and dominate a community, out competing or displacing native plants integral the community.
   c. Complete fire suppression or fire frequency too low, may result in changes in litter and duff, and reduction in flowering, seed production and recruitment of native plant species (e.g., oaks in savanna and woodlands).
   d. Fire, grazing, and other activities affect competition between different species of native forbs and grasses; withholding all or relying on one management tool may lead to declines in populations of certain plant species and overall species richness.
3. Attempts at drainage can change the hydrology of native vegetation remnants, often resulting in “dehydrated” remnants with less reproductive

vigor and competitive resistance to invasion by woody plants. Encroachment by woody plants may also result in dehydration of native vegetation. Other hydrological changes that affect native vegetation changes are caused by entrenchment of streams and land use changes, resulting in changes of flooding duration and frequency, soil saturation, and sediment deposits.

4. Nutrient pollution may have adverse impacts on native vegetation remnants, by changing competitive relationships among native species, or between native and exotic plant species. In part, the increase of certain exotics (reed canary grass, Canada thistle) and invasive natives (cattails) may be a result of nutrient pollution. These nutrients are a result of runoff, groundwater contamination of agricultural, golf courses, and lawn fertilizers, but also through poor sewage treatment, manure from livestock or equestrians, or atmospheric transport of certain pollutants.
5. Trampling of vegetation and compaction of soils may adversely impact native vegetation remnants; this damage may result from vehicles, equipment, equestrians, livestock, or heavy foot traffic. Soil and vegetation disturbance may lead to soil erosion or colonization by invasive plants. In certain vegetation types, such as dolomite prairies or seeps, heavy trampling may destroy unique soil characteristics that are necessary to support specific vegetation.
6. Native vegetation may be adversely impacted by herbicide drift from agricultural activities or right-of-way maintenance. Herbicides, other chemicals, and sediment may be brought into native vegetation remnants in runoff from adjacent agricultural land or construction sites.
7. The small size, fragmentation, and increasing isolation of native vegetation remnants make them vulnerable to loss of plant species because:
   a. They support small populations of these species, which are vulnerable to destruction from stochastic events or loss of genetic diversity.
   b. They may be of insufficient size to support viable populations of pollinators or other organisms important for maintaining specific plant species.
8. Changes in animal populations may adversely impact native plants:
   a. Arrival of new species of non-native animals that may cause direct or indirect changes in native vegetation, such as gypsy moths (*Lymantria dispar*) defoliating oaks or European earthworms (Lumbricidae) changing soil and duff structure in forests and woodlands.
   b. Native animals may also affect native vegetation, as evidenced by browse lines in forests caused by deer, or soil disturbance from pocket gophers.
9. Global climatic change may also change native vegetation remnants, by favoring certain species (native or exotic) able to respond to the changes.

3.5.2.4.2. Cultural and Successional Communities

1. Although direct destruction is a threat to cultural and successional communities, it is a less severe threat. Cultural and successional communities reappear after physical destruction, provided the land is not converted to other uses. Cropland, tree plantations, and agricultural grassland

can be replaced; forb lands, shrublands, and other successional communities will become re-established. Some communities (e.g. forb land) will disappear without some type of disturbance that prevents succession to shrubland or other communities. However, direct destruction of cultural and successional communities could have the following adverse impacts:

a. Loss of native plant populations persisting in these communities, and the genetic diversity they may contain.
b. Loss of degraded native vegetation, which may have potential for restoration to natural communities.
c. Loss of habitat for wildlife and other animal species (e.g. grassland birds in agricultural grasslands, or herons or raptors nesting in successional woodlands).
d. Loss of buffer for native vegetation remnants, with other adverse impacts including effects on water quality, erosion, etc.
e. Changes in the regional flora, caused differences in successional communities structure and composition, with increased amounts of non-native plant species.

2. The second most adverse impact on cultural and successional communities is the lack of appropriate management. Appropriate management activities may include, but are not limited to, planting and harvesting of crops, mowing, hay cutting and removal, prescribed burning, woody species removal, exotic plant control, and livestock grazing. There are three specific adverse impacts resulting from the lack of appropriate management:
   a. Vegetation structure may change as woody plants (both native and exotic species) invade the habitat, resulting in suppression or disappearance of species requiring full sunlight through shading, allelopathy, or competition from nutrients and water.
   b. Exotic plant species (both herbaceous and exotic) may invade and come to dominate a community. The presence of invasive plant species may also complicate management activities (e.g. thistle and leafy spurge infestations preventing use of livestock for grassland management.
   c. Fire, grazing, mowing, and other activities affect competition between different plant species; withholding all or relying on one management tool may lead to changes in composition and structure of vegetation not aligned with management goals.
3. Restoration of hydrology can change cultural and successional communities, by restoring wetlands in areas incompatible with management goals (e.g. shortgrass habitat for upland sandpiper).
4. Cultural and successional communities can be adversely affected by trampling of vegetation and compaction of soils; a result of vehicles, equipment, equestrians, livestock, or heavy foot traffic. Soil and vegetation disturbance may lead to erosion or result in new infestations of invasive plant species.
5. The fragmentation of certain cultural and successional communities (e.g. agricultural grasslands) by roads, buildings, and inappropriate vegetation

(e.g., fencerows, tree plantations) makes them unsuitable for area-sensitive species.

3.5.2.4.3. Restored Native Vegetation

1. The greatest adverse impact on native restorations is incompatible management or lack of management actions. This includes prescribed burning at an inappropriate season or with insufficient frequency, failure to control encroaching shrubs, or using the wrong techniques to plant native seeds.
2. The presence of certain invasive species (both native and non-native) may threaten restoration projects, by competing with desired species for light, water, nutrients, and space. Invasive species may also interfere with rehydration of ground water or grass fuels required to carry on prescribed burns. Management to control invasive species may preclude other activities required for successful restoration. Some attempts to control invasive species (herbicide use, biocontrol) may pose threats to restored native vegetation.
3. Failure to select the most appropriate vegetation for restoration may have an adverse impact. The plant species that comprise the selected vegetation type may not be well adapted to site conditions (e.g., restoring upland forest on hydric soils).
4. Failure to develop appropriate seed mixes for site conditions would also have adverse impact on restoration. Planting upland prairie species on a wet site would waste considerable amounts of seed, and may encourage encroachment by invasive species. This also applies to the proportions of seeds by species. For example, seed mixes heavy on tall grasses (big bluestem, switchgrass, Indian grass) tend to develop into stands heavily dominated by these species, with very low forb diversity.
5. Failure to use seed of appropriate provenance may have an adverse impact on restorations. Seed of extra-limital provenance, for example, warm-season grasses originating from the Great Plains, may prove more competitive in restorations and exclude forbs. Conversely, plants originating from seed of non-local provenance may not survive under local climatic and edaphic conditions.
6. Failure to establish a full array of interacting organisms in viable populations may have adverse impacts on restoration. Many native plants are at least partially dependent on interactions with other organisms (insect pollinators, mycorrhizal fungi, nitrogen-fixing bacteria, host plants for root parasites); without these organisms present, they may fail to become established. Interactions between different plants species may also be important in determining the success of restorations. For example, the long-term dominance of a few grass species may be controlled by the presence or absence of certain grasses and forbs, through competition, allelopathy, or root parasitism.

7. Inability to fully restore hydrologic functions may have adverse impacts. Because of past alterations, such as stream down cutting, ditching, and tiling, full hydrological restoration may be impossible. At some sites, this must be taken into account before planning and designing restoration projects.
8. Restored native vegetation may be destroyed or converted to other uses, such as roads, buildings, parking lots, or agricultural land.
9. Nutrient pollution may have adverse impacts on restored native vegetation, by changing competitive relationships among native species, or enhancing growth of certain invasive plant species. These nutrients result from runoff and groundwater contamination of agricultural, golf course, and lawn fertilizers, but also through poor sewage treatment, manure from livestock or equestrians, or atmospheric transport of certain pollutants.
10. Restored native vegetation may be affected adversely by trampling of vegetation and compaction of soils; from vehicles, equipment, equestrians, livestock, or heavy foot traffic. Soil and vegetation disturbance may lead to erosion or encroachment by invasive plant species. In certain restored vegetation, such as seeps, heavy trampling may prevent recovery of damaged soil structure.
11. Restored native vegetation may be adversely impacted by herbicide drift from agricultural activities or right-of-way maintenance.
12. Changes in animal populations may adversely impact restoration:
    a. Arrival of new species of non-native animals that may cause direct or indirect effects to restored vegetation.
    b. Native animals may also affect the restoration process, such as selective browsing by white-tailed deer on certain forbs (e.g., Michigan lily, Culver's-root, showy tick-trefoil) or selective root predation by voles and other rodents (e.g., on blazing-stars, pale purple coneflower, and rattlesnake-master).
13. Global climatic change may also affect restored native vegetation, by favoring certain species (native or exotic) able to respond to the changes.

3.5.2.5. Midewin National Tallgrass Prairie

Past Actions – Historical Context, Range of Variability, and Trends

Historically, the landscape of Midewin was 86% prairie, 14% timber, and less than 1% swamps). The "prairie" probably was comprised of a mosaic of upland typic prairie, wet typic prairie, sedge meadow, and some shallow marshes, with extensive dolomite prairies towards the west. "Timber" was probably a catchall term for all habitats with trees, including savanna, woodlands and forests. The exact meaning of "swamp" is unknown; it may refer to deep marshes, seeps, or floodplain forests. A more diverse approximation of original vegetation can be made using information from soils and remnant vegetation. Additionally, there may have been small areas near the Kankakee River cultivated by Native Americans or occupied by Native American villages.

The full range of native vegetation present in 1830 is expected to have been greater than that represented by the existing native vegetation remnants. For example, none of the existing native vegetation remnants are classified as dry-mesic or dry typic prairie; however, an examination of soils and topography on site indicates that both of these categories were probably once present on land now part of Midewin. Fens provide another good example. A few native remnants now classified as sedge meadows or seeps were probably fens. However, agriculture-related disturbances have destroyed or altered the distinctive features of these sites, such as sedge peat and marl deposits. Characteristic fen species may have disappeared from these remnants, either replaced or survived by plants able to grow under less specific soil conditions.

By the middle 1800's, Euro-American settlement of the area near the confluence of the Des Plaines and Kankakee rivers had begun. A settlement was established on the Kankakee River in 1834, and was incorporated as Wilmington in 1854. Farmsteads were established on the area now Midewin. Prairie vegetation was plowed for conversion to crop fields, and native prairie was used for livestock pasture and as a source of hay. Timber was cut in prairie groves and savannas for buildings, fences, tools, and firewood. Groves were also used as pastures and as sources of maple syrup. Most large animals (bison, elk, black bear, cougar, wolf) were hunted to local extinction, either as a source of food, or because they threatened livestock or crops. Roads were built, and served to enhance suppression of prairie fires. The Euro-American settlers brought some non-native plants and animals, primarily crop plants (for food, medicines, and dyes) and livestock. However, they were also accompanied by other organisms that had impacts on the vegetation, including pets, ornamental plants, honeybees, European earthworms, and weeds.

The human population grew over the next century, and so did the impact on native vegetation. Most prairie (>90%) was effectively converted to row crops or agricultural grasslands (hayfields and pastures) by 1900, and widespread tiling of wetlands (including wet prairie) was underway. Non-native grasses and legumes were introduced to improve pastures and hayfields. Prairie fires were halted effectively by roads, railroads, ditches, and plowed fields that acted as firebreaks. Many species of smaller wildlife declined or disappeared, a consequence of both habitat destruction and intense hunting (for subsistence or market). Trees (both native and non-native species) were widely planted for shade, hedgerows, ornament, and windbreaks.

Surviving typic prairie vegetation became restricted to narrow strips associated with roads, railroads, and fences. Until the 1950's, these areas were often burned to control brush, so the native prairie plants survived. However, most native prairie hayfields and pastures were "improved" through planting of non-native grasses. West of Illinois Route 53, the level landscape and shallow soils were used as pasture or hayland. Some shallow-soil areas (formerly dolomite prairie)

were intermittently cultivated and then converted to pasture or hayland; a few sites were abandoned and are now successional vegetation.

Wetlands that could not be tiled and converted to agricultural uses were left; these areas received runoff from upland and drained areas, and were often used for pasturing or watering livestock. Certain fragile wetlands, such as seeps and fens, were altered severely by livestock use. Other prairie wetlands, no longer protected from periodic fire, were invaded by woody species, and began to develop into successional woodlands.

Livestock grazing, timber cutting, and the exclusion of natural fires have altered savannas, forests, and woodlands. Some wooded areas were completely cleared and converted to other uses, mostly cropland. Although many savannas retained their open structure because of grazing, the understory gradually lost the native herbaceous component. Thorny native shrubs increased in savannas and woodlands, mostly hawthorns (*Crataegus* spp.), Missouri gooseberry (*Ribes missouriense*), blackberries (*Rubus* spp.), and prickly-ash (*Zanthoxylum americanum*).

Drainage of wetlands and increased runoff had adverse impacts on stream vegetation. Increased turbidity, nutrients, sediment deposition, and flow fluctuations had impacts on in-channel vegetation; many submersed and emergent herbs declined or disappeared. Reed canary grass and other exotics colonized the stream banks and gravel bars. Down-cutting of streams lowered the water table in adjacent floodplains and riparian areas, allowing colonization by woody plants, creating extensive successional woodlands along the banks of Prairie Creek and other streams.

When the site came under the administration of the Department of the Army (*c.* 1940), there were a number of rapid changes that affected the vegetation. Extensive areas were converted to ordnance production, with construction of buildings, parking lots, pipelines, roads, and utilities. Large amounts of soil were moved to create bunkers, bridge crossings, and railroad berms; the source areas were left unclaimed. By-products of ordnance manufacturing process were disposed of in landfills, wetlands, and streams. Some areas were quarried to provide gravel and limestone. Private homesteads were removed, although some planted ornamentals were allowed to remain. Agricultural uses (cropland, hayland, and pasture) continued on land not converted to ordnance production. Livestock were allowed access to streams and wetlands for water. Mowing, haying, cropping, and grazing were used to keep grasses short, for security and to reduce potential for hazardous fires. Existing streams were channelized, and new channels were created for portions of Jackson, Prairie, and Grant creeks. Several impoundments and ponds were created to provide water for emergency use. A few tracts were planted with exotic shrubs and trees to benefit game species. Small tracts of native prairie survived in pastures and hayfields.

Wetlands, woodlands, and forests survived where they were not converted to industrial uses. This intensive management continued until the late 1970's.

Over the last 12-15 years, ordnance manufacturing has declined, and finally ended in 1999. Maintenance of open land has declined, and many areas formerly mowed or used for pasture, hayfields, or croplands are now becoming invaded with dense stands of shrubs and young trees. Some native vegetation has recovered because of reduced impacts from agricultural and industrial activities, but there has been increased invasion by woody plants. There have been increases of invasive non-native species on Midewin. Some of these species were purposefully planted on site (Amur honeysuckle), while other species arrived as they spread from sites of earlier introduction elsewhere in northeastern Illinois (garlic mustard, European buckthorn).

Since the land was transferred to the Forest Service, there have been further changes. Certain croplands have been converted into agricultural grasslands, for the purpose of providing grassland bird habitat. Several tracts have been taken out of pasture to reduce impacts on wetlands, native vegetation remnants, and sensitive plant species. Fences have been installed to exclude cattle from streams and wetlands. Certain croplands were converted to seed production beds and fields. Other croplands were taken out of production for eventual restoration to native vegetation. Alfalfa hayfields have been planted temporarily in row crops, in preparation for conversion to grassland habitat or prairie restoration.

3.5.2.5.1. Cumulative Effects Area – Historical Context

The geographic area considered in this analysis is the Central Till Plains Section, Prairie Parkland Province, Prairie Division.

The natural vegetation of the CTPS was primarily tallgrass prairie; specific subtypes include typic prairie, sand prairie, gravel prairie, dolomite prairie, and hill prairie, each associated with specific substrates or topography. Variation in species composition and habitat structure was also reflected in moisture regimes. For example, hill prairies were often present on southwesterly exposures in dissected regions along major rivers, but were not present on Midewin. Typic prairie (both upland and wet) was the dominant vegetation type, perhaps including at least 84% of the CTPS (Iverson et al, 1989). Dolomite prairie was restricted to major river valleys, where dolomitic bedrock was at or near the surface. These areas occur along the lower Des Plaines, lower Kankakee, and upper Illinois rivers.

Within the CTPS, savannas, woodlands, and forests were largely restricted to dissected regions along major streams (15.5%; Iverson et al, 1989). Although most savannas existed as an ecotone between the woodlands and the open

prairie, isolated groves were present on the more rolling terrain associated with end moraines or on elevated terraces present within floodplains.

Wetlands (including wet prairies) probably comprised at least 30% of the CTPS, based on coverage by hydric soils (Suloway and Hubbell 1994). Many wetlands in this region were associated with major drainages, including the Illinois, Kankakee, Des Plaines, Fox, Mackinaw, Sangamon, Kaskaskia, both Vermilions, and Wabash rivers; extensive complexes of wet prairie, sedge meadow, marsh, and bottomland forests could be found in the stream valleys. Upland depressions and swales also contained wetlands dominated by herbaceous graminoids, such as wet prairies and pothole marshes. There were also extensive areas of level landscapes that were seasonally inundated or saturated; these areas often supported wet typic prairie. Seeps and fens were present along valley sides, at the edges of terraces, at the heads of ravines, and lower slopes of end moraines.

The area being considered for analysis of cumulative effects also includes a small portion of the Southwestern Great Lakes Morainal Section (Keys Jr. et al. 1995). This consists of approximately 21 square miles of land in western Will, southeastern DuPage, and southwestern Cook counties, Illinois, and conforms to that portion of the lower Des Plaines River valley within the Southwestern Great Lakes Morainal Section. Combined with that portion of lower Des Plaines River valley within the CTPS (totaling 53 square miles), it was probably the world's largest concentration of dolomite prairie, and still holds the majority of the remaining dolomite prairie.

3.5.2.5.2. Past Actions – Historical Context, Range of Variability, and Trends

Past activities that have affected vegetation within historical times on the CTPS and the relevant portion of the Southwestern Great Lakes Morainal Section are similar to those occurring on the land now included within Midewin. However, there are some important differences.

As on Midewin, the largest single impact on native vegetation within the CTPS was the extensive conversion of prairies and wetlands to agricultural land, plus widespread associated fire suppression. Most of the natural vegetation was destroyed, including >99.99% of typic prairie (White 1978, Illinois Natural Heritage Database 2001). As on Midewin, there was also extensive drainage of wetlands by tiling and ditching operations; perhaps over 98% of the natural wetlands of the CTPS have been converted to agricultural use (Suloway and Hubbell 1994). During the middle 1900's, however, there were many land changes throughout the CTPS that did not occur on Midewin (or occurred to a lesser degree). Most large, permanent pastures and agricultural grasslands were converted to row crop production. Smaller, temporary grass fields were established to fill local needs for hay or pasture. Most fencerows and hedgerows were removed to enlarge fields under production and to accommodate larger

farm equipment. Throughout the CTPS, there was increased use of agricultural chemicals for crop production. Herbicides replaced fire and hay-cutting as the preferred tool for controlling brush and noxious weeds in right-of-ways, and many surviving stands of native prairie and prairie plants were eradicated.

At present, urbanization and conversion of agricultural land and remaining natural vegetation to industrial, residential, and commercial uses is an increasingly important impact in the CTPS, especially immediately north of and around Midewin. Associated with this urbanization is the construction of new roads and utility corridors. Throughout much of the lower Des Plaines River valley, most wetlands and dolomite prairies were destroyed by quarrying and industrial uses. The valley is now a major industrial region and transportation corridor; the few remnants of the original vegetation are now protected.

Non-native species were introduced throughout the CTPS, and additional species spread in from adjacent regions. Since 1830, there has been a gradual acceleration in the establishment and spread of additional non-native organisms, and they have come to dominate much of the landscape of the CTPS.

For the Illinois portion of the CTPS, no more than 12,000 acres (approximately 0.08%) of native vegetation are believed extant; many of these remnants are small (<10 acres) and highly isolated (Illinois Natural Heritage Database). The percentage of surviving native vegetation in the Indiana portion is probably similar to the condition in Illinois. Many of these remnants of native vegetation are continuing to disappear and degrade under the current conditions. Plant species continue to disappear from many remnants, either through lack of management, competition from invasive species, degradation from incompatible uses, loss of interacting organisms (e.g., pollinators) or stochastic events that impact small populations.

Some remnants of native vegetation within the CTPS have received protection and management, including prescribed burning, removal of woody vegetation, and control of exotic plant species. Approximately 1400 acres of native vegetation (mostly prairie and wetlands) are included within Goose Lake Prairie State Park. Many smaller tracts totalling at least 1500 acres occur throughout the CTPS are managed for native vegetation; however, many of these tracts are less than 10 acres in size.

Protected examples of dolomite prairie exist at Lockport Prairie Nature Preserve, Romeoville Prairie Nature Preserve, Des Plaines Conservation Area, and a few smaller sites in the lower DesPlaines River valley. Together, these remnants do not exceed 700 acres. Other dolomite prairies can be found in the region, but most unprotected dolomite prairie remnants are quite small and often highly degraded.

3.5.3. ENVIRONMENTAL CONSEQUENCES

3.5.3.1. Direct and Indirect Effects

3.5.3.1.1. Midewin National Tallgrass Prairie - Relevant Actions Common to All Alternatives

There are numerous actions that will occur regardless of the alternative chosen. Some of these actions will be the result of specific activities conducted by the Midewin and its partners and cooperators. Other actions are outside the control of Midewin.

a. All existing native vegetation remnants (400 acres) will be protected and managed. None will be converted to other uses, such as agricultural grasslands or facilities.
b. At minimum of 2,800 acres of agricultural grasslands will be managed to produce short-stature and medium-stature grassland habitat for upland sandpipers, bobolinks, loggerhead shrikes, and other grassland birds.
c. Noxious weeds will be managed with mowing or agricultural techniques to prevent flowering and seed production. Plants present on Midewin that are considered noxious weeds by the Illinois Department of Agriculture include Canada thistle (*Cirsium arvense*), perennial sow-thistle (*Sonchus arvensis*), musk thistle (*Carduus nutans*), and Johnson grass (*Sorghum halapense*).
d. A minimum of 1,077 acres of former agricultural land (pasture, hay, and crops) will be restored to native vegetation at six sites. Native vegetation restored at these sites includes dolomite prairie, upland typic prairie, wet typic prairie, sedge meadow, marsh, seep, savanna, and perennial stream.
e. Existing seed production facilities will be used to supply seed for previously mentioned projects (1.d.).
f. There will be deer hunting in certain areas of Midewin.
g. Some obsolete, unnecessary, or hazardous structures would be removed, and the sites would be re-vegetated.
h. Interim hiking trails would be established at a few localities outside of the perimeter fence.

3.5.3.1.2. Relevant Actions – Alternative 1

a. Under this alternative, the only specific management against invasive species will be management activities to control noxious weeds.
b. Existing seed production beds and fields will be maintained until projects underway are completed. Then maintenance will cease.
c. 2800 acres of Midewin will be managed as agricultural grasslands. Management will consist of livestock grazing, mowing, and hay cutting.
d. Approximately 8,400 acres will continue to exist as or develop into successional vegetation types.

e. There will be 3,000 acres of crop fields maintained on Midewin under Alternative 1.
f. The existing 400 acres of native vegetation remnants will be protected and managed in a limited manner.
g. At least 1,700 acres will continue to be restored to native prairie and wetlands under Alternative 1.
h. There will limited visitor access, primarily through escorted tours. A limited area will be open for deer hunting and interim trails.

3.5.3.1.3. Relevant actions common to Action Alternatives (2, 3, 4, 5, & 6)
The following activities will have impacts on vegetation.

a. Agricultural land use (row crops) gradually phased out, and the land will be converted to native vegetation, agricultural grassland, administrative use, or trails and other visitor facilities.
b. Reduction of fragmentation in grassland habitats, through removal of fencerows, hedgerows, shrublands and similar features.
c. Use of Integrated Pest Management (IPM) techniques to control noxious weeds and invasive species (both native and non-native plant and animal species).
d. Management of agricultural grasslands with livestock grazing, hay cutting, prescribed burning, and mowing to provide habitat for certain suites of grassland birds.
e. Research, environmental education, and interpretive programs.
f. Recreation use (hunting, hiking & bicycle trails).
g. Development of infrastructure, including administrative site, visitor center, trails, roads, other amenities, and seed production fields and beds.
h. Additional lands may be received through purchase, donation, or exchange.
i. Fire, mowing, and grazing will be used as management tools for native vegetation.
j. Tiles and other drainage features will be removed within native vegetation restoration areas, and original landscape contours will be restored.
k. Existing native vegetation remnants will be restored to a close approximation of pre-1830 conditions where possible, and management of surrounding areas will be conducted so as to encourage expansion of native vegetation.
l. Maintaining populations of threatened, endangered, and sensitive species.
m. Restoration of native vegetation and other important habitats on lands highly altered by agricultural or other uses. Habitats to be restored and managed include the following:

- Dolomite Prairie; minimum of 1380 acres.
- Upland Typic Prairie; minimum of 1855 acres.
- Wet Typic Prairie; minimum of 1940 acres.
- Sedge Meadow; minimum of 230 acres.
- Marsh; minimum of 115 acres.

- Seep; minimum of 2.5 acres.
- Savanna; minimum of 485 acres.
- Woodlands and Forests; minimum of 420 acres.
- Agricultural Grasslands (including both Short-stature Grassland Habitat and Medium-stature Grassland Habitat); minimum of 3745 acres.

Detailed descriptions of these desired vegetation and habitats are be found in the Prairie Plan Appendix A. In many cases we have combined or spilt up several natural communities and moisture classes to more closely fit vegetation types or habitats that are of concern. For example, dividing typic prairie into two moisture classes (wet and upland) reflects issue concerning the nature of wetland restoration on Midewin. Conversely, we have combined woodlands and forests into one category because of limited coverage and their close association on soils and in the landscape at Midewin.

3.5.3.1.4. Relevant actions – differences between action alternatives

For vegetation, the five action alternatives differ primarily by:

- total acreage of land restored to different vegetation and habitat types (including agricultural grasslands for grassland bird habitat).
- configuration of these restored vegetation and habitat;
- location and relative isolation of native vegetation remnants from restored native vegetation.
- total acreage and configuration of land developed for visitor facilities, administrative purposes, and seed production; and
- intensity of recreation and administrative use, based on the number of access points; amounts and locations of roads and trails; and the types of recreation uses.

Table 3.17- Approximate coverage of Vegetation and Habitat types by Acreage (unless noted), historic and by alternative. Coverage is approximate for historic and alternatives and may exceed 16830 acres because of rounding errors and habitat overlaps.

Vegetation/ Habitat Type	Pre-1830	Alternatives					
		1	2	3	4	5	6
Native Vegetation and Natural Communities:							
Dolomite Prairie	1380	380	1380	1380	1380	1380	1380
Upland Typic Prairie	8620	85	1855	2670	3750	5865	5930
Wet Typic Prairie	4845	490	1940	2325	3080	3715	3730
Sedge Meadow	570	75	230	275	365	440	440
Marsh	285	90	115	135	180	220	220
Seep	>10	2	>2.5	>5	>7.5	>10	>10
Savanna	500	40	490	490	490	490	490
Woodland/Forest	430	190	420	430	430	430	430

Vegetation/ Habitat Type	Pre-1830	Alternatives					
		1	2	3	4	5	6
Successional and Cultural Habitats and Vegetation							
Built-up and developed	0	850	670	570	570	520	330
Cropland	0	3000	0	0	0	0	0
Agricultural Grasslands[1]	0	2800	10110	9150	6690	3810	3920
Wet Meadow	0	475	0	0	0	0	0
Disturbed Emergent Wetlands	0	80	0	0	0	0	0
Successional Woody Vegetation[2]	0	8400	<50	<50	<50	<50	<50
Successional Native Grassland[2]	0	0	10	10	10	10	10

[1]For this planning period and all six alternatives, this assumes that short-stature and medium-stature grassland habitat objectives can only be met as agricultural grasslands. All or most tall-stature grassland objectives will met under prairie vegetation types. Also, the acreage for agricultural grasslands does not include existing wetlands within these areas; they will restored as small inclusions of wet prairie, sedge meadow, and marsh, so that they will not fragment grassland bird habitat; they are included under the appropriate native vegetation type within this table.
[2]For all action alternatives, it is expected that small amounts of successional native grassland and successional woody vegetation will survive amid restored vegetation.

Table 3.18- Trails - Comparison of Action Alternatives

Feature	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Public Access Points (number)	8	9	7	8	4
Roads and Transportation[1] (miles)	17	10	16	17	8
Trails – bicycle and hiking (miles)	35	20	5	0	0
Trails – equestrian and hiking (miles)	0[2]	11	5	0	0
Trails – hiking only (miles)	37	40	20	30	12
Trails – multi-use (hiking, bicycle and equestrian) (miles)	0[2]	19	18	23	15
Total Trails	**72**	**90**	**48**	**53**	**27**

[1]This category includes administrative roads, public access roads, and internal transportation.
[2]There is no equestrian use in Alternative 2.

3.5.3.2. Cumulative Effects

There are numerous uncontrollable actions that may negatively impact vegetation within and outside of Midewin and the CTPS. At both scales, impacting events include long-term climatic change, air pollution, unusual or severe weather conditions (tornadoes, droughts), and wildfires. At the regional (CTPS) level, relevant actions that impact vegetation include the following:

a. Continued conversion of open land (including cropland, grassland, and native vegetation remnants) to residential, commercial, or industrial uses.

b. Adjacent lands to Midewin are being or will be developed as a national veteran's cemetery, industrial parks, and landfill. Some land east of Midewin (but not contiguous) may be developed as a third airport for the Chicago metropolitan region.
c. Increased development of transportation, energy-delivery, and communication infrastructure associated with conversion of open land to developed uses.
d. Continued alteration of wetlands, streams, and riparian forests by agricultural runoff, stream channelization, and sediment deposition.
e. Development of new quarries for stone, sand, and gravel.
f. Fragmentation and vegetation change in remaining natural vegetation.
g. Increased numbers of non-native species, both in numbers of individuals and number of species, leading to increased invasion of non-infested areas.
h. Restrictions placed on activities required for vegetation management, because of real or perceived conflicts with adjacent land use (e.g., prescribed burning and residential areas).
i. Increased human population and demand for open land available for recreation, including uses and management incompatible with vegetation.
j. Changes in surface water flow and quality associated with land use changes (agriculture to urban).
k. Increased withdrawals of groundwater, and contamination of groundwater from agricultural, urban, and industrial sources.
l. Increased amounts of open land (including native vegetation remnants) becoming protected and managed by federal, state, county, and municipal agencies, and private organizations. This includes additions to existing state parks and county preserves, new dedicated state nature preserves, and other sites. Continued development and implementation of management plans for these sites should increase protection and raise the quality of existing native vegetation.
m. Increased amounts of restored native vegetation from several restoration projects elsewhere in the CTPS, ranging in size from 7,000 acres to <1 acre.
n. Increased public interest in becoming volunteers and stewards to manage both native vegetation and native restoration projects.
o. Loss of native vegetation remnants will reduce the number of sources and plant species available for restoration projects at Midewin and in the CTPS.

3.5.3.3. Direct and Indirect Effects

3.5.3.3.1. Midewin National Tallgrass Prairie - Native Vegetation Remnants

Under all six alternatives, native vegetation remnants will be protected and managed. However, under the action alternatives (2, 3, 4, 5, and 6) these remnants will be aggressively managed to remove non-native species and to restore original structure and hydrology. Previously unrecorded species may appear from the seed bank, and suppressed species will flower and produce

seed on a more frequent basis. There will also be expansion of native vegetation into surrounding areas. Under all action alternatives, this will result in increased connectivity between many existing native vegetation remnants, facilitating pollinator activity and gene flow.

The number and acreage of native vegetation remnants may increase under the action alternatives. This would result from land acquisitions, donations, exchanges, or additional transfers from Army.

Deer hunting is also expected to have positive impacts on native vegetation remnants, if it is used a management tool to control deer population size and encourage movement.

These consequences will not occur under Alternative 1. Instead, existing vegetation remnants will continue to loose plant species through competitive impacts from invasive or non-native plant species, and through the effects of stochastic events on small populations. Many populations of native plants within the remnants are expected to disappear gradually through absence of pollinators, lack of recruitment, and other factors. Management of these remnants will become increasingly difficult as surrounding land becomes dominated by invasive woody species; there will be an increased seed rain from these woody plants into the native vegetation remnants. No additional remnants will be acquired, by any means.

Among the action alternatives, alternatives 5 and 6 provide for the greatest potential connectivity of native vegetation remnants and incorporation into restored habitat types. Under these alternatives, all but four known remnants occur within proposed native vegetation restorations, and two are relatively close (within 300 meters) to restored native vegetation. However, these remnants would be managed, and limited peripheral restoration could improve their long-term viability. Of these two alternatives, Alternative 5 may have slightly higher adverse effects, because of a larger recreation infrastructure, including a limited amount of equestrian access west of Illinois Route 53. Potential impacts associated with this infrastructure include disturbance from repeated off-trail use by equestrians or bicycles and associated transport and introduction of invasive species.

The adverse effects of Alternative 4 on native vegetation remnants are only slightly different than alternatives 5 or 6. Nine remnants are isolated outside of native vegetation restoration areas and there is slightly less recreation access (trail miles) than in Alternative 5. However, there is limited equestrian access west of Illinois Route 53, with the associated possibility of disturbance and introduction of invasive species caused by illegal, off-trail equestrian use.

Alternative 3 results in relative isolation of twenty native vegetation remnants, all east of Illinois Route 53. However, these areas would still be managed, and there would be limited, peripheral restoration to ensure viability of these remnants. However, there could be increased impacts from recreation use, because this alternative has the greatest amounts of trails (approximately 90 miles), with an extensive system of multi-use trails west of Illinois Route 53, where the greatest concentration of native vegetation remnants lies.

Alternative 2 results in the greatest isolation of native vegetation remnants, with twenty-four present within grassland habitat areas. Although these areas would still be managed and receive some peripheral restoration, they would not exist within contiguous tracts of restored, native vegetation. Recreational impacts are expected to be slightly less than in Alternative 3, because of reduced total trails and exclusion of equestrian use.

3.5.3.3.2. Cultural and Successional Vegetation

Under all six alternatives, some cultural and successional vegetation will exist. The total amount and proportions among these types differ between alternatives, often depending upon the amount of land allocated specifically for management as short-stature and medium-stature grassland habitat.

Under Alternative 1, approximately one-half of Midewin would be allowed to develop as successional vegetation. Unmanaged croplands and agricultural grasslands will become dominated by invasive forbs and grasses as management ceases, and eventually become dominated by extensive stands of shrubs and young trees. Invasive native and non-native woody plants will dominate these areas; they will generate a seed rain onto any nearby managed areas on Midewin, including native vegetation remnants and agricultural grasslands. Alternative 1 has less agricultural grasslands than any of the action alternatives. Fragmentation of these grasslands and the constant seed rain from successional woody vegetation will require increased management of agricultural grasslands. Most existing wet meadows and disturbed emergent wetlands will continue to exist (there may some woody invasion), but the diversity of native plant species is not likely to increase without management. All successional native grasslands are likely to disappear through invasion by shrubs and non-native grasses. Finally, there will no increases in successional and cultural habitats resulting from land exchanges, donations, purchases or transfers.

Under the action alternatives (2, 3, 4, 5, and 6), the extent of most types of cultural and successional vegetation will be greatly reduced. All cropland will be phased out over the next 10-15 years, and replaced with restored native vegetation or grassland habitat. The amount of agricultural grasslands will increase, although the acreage and configuration differ between the action alternatives. Alternative 2 will have the greatest amount of agricultural grasslands (9710 acres), followed by Alternatives 3 (8800 acres) and 4 (6720 acres).

Alternatives 5 and 6 have the same amount of agricultural grassland (3925 acres). Differences between alternatives in intensity, location, and types of recreation uses may have adverse effects on the agricultural grasslands, primarily because of conflicts between recreation use and resource management. Alternative 3 provides the greatest potential for these conflicts, followed by 2, 5, and 4; Alternative 6 provides the lowest potential for conflict between recreation and restoration. In Alternatives 2 and 5, areas allocated for a visitor center, campgrounds or other facilities displace existing agricultural grasslands.

The existing wetlands in the agricultural grasslands would be managed to restore appropriate native vegetation (wet prairie, sedge meadow, marsh), and to reduce their potential as a seed source of invasive plant species. Woody vegetation would be removed to reduce fragmentation in agricultural grasslands; this is appropriate, as these wetlands occur on hydric prairie soils.

The acreage of agricultural grasslands may increase beyond the amounts given under the action alternatives, from land acquisitions, donations, exchanges, or additional transfers from Army.

Existing wet meadows, disturbed emergent wetlands, and successional woodlands on hydric soils will be managed through hydrologic restoration, invasive species control, woody plant removal, prescribed burning, enhancement, planting and seeding, and other techniques to restore sedge meadow, wet prairie, marsh, and seep vegetation where appropriate. Most other cultural and successional vegetation will also be restored as appropriate, based on evidence from soils, topography, and other evidence. Successional native grassland will be managed to increase cover and native species diversity. Some successional woody vegetation (<50 acres) will be allowed to remain under certain special circumstances, including:

- Known nesting or roosting sites for shrikes, herons or raptors.
- Providing vegetative cover where pre-1830 conditions cannot be restored because of permanent changes in external conditions (e.g., floodplain of Prairie Creek).
- Where necessary screening or buffering is required.
- Existence of a unique opportunity for interpretation of past land use or resource management issues (e.g., a former housesite) that will not fragment grassland habitat or serve as a source for invasive plants.

3.5.3.3.3. Restored Native Vegetation

Under all six alternatives, some native vegetation will be restored. No alternative was developed in which the entire site was restored as native vegetation, because of habitat requirements for sensitive species. The total amount and proportions of the different types of native vegetation differ between alternatives, and are directly dependent upon the amount of land allocated specifically for native vegetation and other uses.

In all alternatives, restoration of native vegetation from disturbed land will require time. In restorations of herbaceous communities (prairies, sedge meadows, marsh) dominance by native graminoids and forbs is often apparent within three to five years of planting; however, it is likely to take decades of management and enrichment before the composition, species richness, and structure of the restored vegetation resembles native vegetation remnants. For some vegetation types, such as savannas, woodlands, and forests, the dominant canopy trees require at least fifty years of growth before they begin to influence the structure and composition of understory vegetation. Agricultural grasslands require much less time to reach desired condition; appropriate management (grazing, hay cutting) may begin during the third year after planting.

Under Alternative 1, approximately 920 acres of native vegetation will be restored. The vegetation types restored will include dolomite prairie, upland typic prairie, wet typic prairie, sedge meadow, and marsh. These restorations will consist of at least three or more discrete units, all exceeding 50-75 acres, with at least one exceeding 350 acres. Most of these restorations will be of sufficient size to be sustained by management. The presence of at least 8400 acres of land dominated by invasive native and non-native shrubs and trees, however, will create a constant management need within these restorations; there will be a continual invasion by woody seedlings from surrounding successional vegetation. There will be little additional impact from recreational use or facilities.

Under the action alternatives, from 6,045 to 12,250 acres of native vegetation would be restored. Most areas now occupied by cultural or successional vegetation would be restored as native vegetation, with the exception of 3745 to 9710 acres of agricultural grasslands.

Equal amounts of dolomite prairie will be restored under the five action alternatives (approximately 1380 acres); additionally, there may be opportunities for restoring small areas of dolomite prairie in abandoned rock quarries along Prairie Creek in all action alternatives. Any differences between the action alternatives are caused by differences in potential, recreational impacts on restored dolomite prairie. The potential impacts are the lowest in Alternatives 6 and 2, based on trail mileage, location, and use (no equestrian use in Alternative 2). Potential impacts are highest in Alternative 3, largely because there are multi-

use trails relatively close to restored dolomite prairie areas in this alternative; this raises the potential disturbances from introduction of invasion species or illegal off-trail activities associated with equestrian use. The remaining impacts are intermediate, with slight differences between 4, and 5. The location of developed areas does not impact restored dolomite prairie.

Restored typic prairie, sedge meadow, and marsh varies considerably among the action alternatives, with the smallest amount in Alternative 2 ranging up to Alternative 6. In Alternatives 3, 4, 5, and 6, areas proposed for upland typic prairie restoration is relatively contiguous, interrupted only by Illinois Route 53 and the placement of recreational facilities (in Alternatives 3 and 4). These facilities are less interruptive on Alternative 5 and do not exist in Alternative 6. In areas adjacent to these facilities, there will be impacts on restored native vegetation. These impacts may prevent full site restoration (including hydrologic restoration) because of increased runoff from paved surfaces and drainage requirements of public use areas. The full impact of these facilities will be determined at the site-specific or project level.

Trail location and use will also impact restored typic prairie and associated wetlands. Alternative 6 will have the best conditions, because of relatively low trail mileage and no equestrian use west of Illinois Route 53, combined with the highest amounts of restoration. Despite the relatively low amounts of native restoration, Alternative 2 may also have low impacts because there is no equestrian use. Alternative 3 is likely to have the greatest adverse impact on native restoration, because of the relatively low amount of restoration and the highest trail miles. There is also an extensive system of multi-use trails west of IL Route 53, which could impact these restorations with introduction of exotic plants or illegal off-trail activities associated with equestrian use.

Alternative 4 and 5 have similar potential for recreation impacts, because of roughly equivalent trail configurations and uses, especially west of Illinois Route 53. Alternative 5 proposes more restoration to typic prairie, sedge meadow and marsh than Alternative 4.

Restored savanna, woodland, and forest varies less among the action alternatives than in prairie and open wetland habitats, with the acreages being roughly similar in all action alternatives (905 to 920 total acres). However, differences in configuration and placement of facilities will have impacts on the acreage and configuration of these tree-dominated vegetation types. In Alternatives 2, 3, and 4, certain savanna and forest/woodland areas are partially adjoined by agricultural grasslands. Alternative 2 has the most isolated savanna and woodland tracts, especially near Prairie Creek west of Illinois Route 53.

Restored savannas and woodlands may also be impacted by the location and configuration of recreation facilities, such as campgrounds, trails, the visitor

center, and an environmental learning center. These facilities have the highest impact in Alternatives 2, 3, and 4, and the lowest impacts in Alternatives 5 and 6. Within and adjacent to these facilities, there will be impacts on restored native vegetation. Prescribed fire may be prevented do to the close proximity of facilities. The configuration of these facilities may prevent full site restoration (including hydrologic restoration) because of increased runoff from paved surfaces and drainage requirements of public use areas.

The exact amount of seeps restored under the action alternatives ranges from greater than 2.5 acres (Alternative 2) to greater than 10 acres (Alternative 6). This number is both small and imprecise, because it is difficult to determine where site conditions for seeps existed before 1830, which affects estimates for potential restoration. As hydrological restoration proceeds, it is likely that many former seeps will reappear in former cropland, agricultural grassland, and developed land as drainage structures (ditches and tiles) are removed. Based on acreages available for native restoration, the most acres of seeps would be restored in Alternatives 5 and 6, with descending amounts in Alternatives 4, 3, and 2. Seeps surrounded by restored native vegetation will probably have sufficient hydrologic restoration and the least problems from invasive plant species. Impacts on seeps from recreation uses and facilities is likely to be greatest in Alternative 3, then 2, 4, and 5, with the lowest amount of impacts in Alternative 6.

The amount of land available for restoration may increase from land acquisitions, donations, exchanges, or additional transfers from Army.

Deer hunting is expected to have positive impacts on restoration of native vegetation, provided that hunting is used as a management tool to control deer population size and encourage deer movement.

3.5.3.3.4. Central Till Plains Section - Native Vegetation Remnants

In the Illinois portion of the CTPS, less than 0.1% of the pre-1830 vegetation exists (Illinois Natural Heritage Database 2001), totaling less than 12,000 acres in Illinois. The number, size, and quality of these native vegetation remnants is expected to continue to decline, as unprotected sites are developed for other uses or become dominated by non-native plant species.

However, many existing native vegetation remnants are now protected in the CTPS, and managed. There is a concentration of these areas around Midewin, with at least 2,300 acres within the Prairie Parkland. The largest of these is Goose Lake Prairie State Park, which includes 1,400 acres of typic prairie and associated wetlands. Smaller but important tracts are present within Iroquois County Conservation Area, Des Plaines State Fish and Wildlife Area, Kankakee River State Park, and many lands held by the Forest Preserve District of Will County. Additionally, it is likely that federal, state, county, and municipal agencies

and non-governmental organizations will continue to purchase and manage some of the existing native vegetation remnants that remain unprotected.

Under Alternative 1, approximately 400 acres of native vegetation remnants will be protected and managed. These consist of approximately 3% of the total native vegetation remnants in Illinois portion of the CTPS. However, because they will remain relatively isolated and small, they are likely to continue to decline in species richness and overall quality.

Under the action alternatives, these native vegetation remnants will also make a contribution to the amount of native vegetation surviving in the CTPS. However, the contribution is likely to be greater than under Alternative 1, resulting from aggressive management, enhancement, and peripheral restoration. Alternative 6 will provide the greatest benefits, because the fewest remnants will be isolated, there will be greater connectivity between the remnants, and there is the least amount of potential impacts. There are slightly lower benefits, in descending order, among Alternatives 5, 4, 3, and 2, all concerning a combination of relative isolation and potential impacts from recreation and facilities.

Under the action alternatives, these remnants will also make a contribution to restored native vegetation. As management improves their quality and increases both the size and vigor of native plant populations within the remnants, they will contribute increasing amounts of seed to restoration projects on Midewin and elsewhere in the CTPS.

3.5.3.3.5. Cultural and Successional Vegetation

In the CTPS, nearly all of the modern landscape consists of cultural and successional vegetation (>99%). Overall, none of the alternatives will have any adverse impacts on the amounts of developed land or cropland; both are widely distributed and often dominant land uses throughout the CTPS.

The alternatives do not have adverse impacts on the amount of non-native successional vegetation in the CTPS. These types of vegetation remain fairly common, despite increasing conversion of forb lands, fencerows, hedgerows, shrublands, tree plantations, and successional woodlands to other uses. Many state parks, county preserves, and other public open land in the CTPS consist entirely of these vegetation types, and they are unlikely to be removed completely from all public lands. Limited amounts may be removed as native vegetation is restored on some sites, as at Goose Lake Prairie. Some non-native successional vegetation on private land may be lost through urbanization, but some will survive in rights-of-way, riparian areas, or buffer land around industrial development.

Agricultural grasslands consist of less than 13% of the CTPS (approximately 2,000,000 acres), and the amount has been dropping steadily since the 1920's, with over 75% lost since the early 1900's, when coverage peaked (Herkert 1991). Additionally, most of the existing agricultural grasslands are temporary and under 20 acres in size, and do not provide habitat for most grassland wildlife (Herkert *et al.*, 1996). The largest concentration of agricultural grasslands >100 acres in the CTPS is in Will County, Illinois, and includes Midewin. Under Alternative 2, Midewin will provide only 0.51% of the agricultural grassland in the CTPS, but approximately 58% of agricultural grassland habitat larger than 100 acres. Smaller but significant percentages will be maintained under alternatives 3 (0.46% of total; 52% larger than 100 acres), 4 (0.33% of total; 37% larger than 100 acres), 5 and 6 (0.19% of total; 22% larger than 100 acres), and 1 (0.14% of total; 16% larger than 100 acres) in descending order (McKinney *et al.,* 1998). Under any of the six alternatives, Midewin would provide the largest concentration of agricultural grasslands greater than 100 acres size within the CTPS.

3.5.3.3.6. Restored Native Vegetation

Under all six alternatives, some native vegetation will be restored. Because of the small size and relatively small number of native vegetation restorations, any amount of restoration could be considered as notable increase for the CTPS. However, as other restoration projects get underway, there will be increased acreage of restored native vegetation. The largest of these is 7000 acres (The Nature Conservancy), but projects of similar scale (600-30,000 acres) have been proposed in both Illinois and Indiana. These projects equal or surpass native vegetation restoration proposed on Midewin under Alternative 1; however, most of these restorations are on sandy soils, and the principal vegetation types under restoration will include sand prairie, sand savanna, and associated wetlands. Typic prairie restoration on silt-loam soils is fairly rare, with most restorations under 10 acres; the largest examples are at Goose Lake Prairie State Park in Grundy County, Illinois, where there is approximately 1400 acres of restored typic prairie (W. Glass, pers. comm.).

Restoration on Midewin would also have impacts on remnant native vegetation elsewhere in the CTPS, but most strongly in the immediate vicinity of Midewin (Prairie Parklands). Under Alternatives 5 and 6, the amount of native vegetation to be restored would exceed 12,150 acres. This would include at least 11,000 acres of prairie vegetation (including dolomite, upland typic, and wet typic prairie types) and would become the largest concentration of restored or natural prairie existing in the CTPS. Alternatives 4, 3, and 2 would restore smaller amounts of prairie vegetation, but would still provide notable gains for restored prairie within the CTPS.

While the action alternatives would provide smaller amounts of restored savanna, woodland, forest, sedge meadow, and marsh, they would still provide notable

increases in the amounts present in the CTPS. Savannas and woodlands on silty or loamy soils are among the rarest types of natural vegetation within the CTPS (White 1978, Bowles and McBride 1996) and restoration would increase the amount by over 100%.

Restoration of seeps on Midewin would probably not have significant impacts on the total acreage of seeps within the CTPS. Although only three acres of high quality seep communities recorded from the Illinois portion of the CTPS (Illinois Natural Heritage Database 2000)

Native vegetation restoration on Midewin would have positive impacts on other restoration projects elsewhere in the CTPS, especially in the immediate vicinity of Midewin (Prairie Parklands), by increasing the amount of habitat present. The Prairie Parklands would eventually consist of the largest concentration of existing and restored prairie habitat anywhere in Illinois. Additionally, Midewin will eventually be source of seed and plant material for future restoration projects elsewhere in the Prairie Parklands.

3.5.3.4. Summary of Effects

3.5.3.4.1. Midewin National Tallgrass Prairie

Alternative 1 has the greatest benefit for non-native successional vegetation, with approximately half the site becoming a mosaic of forb land, non-native grassland, shrubland, and successional woodland. In Alternative 1, all of these lands become extensive tracts of successional woodland, dominated largely by non-native plant species, unless some outside factor, such as global climate change, favored some other type of successional vegetation.

Alternative 2 provides the greatest benefit for agricultural grasslands, because it provides the most area for management as short-stature and medium-stature grassland bird habitat.

Alternative 6 provides the greatest benefit for both native vegetation remnants and restored native vegetation. Most native vegetation remnants will exist within a mosaic of restored vegetation, and the extent of restored native vegetation will be greatest under Alternative 6. Alternative 5 will provide slightly less beneficial conditions, because of impacts from increased recreation and facilities.

Alternatives 3 and 4 provide intermediate conditions for agricultural grasslands, native vegetation remnants, and restored native vegetation. However, Alternative 4 provides a greater benefit for native vegetation remnants and restored native vegetation over Alternatives 1, 2, and 3, because of a combination of increased restoration area and less extensive impacts by recreation infrastructure.

Alternative 4 provides significant amounts of both restored native vegetation and large agricultural grasslands. The configuration reduces impacts that could result from these allocations, such as lack of connectedness between restored vegetation areas, and isolation of native vegetation remnants. Alternative 4, when combined with the mitigation measures plus provided in the Prairie Plan standards and guidelines, also reduces potential impacts from recreation uses on native vegetation remnants, agricultural grasslands, and restored native vegetation.

3.5.3.4.2. Central Till Plains Section

Most types of cultural and successional vegetation are widespread and abundant throughout the CTPS, and management at Midewin will not have a significant effect on current trends. Agricultural grasslands >75 acres in size are the only exception; they have declined over 75% since the 1920's (Herkert 1991). Alternative 2 provides the greatest positive increase for agricultural large grasslands (>100 acres) within the CTPS, because it will provide at least 58% of these grasslands within the CTPS. However, the other action alternatives also provide significant amounts of large agricultural grasslands (52% to 22%), although not as great as in Alternative 2.

Alternatives 5 and 6 provide the greatest increases of restored native vegetation within the CTPS, increasing the existing amount almost tenfold. If other proposed restoration projects come to fruition, then Midewin may eventually provide at least 20% of restored native vegetation. This is especially important for prairies on silt loam soils, as most of the proposed restorations elsewhere in the CTPS are on sandy soils. Alternatives 2 and 1 provide much smaller amounts, but they would still reach regional importance. Alternatives 4 and 3 provide intermediate amounts, but they provide a balance of significant increases for both agricultural grasslands and native restoration are provided. Alternative 4 also proposes less potential impacts (from recreation) to this important restored habitat than Alternative 3.

3.5.4. MITIGATION

The mitigation measures stated in the Prairie Plan standards and guidelines are sufficient to reach the goals and objectives of the desired future conditions (protection, management, and enhancement of existing native vegetation; establishment and management of sufficient grassland bird habitat; and restoration and management of ecologically accurate natural vegetation on appropriate sites). These standards and guidelines are presented in the Prairie Plan under the headings for Ecological Sustainability (especially under Threatened and Endangered species, Sensitive Species, Species Restoration, Noxious Weeds and Invasive Plant Species, Native Vegetation Remnants, Habitat Restoration, and Wildlife) and Recreation and Interpretation (General

Standards and Guidelines, Trails). Reaching the desired future conditions will also require that sufficient monitoring and law enforcement be used to detect and prevent actions counter to the goals and objectives.

3.5.5. MONITORING

Trail corridors and sensitive habitats will be regularly monitored for evidence of inappropriate use that may lead to new infestations by invasive species or noxious weeds.

The following aspects of vegetation will be monitored:

3.5.5.1. For native vegetation remnants:

1. The type (natural community), using the classification based on White and Madany (1978) and White (1995):
2. The acreage of each type of remnant (including recognition of moisture classes).
3. The location of each remnant.
4. The relative isolation of each remnant, by percentage of cover within 300 meters of other existing remnants or restored native vegetation.
5. Threats (type, intensity, and location).

3.5.5.2. For cultural and successional vegetation:

1. The type of vegetation,
2. The acreage of each vegetation type.
3. The location of each vegetation type.
4. Threats (type, intensity, and location).

3.5.5.3. For restored native vegetation:

1. The type of vegetation,
2. The acreage of each vegetation type.
3. The location of each vegetation type.
4. Threats (type, intensity, and location).

In addition to the aspects listed above, additional parameters will be measured as described under Management Indicators (See appropriate section). These include aspects of plant species diversity, vegetation structure, and threats, and can be used to gauge success of restoration and management. Trail corridors and native vegetation remnants will be monitored for evidence of inappropriate use that is causing vegetation damage or may lead to new infestations by invasive plants.

3.6. *BIODIVERSITY (ECOLOGICAL INTEGRITY)*

3.6.1. INTRODUCTION

Biodiversity or biological diversity has been defined as “the variety of life forms, the ecological roles they perform, and the genetic diversity they contain” (Wilcox 1984; p. 640). This broad definition includes species richness, interactions between species, and interactions within and between populations of individual species at all scales.

The tallgrass prairie biome is a complex system of interacting parts including grasses, forbs, large herbivores, insects, burrowing mammals, birds, fungi, soil microbes, and other organisms that further interact with climate and fire. Tallgrass prairie and grasslands in general evolved under a system of disturbance regime that included fire, ungulate grazing, and periodic droughts; most grassland species are adapted to these disturbances (Anderson 1982, 1990, 1991). In general, tallgrass prairie is a community dominated by graminoids (e.g. grasses and sedges), but with an important component of forbs (broad leaved, herbaceous, flowering plant). The dominant graminoids in tallgrass prairie are the taller grasses, including big bluestem Indian grass and switch grass, but other grass species may dominate.

3.6.2. The Prairie Peninsula

3.6.2.1. AFFECTED ENVIRONMENT

The tallgrass prairie biome was distributed throughout Iowa, southern Minnesota, northern Missouri, and the eastern portions of Oklahoma, Kansas, Nebraska, South Dakota, and North Dakota with an extension east of the Mississippi River (Anderson 1991). This eastern extension is known as the *prairie peninsula* (Transeau 1935) of which the core area is consists primarily of central and northern Illinois, southern Wisconsin, and northwestern Indiana. Outliers of the *prairie peninsula* could be found north, east and south of the core area, to Michigan, southern Ontario, western New York, and southern Illinois. Fluctuations in climate and fire frequency resulted in a dynamic, ever-changing boundary between the prairie peninsula and the eastern forests.

Dry climatic conditions approximately 7,000 years ago allowed the tallgrass prairie biome to spread into the *prairie peninsula*. During the subsequent 5,000 years of climatic amelioration, this extension of the prairie biome would have disappeared if not for periodic fires (Robertson et al. 1997). Without periodic fires, woody vegetation would have invaded and excluded the prairie vegetation. Instead, the periodic fires created a gradually shifting mosaic of prairie, savanna,

and woodland. During periods of low fire frequency, woody vegetation would invade into prairie grassland; higher fire frequencies would eliminate invading shrubs and trees, and allow expansion of grasses into woodlands. The frequency, seasonality, and intensity of fires were undoubtedly important factors in determining the movement of the boundary between prairie and wooded lands. Although some fires originated from lightning strikes, Native Americans are thought to be a major source of fire, often deliberately set (Higgins 1986; McClain and Elzinga 1994; White 1995). Bragg (1982) estimated historical fire frequency at 2 to 5 years. There is speculation that Native Americans may have even set fires more frequently in some regions.

The prairie biome is considered a fire climax successional community. Plant and animal communities tend to go through a succession of stages until they reach a community type that remains fairly stable over a long period of time, a climax community. In the tallgrass prairie biome this climax community was maintained by periodic fire. Through most of the tallgrass prairie region, the climate is suitable for woody plants to gradually encroach and exclude the prairie vegetation, eventually developing into a woody plant-dominated climax community. Fire is the mechanism that prevented woody succession.

Within the *prairie peninsula*, natural grassland communities are diverse, varying with soil type, moisture levels, slope, and aspect. There were other plant communities present, including sedge meadows, marshes, fens, seeps, savannas, woodlands and even forests. In extensive, relatively level areas where topography allowed for frequent and widespread hot fires, the graminoid-dominated communities (prairie, sedge meadow, marsh) were common. In areas where topography reduced fire spread and intensity (e.g. in the fire shadow of streams and on moraines and bluffs) woody vegetation would become established and develop into savannas, woodlands and even a few forests. Forested areas were commonly found along the stream valleys, in ravines, or in the center of prairie where fire was an infrequent occurrence. More open woodlands and savannas would be present as an ecotone between forest and prairie, but topography would reduce the intensity and frequency of fires. The distribution of upland prairie and prairie wetlands was strongly dependent upon the interaction between topography and hydrology, with prairie wetlands being confined to swales, low-gradient drainages, floodplains, and expanses of poorly drained, level ground. Wetlands often developed in upland depressions, forming “prairie potholes” consisting of concentric zones of upland prairie, wet prairie, and sedge meadow around the center of the depression, which usually consisted of marsh or a seasonally inundated wetland.

The tallgrass prairie supports a rich diversity of plants and animals with myriad interactions. Hundreds of native plant species can be considered as part of the prairie; in Illinois alone, almost two-thirds of the native flora occurred in at least one type of natural community associated with tallgrass prairies, including

savanna, and prairie wetlands (E. Ulaszek, pers. comm.); this amounts to nearly 1,300 species. The diversity of prairie plants even in small remnants of 5 acres in size can be higher than 100 species (Robertson et al. 1983). Overall, there are at least 200 vascular plant species that could be considered characteristic of tallgrass prairie communities within the *prairie peninsula*, even though they may occur in other vegetation types elsewhere. A relatively low percentage of the biomass consists of bryophytes (mosses, liverworts) and lichens; these are largely restricted to specialized microhabitats, such as tree bark and exposed rocks, but there are species that grow on exposed soil and in wetlands.

Interactions between plant species may be complex, often consisting of competition for nutrients, water, and light. These competitive interactions are important in determining vegetation composition and structure. Less obvious interactions include allelopathy and parasitism. Allelopathy occurs when one plant species exudes a compound that inhabits germination or growth in nearby plants, thereby reducing competition; black walnut certain sunflowers and tall goldenrod are well-studied examples. Parasitism occurs when a plant is dependent upon another plant for a water, nutrients, or carbohydrates; some species are entirely dependent, but many parasitic plants are also photosynthetic, therefore called *hemiparasites*, because they are only partially dependent on other plants. Some common hemiparasitic plants in tallgrass prairie include false toadflax, lousewort and Indian paintbrush. Not surprisingly, the presence and abundance of these plants appears to impact the vigor and height of the dominant grasses, which may allow increased diversity of forbs and shorter-stature grasses.

The tallgrass prairie has a rich assemblage of invertebrates, including insects, arachnids (e.g., spiders, mites, ticks), crustaceans (e.g., sowbugs, chimney crayfish), and land snails. No complete studies have been done to adequately estimate the number of invertebrate species that could have been found in prairies. Panzer (per. comm.) suggests that at least 4,000 insect species may occur in a prairie tract of more than 1,500 acres. Many of these insects are specialized herbivores, feeding on only one species of prairie plant; for example, the larvae of the prairie dock root-borer, a moth feeds only on one prairie forb, the prairie dock. Some parasitoid wasps often use only one insect or one group of insect species as a host. Insects are important pollinators of many prairie forbs; approximately 75% of herbaceous prairie plants are dependent on insects for pollination. Some prairie forbs are extremely specialized, and pollination is only possible by one insect species. Native bees are important pollinators, but certain species of moths, flies, wasps, beetles, and butterflies are also important for pollen movement.

Vertebrates are an important component of the prairie fauna. Over twenty species of amphibians and reptiles were commonly associated with the tallgrass prairie. Within the prairie peninsula, at least twenty-seven breeding species of

birds could be considered as somewhat or strongly restricted to prairie grasslands. More than twenty mammalian species can be associated with tallgrass prairies. Enumerating animal species for all habitats within the prairie biome (e.g. woodlands, streams, wetlands, etc.) would double or perhaps triple these numbers, especially for the invertebrate groups. For example, consider the diversity present in prairie streams, with their rich fauna composed of fishes, fresh-water mussels, snails, crayfish, insect larvae, and annelids.

Much of the prairie biomass and associated interactions occur out of sight, in the soil. Plant roots, soil fauna (arthropods and other invertebrates), fungi, and microbes may comprise more than half of the total biomass of tallgrass prairie. In tallgrass prairie, most organic matter accumulates underground as dead and decaying roots, not aboveground in woody material, as in forests. Mycorrhizal hyphae form an intimate connection with prairie plant roots, contributing to nutrient and water uptake. These fungal hyphae also form connections between plants, perhaps assisting in parasitic relationships. The mycorrhizae also play an important role in determining soil structure, facilitating movement and distribution of air, water, minerals, organic matter, and microbes. Certain other bacteria form colonies in nodules on the roots of legumes and certain woody plants (actinomycetes); these bacteria fix nitrogen from inorganic sources, perhaps giving their hosts an edge under highly competitive or low nutrient growing conditions. Living roots of prairie plants (and presumably their associated fungi and fauna) may reach down to 6 meters or more, eventually contributing to organic matter and soil structure at greater depths than in many other vegetation types. This “underground prairie” is important in the formation of the deep, fertile soils that are characteristic of the tallgrass prairie and many other types of grassland.

Invertebrates and small mammals are important in creating small-scale disturbances in prairie soils. By burrowing and building mounds, ants, rodents, and badgers incorporate organic matter into the soil, change drainage, increase aeration, and mineral soil to the surface. These activities also create sites for seedling germination and recruitment for many prairie plants, by reducing competition from established perennial grasses and forbs. Other soil disturbances were caused by erosion, soil slumping on hillsides, windthrow of trees, and repeated freezing and thawing or saturation and drying cycles.

Because of a combination of relatively high rainfall and mineral rich soils, prairie grasses produce more biomass than can be decomposed in a single growing season. As this dead biomass accumulates, productivity decreases. Grazing and fire can take off this excess biomass and thus increase productivity. Both grazing and fire can also impact species diversity.

Grazing is an important factor in the development of prairie and other grasslands. The dominant grazing ungulate of the western prairie and Great Plains

grasslands was the American bison or “buffalo”. Bison were also present on the grasslands of the *prairie peninsula*, but were apparently less abundant than on the Great Plains. Bison are predominantly grazing herbivores, with approximately 90% of their consumption as graminoid material (Plumb and Dodd 1983). Bison tend to be less selective as they graze than cattle or deer, often coarsely cropping grasses (Guthrie 1984). Because of the combination of size, mobility, and foraging behavior, bison can have significant effects on biological diversity in grasslands. Grazing in native grasslands tends to create heterogeneity in grass structure, alter the abundance of certain grasses and forbs, and increase species richness, and change species dominance (Collins and Steinauer 1998). Bison (or other large grazers) assist in cycling nitrogen from the above ground biomass to the soil through feces and urine, where it is again available to plants.

Bison also cause microhabitat changes, through trampling and the creation of wallows and *grazing lawns*. *Grazing lawns* are favored grazing areas, often because the forage consists of highly palatable species or is high in trace minerals. These highly used areas provided habitat for relatively rare *fugitive species*. *Fugitive species* require early successional conditions that are relatively free from competition from other organisms; in prairie vegetation, some areas disturbed by bison were free from mature, competitive perennial plants, so that seedlings of certain fugitive plant species could become established. When the deeper “buffalo” wallows filled with water, they became seasonal wetlands for amphibians and other organisms. In some respects, bison were a *keystone species* on North American grasslands (Bond 1993). *Keystone species* are organisms that affect the abundance and diversity of many other species in their habitat; when removed, there may be significant shifts in the structure, species richness, and functions of the ecosystem.

Elk and white-tailed deer are the only other large ungulates indigenous to the prairie peninsula; they forage by both browsing and grazing, and are often highly selective. White-tailed deer often target tender, nutritive browse such as buds, growing points, young leaves, and inflorescences of forbs and woody plants. Selective browsers can impact vegetation composition and structure by preventing reproduction of selected forbs, but also by reducing encroachment of palatable shrubs.

The prairie flora and fauna are adapted to the disturbance regime of periodic fire. Most prairie plants have growing tips that are underground, protected directly from the fire and insulated from heat by the soil. Woody plants, however, have growing tips above ground where they are exposed to fire. Even if burned during early summer, many prairie plants can re-sprout, recover, and flower during the same growing season (Anderson 1972). Prairie animals are also adapted to fire to varying degrees. Some animals (especially vertebrates and certain invertebrates) can escape the fire by fleeing to unburned areas or moving underground; others are dormant underground during potential fire seasons. A

few individuals of these species may be killed, but there are no long-term effects on populations. For other species, especially certain arthropods, large numbers may be killed by fire, but populations may recover rapidly because of high reproductive rates among surviving individuals. Such fire-related population fluctuations among arthropods may have had significant impacts for certain prairie plants, by effecting levels of pollination, herbivory, seed predation, and pathogen transmission. Prairie fires apparently burned in a mosaic, leaving some areas unburned, while other areas burned at lower intensities. Unburned areas acted as refugia for animals sensitive to fire; they would later re-colonize the burned areas.

Besides controlling woody vegetation, fire has various impacts upon the vegetation of tallgrass prairie. Fire can have an effect of the productivity of prairie vegetation. Fire increases aboveground biomass production in prairies over production in unburned, ungrazed and unmowed prairies (Hulbert 1986). Some prairie plant species will respond by reproducing after burning, while other species will forgo reproduction after a fire. Fire frequency can also change the diversity and composition of prairie vegetation. Collins and Steinauer (1998) found frequent burning tends to reduce species diversity, increases the dominance of warm season grasses, reduce temporal variability, and decrease community heterogeneity. Fire favors the growth of warm season grasses by increasing moisture and nitrogen availability and increasing light early in the growing season by removing litter. Over the long-term, too-frequent fires would tend to favor these grasses at the expense of prairie forbs. Plant composition can also be effected by seasonality of fire, for example late spring burns can be favorable for some of the warm season grasses, and less favorable for other grasses and forbs (Hulbert 1986).

The two major disturbances, fire and grazing, tend to moderate the effects of the other. Fire favors warm season grasses, which results in luxuriant growth attractive to bison. Fire tends to result in nitrogen loss from the soil in the short term (increased plant uptake), while bison can make nitrogen from plant biomass available to the soil. The interaction of fire and grazing maximizes species diversity and community heterogeneity (Collins and Steinauer 1998), and both disturbances are necessary to maintain healthy prairie ecosystems.

3.6.3. Midewin

3.6.3.1. AFFECTED ENVIRONMENT

Midewin National Tallgrass Prairie is not a functioning prairie ecosystem. However, important components of this ecosystem are present, and those components no longer found at Midewin do occur elsewhere in the Prairie Parklands or adjoining regions.

Midewin has remnants of native vegetation at Midewin, including representatives of certain prairie communities (see Appendix B, Existing Vegetation). These remnants total approximately 400 acres; at least 160 acres consists of native prairie communities, including at least 120 acres of dolomite prairie. Many of these native vegetation remnants are less than one acre in size and are highly isolated in a landscape dominated by cultural and successional vegetation. The largest tracts of native vegetation remaining are not prairie vegetation, but represent woodland, forest, or wetland communities. Of these remnant communities, the dolomite prairie may be most significant; the largest concentration of dolomite prairie was in the lower Des Plaines River valley, and a significant portion of the surviving amount is at Midewin (~17%). Additional natural communities may have been present, but were destroyed or degraded beyond recognition by agricultural or industrial activities. These include representatives of the drier moisture classes of typic and dolomite prairie and fens.

There are at least 440 species of native vascular plants present on Midewin. Most of these are concentrated in the native vegetation remnants, but some disturbance-adapted species are fairly widespread, such as common ragweed, eastern cottonwood, and tall goldenrod. Some prairie plants survive outside of native vegetation remnants, in roadsides, pastures, or on subsoil exposures (native successional grasslands). Most prairie plants in these situations are fairly tolerant of disturbance, such as prairie dock, yellow coneflower, prairie cordgrass, and stiff goldenrod, but few more conservative are occasionally present, including Riddell's goldenrod and short green milkweed.

Also present on Midewin are eleven species of endangered or sensitive plants (see Threatened, Endangered, and Sensitive Species section of this FEIS). These plants are restricted to the native vegetation remnants. Populations of two additional plant species (one Federal Threatened and one Sensitive) occur adjacent to Midewin' some individuals of both species occur within 35 meters of the boundary. The habitat for these species is contiguous with suitable habitat on Midewin, and their presence on Midewin is highly likely.

Twenty-seven species of mammals known to be present on Midewin; this includes several prairie species, including voles, plains pocket gopher, deer mouse, thirteen-lined ground squirrel, coyote, and striped skunk. Most of these animals are relatively adaptable and survive in habitats other than prairie, including agricultural grasslands. Many of the other animals present at Midewin can occur in prairie, but also occur in woodlands and other habitats, such a white-tailed deer, eastern mole and fox squirrel. Extensive mammal surveys at Midewin have not been completed and it is likely that additional species will be discovered during further surveys. One prairie mammal, Franklin's ground-

squirrel does not occur on Midewin, but has been observed repeatedly on adjacent state land.

At present, 104 bird species are known to breed on Midewin, and another 68 species utilize the site during migration or as winter habitat. Many of the bird species present on Midewin are fairly widespread and common, and are able to utilize a variety of habitats, such as shrublands, fencerows or other successional habitats. There are also species that require more restricted and natural habitats, such as wetlands and forests. Most significant, however, are the grassland birds at Midewin. At least twelve species of grassland-restricted native birds nest on Midewin, and for at least three species, Midewin hosts the greatest concentration of nesting pairs in northern Illinois. For the most part, these grassland birds are not utilizing native prairie, which is now of insufficient size and structure. Instead, these birds are using the extensive agricultural grasslands (pastures and hayfields) present on Midewin. Midewin also provides important winter habitat for certain grassland birds, mostly raptors. The rodent populations present in the agricultural grasslands attract these birds.

Among the birds present on Midewin are ten threatened or sensitive species (see Threatened, Endangered, and Sensitive Species section of FEIS). The one Federal Threatened species is the bald eagle, which is a rare migrant visitor to Midewin. Five of the sensitive bird species are grassland birds attracted by the concentration and size of agricultural grasslands, including the upland sandpiper and the bobolink Of the remaining sensitive birds, one is restricted to wooded habitats, and the remaining two are restricted to wetlands.

Fifteen reptile species are known from Midewin. Many are found in native prairie, but have also adapted to old fields and agricultural grasslands. Blanding’s turtle is a sensitive specie and is dependent on natural wetlands.

Nine amphibian species are known from Midewin. Many of these are associated with natural wetlands, but others have adapted to more disturbed habitats, for example, the northern leopard frog forages in agricultural grasslands. The only amphibian listed as sensitive is the plains leopard frog a prairie and prairie wetlands species.

There are 53 species of fish known from Midewin; numerous surveys have been conducted for Prairie, Grant, and Jackson creeks. Jordan Creek and its tributaries on Midewin do not support a permanent fish population. There are also fishes present in a few impoundments and constructed ponds on site.

Surveys have verified the presence of nine native fresh-water mussels, plus the non-native Chinese clam. Mussel surveys have been completed for Jackson, Prairie, and Grant creeks. The one sensitive mussel species, the ellipse is restricted to Jackson Creek on Midewin.

Terrestrial arthropods have not been completely surveyed on Midewin. Surveys have focused on spiders and certain insect groups, including remnant-dependent species and Federal Endangered and Threatened species. No federally listed species were found. However, twenty-five remnant-dependent insect species were located on Midewin (Glass 1994); most of these were associated with remnants of native vegetation, especially prairie communities. Three insect remnant-dependent species present on Midewin are now sensitive species; each requires a different prairie plant species for food.

Although streams on Midewin have recovered somewhat from past impacts, many reaches have been highly altered by channelization and other changes. Some reaches of these streams are still in good condition, especially Jackson Creek, which received a Biological Stream Characterization of “B”. A “B” ranking indicates a stream is a “highly valued aquatic resource”. The significance of Jackson Creek becomes apparent with the realization that many Illinois streams do not even rank a “C”. The vegetation present along the streams is often a consequence of human disturbance, and includes many non-native species.

Most of the landscape at Midewin consists of cropland or successional vegetation that does not support the flora or fauna characteristic of the tallgrass prairie ecosystem. Instead the native plants and animals present are adaptable species that can thrive under highly disturbed conditions; some can and do occur in prairies, but they are not dependent on prairie conditions for survival. They have behavioral or dispersal mechanisms that enable them to persist in fragmented habitats, and they are pre-adapted to survive under degraded conditions. In most cases, these adaptable natives exist along with an assemblage of non-native species with similar adaptations, including the 160 species of non-native plants present on Midewin.

Because of the fragmented nature of existing native vegetation, the loss of many native species, and the overall increases in native generalist species and non-native species, many ecological processes and interactions have been disrupted. There is probably little gene flow between the small populations of insects and plants surviving in native vegetation remnants. Many of these remnants are experiencing severe invasions by native woody and non-native plants. Even existing grassland bird habitat in agricultural grasslands is highly vulnerable to loss because of the tremendous increase in invasive woody plants on site. Roads (including Illinois Route 53) and railroad berms create barriers to dispersal, especially, for reptiles, amphibians, and small mammals. Because of higher populations of certain generalist predators, there may be higher predation rates on ground-nesting birds and other organisms. Fire does not exist as a natural disturbance process, and ungulate grazing is now restricted to agricultural grasslands. Stream alterations and disruption of natural hydrology prevents the recovery of wetlands and streams from past abuses.

3.6.3.1.1. Cause and Effect Relationships/Resource Pressures and Responses

1. Outright destruction is the greatest threat to tallgrass prairie ecosystem. (When native vegetation is converted to agricultural or developed land, or used for strip mines, quarries, or impoundments).

2. Fragmentation results from patchy destruction, or when fragmenting features, such as roads or woody fencerows are placed in previously unfragmented grasslands. Fragmentation has five major effects:
   a. Reducing or interrupting gene flow or other interactions between populations.
   b. Reducing habitat area below that required by area-sensitive species.
   c. Disrupting or altering processes functioning on landscape scales, such as fire, hydrology and movement of large herbivores.
   d. Reducing ecosystem capacity to respond to long or short-term climatic changes.
   e. Increasing edge habitat, leading to increased predation, nest parasitism, and invasion by non-native species.

3. The tallgrass prairie ecosystem is characterized by three landscape-scale disturbances; fire, ungulate grazing, and climatic fluctuations (especially periodic drought) critical for long-term ecosystem health. Fire and grazing regimes have been significantly altered by human action, however, humans can restore these disturbances into prairie ecosystems.

   a. Many prairie and woodland fires were set by Native Americans. Conversely, most fires were suppressed by Euro-American settlers, often through the act of converting native vegetation to roads and croplands, which were effective firebreaks. The suppression of landscape-scale fires continues to the present. Because of past fire suppression, many prairie remnants are in poor condition because of woody plant encroachment. At present, most surviving prairie remnants are dependant upon land managers for periodic burning. Fire frequency needed depends upon the condition of the remnant. Higher quality remnants with little or no woody plant encroachment need less frequent fire. Many existing remnants are too small for fire, landscape, and vegetation to interact as they did before 1830, and burning regimes must be designed to prevent extirpation of isolated populations of fire-sensitive insects and to minimize safety hazards to nearby road and private property.

   b. Changes to grazing regimes occurred as bison and other ungulates were extirpated. Where cattle were grazed on prairies, the vegetation changed, in part of because of an intensive, year-round grazing regime. Also, cattle graze differently than bison, consuming less grass and feeding more

selectively on young growth and forbs (Plumb and Dodd 1983). Many surviving prairie remnants have a history of unsuitable grazing management, including some of the remnants on Midewin.

c. Climatic change has been least impacted and changed by humans, although some is now likely. Periodic droughts killed invading woody plants, and reduce growth and reproductive effort in prairie forbs and grasses. Long-term warm, dry periods allowed migration of certain Great Plains biota into the *prairie peninsula*.

4. Mowing has sometimes been use to approximate grazing effects. If removed as hay, it can simulate some effects of fire and grazing, by removing biomass. Done at inappropriate times or frequency, mowing can have negative effects on prairie animals and plants.

5. Many prairie remnants are small and often highly isolated within a landscape of successional vegetation and crops, often dominated by non-native, invasive plant species. Isolation can negatively impact species diversity, leading to an unhealthy ecosystem. Many restored prairies are too small to support a wide range of prairie-restricted biota. Some organisms are more likely to be lost from small, isolated prairie remnants than other species; many have become sufficiently rare for listing as endangered or threatened by state agencies or the federal government. Some factors that contribute to species extirpation from small, isolated remnants:

   a. Reduced gene flow between populations, leading to lowered genetic diversity. The reduced genetic diversity may result in the population not having enough potential variability to respond to challenges from climatic fluctuations or pathogens.
   b. Insufficient habitat for long-term persistence of a given species' population. Reduced population increases vulnerability to stochastic events.
   c. Some animal species have specific area requirements. If these minimum requirements are met, these species won't be found on the remnant, even if the species is highly mobile.
   d. Some species that disappear because of isolation or reduced habitat size have critical interactions with other species. Their loss will lead to the disappearance of additional species. For example, a severe decline or extirpation of certain plant species (e.g. rattlesnake master) from a remnant will lead to the loss of any insect dependent on that plant for food (*Eryngium* root-borer moth).

6. Certain insects pollinate and cross-fertilize flowers, and facilitate gene flow between populations (through pollen movement) for most prairie forbs. Co-adaptive relationships have developed between many flowering plant species

and certain insects, often relying on specialized floral mechanisms to effect pollen transfer. In many cases, the plant species are dependent upon one insect species for pollination. Conversely, specific plant species may be important nectar sources for pollinating insects at critical periods. There is evidence that some pollinators have been lost from remnants or reduced in numbers to the point where effective pollination is rare or non-existent for certain plant species.

7. Soil animals (both mammals and invertebrates) are important in developing prairie soils. Some burrowing animals have been lost from some remnants (sometimes with concurrent replacement by non-native organisms), with resulting changes in soil function. The loss of small-scale disturbances may reduce recruitment in certain plant species.

8. Landscape scale alterations to natural hydrologic regimes have pervasive, adverse impact on surviving prairie and wetland remnants. Tiling and ditching changes subsurface water tables, resulting in greater water level fluctuations in wetlands and streams. This results in down cutting of streams and changes floodplain and riparian area vegetation. Moisture regimes in prairie and wetland remnants have been altered, with loss of certain species and increased invasion by non-native species. Hydrologic changes have altered these habitats' suitability for certain birds; earlier drying of seasonally flooded wetlands increases the vulnerability of marsh-nesting birds to raccoons and other predators.

9. Degradation of prairies through fragmentation, use of inappropriate management techniques, loss of species, and lack of management has allowed non-native species to invade many prairie remnants. In some cases, non-native shrubs were planted in or near prairie remnants for various reasons; the non-native shrubs spread from the planting throughout the remnant. Many non-native plants have the potential to displace native plant species from prairie remnants, with resulting changes in species diversity and habitat structure. Similar consequences can occur with non-native animals, as where certain biological control agents have had unintended impacts on native insects and plants (Boettner et al. 2000).

10. Inappropriate native species introductions have occurred on some prairie remnants (and other native vegetation remnants). Plant species not found in prairies, or in different microhabitats, have been introduced to remnants. Without records, these introductions have led to confusion about the natural range and ecology of the species involved. If successful, these introductions may have consequences for species in the same remnants.

11. Use of inappropriate species, genotypes, and planting mixes pose a threat to the successful restoration of the prairie ecosystem. In some cases,

aggressive strains of native grasses were used in restorations, leading to dominance by a few grass species. Even a seed mix high in certain aggressive natives can affect the success of a restoration, because establishment of additional species may be suppressed for decades because of competition.

12. Failure to consider all components of the ecosystem can threaten successful restoration. All components of the ecosystem are missing from many potential restoration sites, including insects and mycorrhizae. Planting mixes for these sites often fail to include spring-flowering forbs, shorter-stature graminoids, and hemi-parasitic forbs. The initial introduction and continued enhancement of a wide range of appropriate and potentially interacting organisms may be necessary for the success of ecosystem restoration projects, especially when one objective may be to provide habitat for specialized, late successional species.

13. Time, long-term monitoring, and adaptive management are needed to assure successful restoration. When restoring herbaceous vegetation (such as prairie or graminoid wetlands), native species may become predominant within 2-4 years, but it may take decades for composition, structure, and function to resemble that of natural vegetation. This is especially true for restored savannas, woodlands, and forests, where it may take 40-100 years for development of canopy trees. In some cases, this time delay may impact potential species restoration (habitat structure or interacting species absent). In other cases, the absence of or inability to restore certain critical organisms may hinder restoration success.

14. Recreational uses can cause negative effects in some remnants. User-made trails begin as trampled vegetation. As trail use increases, soils become increasingly compacted, native vegetation dies, and rainwater forms puddles, leading to widening trails as users avoid the water and mud. User-made “spider web” trail networks developed, and fragmented the vegetation into patches separated by bare earth. Visitors to prairies can inadvertently bring in seeds of non-native plants, which easily colonize the bare soils. Trails can provide corridors for further dispersal and spread of invasive species. Off-road vehicles and equestrians can also disperse the seeds of non-native plants (Guthrie 1984; Westbrooks 1998). Unleashed dogs can disturb, injure or kill ground-nesting birds and other wildlife. Roads and wide trails may cause fragmentation and provide barriers to dispersal. The amount of trail use has also been shown to have a negative impact on some prairie species, especially birds.

3.6.3.1.2. Midewin - Historical Context

The landscape of Midewin was surveyed for the Land Survey Office in 1821 and 1834 (Miller 1821a, 1821b, 1821c, 1821d, 1821e; Spaulding 1834a, 1834b). The surveyors described the land after each mile marked. Only large or gross changes in vegetation were noted. Although descriptions are vague, information can be gleaned from survey records.

Interpretation of this information indicates that approximately 96.5% of the Midewin landscape was described as “prairie” while 3.5% was described as “timber”. The surveyors likely included upland prairie, wet prairie, and sedge meadow as “prairie”.

Surveyors within Midewin noted four forested areas. Star Grove was a small prairie grove located along Prairie Creek, south of present-day Kemery Lake. The shape and size of Star Grove was only roughly indicated on the plat map; the timbered area could have ranged from 150 acres to well over 200 acres. The present day size is approximately 152 acres, most of which is still in under Army administration. Black and white oaks, basswood, sugar maple and black walnut were found in Star Grove. Portions of Star Grove were also described as having a hazel and bramble understory. The shrubby understory and isolated location, surrounded by prairie, suggest prairie fires often entered Star Grove, and that portions were probably savanna.

Prairie Creek Woods was a wooded area along Prairie Creek from a point where it empties into the Kankakee River north along the creek for approximately one mile. The land plat doesn’t indicate a definitive boundary at the north end, but based on the plat map this wooded area would have covered approximately 250 to 350 acres. The survey notes describe Prairie Creek Woods as having white oak, black oak, hickory, basswood, and cottonwood. The dominant trees appear to have been white and black oaks which made up 13 of the 18 witness trees. The oak witness trees ranged from 12" to 36" DBH (diameter breast height). Most of the trees were in the 12" to 24 “ range with an average of 19". Today, that portion of Prairie Creek Woods located on Midewin is approximately 145 acres in size and is adjoined by an approximately 35 acres of successional woodland and shrubland.

Jackson Creek Woods consists of remnants of once larger wooded area associated with Jackson Creek. The survey plat map shows the wooded area exceeding 2,500 acres. The portion within Midewin is approximately 230 acres in size, including two discrete tracts along Jackson Creek, both east and west of Baseline Road. Jackson Creek Woods was described as being an oak forest. Along Jackson Creek, white oak was the most common tree with other species including ash, ironwood, sugar maple, black walnut, sycamore, red oak,

basswood and hackberry. At one point along the stream, the undergrowth was described as having hazel and vines. Upland areas were dominated by white oak with ash, elm, sugar maple, basswood, black walnut and hickory. The size of the witness tree white oaks varied from 12" to 60" DBH. Twelve of the 14 bearing and witness trees were in the 12" to 18" DBH range. The average DBH was 19".

Hoff Woods was a large prairie grove; based on the plat map, the grove was approximately one section in size (640 acres) during the early 1800's. Today Hoff Woods covers approximately 436 acres, and large interior tracts have been converted to hay fields. The land survey notes described the dominant over-story trees as being oak (at least some were white oak). Other trees described were black walnut, basswood, hackberry, elm, ash and sugar maple. Along one transect through Hoff Woods, undergrowth was described as consisting of hazel and vines. Six witness or bearing trees were located within Hoff Woods and the DBH ranged from 9” to 12”. Midewin includes 10 acres that was once part of Hoff Woods but now is a grass hayfield. Much of the surviving grove is within Abraham Lincoln National Cemetery.

Other small groves and savannas were probably present on the Midewin landscape during the land survey period. These groves were either too small to map or weren’t intersected by any section lines. Several sites for historic savannas and small groves have been identified. Lost Grove is a small savanna located south of Prairie Creek in Section 3, T.33N., R.10E.; this remnant was discovered during the native vegetation survey (Ecological Services, 1995). Other small oak groves and isolated single bur oaks can be found scattered throughout Midewin.

Prairie covered most of Midewin at the time of the land surveys, although surveyors recorded few details. The prairie east of the escarpment was described as “rolling.” West of the escarpment the prairie was described as “rocky,” “rocks on surface,” and “limestone on surface” in a few locations. From the soils and topography, it would appear there was a continuum of wet to dry prairie. The surveyor of Township 33 North, Range 11 East (which includes the northeastern corner of Midewin) gave better descriptions of the prairie and noted both dry and wet prairie and described some wet areas as swamp (Spaulding 1834a). These “swamps” may have been what are now called marshes.

Although not described by the surveyors, frequent seeps can be found along the escarpment at Midewin. These were probably more common, but most were likely destroyed by drainage operations.

Wildlife was common in the Midewin area prior to settlement. Many early explorers’ accounts describe wildlife. Some wildlife species have been extirpated from Illinois. The following accounts are reviewed in White (1999). In 1680, LaSalle camped at the confluence of the Kankakee and Des Plaines Rivers and

recorded killed bison, deer, turkeys, geese, and swans for food. Hennepin traveled down the Kankakee River to the Illinois River in the fall of 1679. He saw a few bison, but there was evidence that they were plentiful in the area. Hennepin also commented that the Miami had burned the prairies to hunt bison. The bison had apparently moved on to unburned areas. He remarked that, “you can see herds of two and even four hundred.”

Perrin and Hill (1878) describe some the Will County townships. In Jackson township (which includes portions of Midewin) they describe “Turkeys, wolves and other game were so plenty as to make them almost a nuisance.” Woodruff (1878) described some of the natural resources of Will County. He wrote “The county is largely prairie. . . . The prairie is generally of the kind called high or rolling, and many of the low portions were called ‘sloughs’, as they contained water except in the dry season.” About the wildlife he commented, “The prairie also abounds in the native hens [prairie chickens] and quails, the destruction of which has been restrained by game laws. In the early settlement of the county, deer were very abundant and an occasional one is seen still, but they have mostly gone with the Indian. Prairie wolves [coyotes] were also very abundant in the early day, and a source of much vexation and damage, and are not yet extinct. Buffaloes [bison], no doubt, once roamed in vast herds over Will County, but had disappeared before settlement. The timber that filled the native groves and bordered the streams consisted of the various varieties of oak, black walnut, hickory, elm, hard and soft maple, button-wood [sycamore] and iron-wood [ironwood]. Of these and others there was a large and vigorous growth of fine trees on the first settlement of the county, most of which in a few years fell before the ax of the settler for the purpose of building log houses, rail fences, fire-wood, etc. and, as soon as saw-mills were built, for lumber. There were also numerous groves of the wild crab-apple, the fruit of which was tolerable for sauce, when we could get nothing better, and when in blossom the trees were a sight, which cannot be excelled in beauty. Wild plums were also abundant and good, and wild grapes festooned the trees and furnished a fruit which was fair in quality and made good wine.”

Maue (1928) wrote of the numbers of passenger pigeons that flew in flocks that passed as clouds. He also wrote of animals that were extirpated even earlier then the extinction of the passenger pigeon, “Deer were abundant as late as 1850. They disappeared rapidly after that because settlers came in immediately following that date. Firearms and dogs were destructive to game. Turkey, bear, panther, lynx [bobcats], and otter, were driven out or killed by 1860". He further commented “Rattlesnakes were numerous when the first settlers appeared upon the prairies.”

From these local accounts and other comments concerning the prairie regions of Illinois, bison, elk, deer, wolves, coyotes, prairie chickens, turkeys, and sandhill cranes were plentiful. Other wildlife, such as black bear, panthers (mountain

lion), and bobcats were also present, although less numerous. These animals were all extirpated from the Midewin area, and many from Illinois.

By the middle 1800's, Euro-American settlement of this area had begun. A settlement was established on the Kankakee River in 1834, and was incorporated as Wilmington in 1854. Farmsteads were established on the area now Midewin. Prairie vegetation was plowed for conversion to crop fields, and native prairie was used for livestock pasture and as a source of hay. Timber was cut in prairie groves and savannas for buildings, fences, tools, and firewood. Groves were used as pastures and as sources of maple syrup. Roads were built, and served to enhance suppression of prairie fires. The Euro-American settlers brought some non-native plants and animals, primarily crop plants (for food, medicines, and dyes) and livestock. Other organisms also had impacts on the vegetation, including pets, ornamental plants, honeybees, and weeds.

The human population grew over the next century, as did impacts on biodiversity. More than 90% of the prairie was converted to row crops or agricultural grasslands (hayfields and pastures) by 1900, and widespread tiling of wetlands (including wet prairie) was underway. Non-native grasses and legumes were introduced to improve pastures and hayfields. Prairie fires were halted by roads, railroads, ditches, and plowed fields that acted as firebreaks. Many species of smaller wildlife declined or disappeared, a consequence of both habitat destruction and intense hunting (for subsistence or market). Some grassland birds adapted to agricultural grasslands (pasture and hayfields), but prairie chickens and other species gradually declined and disappeared; sometimes as a consequence of hunting pressure. The ring-neck pheasant was introduced as a game bird that could survive in a mixed agricultural landscape. Trees (both native and non-native species) were widely planted for shade, hedgerows, ornament, and windbreaks.

Prairie vegetation became restricted to narrow strips associated with roads, railroads, and fences. Until the 1950's, these areas were often burned to control brush, so the native prairie plants survived. However, most native prairie hayfields and pastures were "improved" through planting of non-native grasses. West of Illinois Route 53, the level landscape and shallow soils discouraged certain agricultural uses, although many areas were used as pasture or hayland. Some shallow-soil areas (formerly dolomite prairie) were intermittently cultivated and then converted to pasture or hayland. Certain fragile wetlands, such as seeps and fens, were altered by intensive livestock use. Other prairie wetlands, no longer maintained by periodic fire, were invaded by woody species.

Livestock grazing, timber cutting, and the exclusion of natural fire have altered savannas, forests, and woodlands. Some wooded areas were completely cleared and converted to other uses, mostly cropland. Although some savannas retained their open structure because of grazing, the understory gradually lost the native

herbaceous component. Thorny native shrubs increased in savannas and woodlands. Wildlife that preferred open savannas, moved into other habitats, or disappeared.

Drainage of wetlands and increased runoff had adverse impacts on stream vegetation. Increased turbidity, nutrients, sediment deposition, and flow fluctuations had impacts on in-channel vegetation; many submersed and emergent herbs declined or disappeared. Reed canary grass and other exotics colonized the stream banks and gravel bars. Fish and mussel species intolerant of turbidity, sedimentation, and agricultural runoff declined or disappeared. The introduced carp and a few tolerant native species become common stream fishes. Downcutting of streams lowered the water table in adjacent floodplains and riparian areas, allowing colonization by woody plants, creating extensive successional woodlands along the banks of Prairie Creek and other streams.

When the site came under the administration of the Department of the Army (*c.* 1940), a number of rapid changes further affected biodiversity. Construction of buildings, parking lots, pipelines, roads, and utilities occurred. Large amounts of soil were moved to create bunkers, bridge crossings, and railroad berms; the source areas were left unclaimed. By-products of ordnance manufacturing process were disposed of in landfills, wetlands, and streams. Some areas were quarried to provide gravel and limestone. Private homesteads were removed, but agricultural uses (cropland, hayland, and pasture) continued on land not converted to ordnance production. Livestock were allowed access to streams and wetlands for water. Mowing, haying, cropping, and grazing were used to keep grasses short, for security and to reduce potential for hazardous fires. Existing streams were channelized, and new channels were created for portions of Jackson, Prairie, and Grant creeks. Several impoundments and ponds were created to provide water for emergency use. A few tracts were planted with exotic shrubs and trees to benefit game species. Small tracts of native prairie survived in pastures and hayfields. Wetlands, woodlands, and forests survived where they were not converted to industrial uses. Certain grassland birds thrived; a few other prairie animals managed to persist in the prairie and wetland remnants. This intensive management continued into the 1970’s.

Over the last 12-15 years, ordnance manufacturing has declined, and finally ending in 1999. Maintenance of open land has declined, and many areas formerly mowed or used for pasture, hayfields, or croplands are now becoming invaded with dense stands of shrubs and young trees. Some grassland birds have gradually declined, but other species have colonized the site. White-tailed deer, coyote, raptors, great blue herons, and other wildlife have reappeared; wild turkeys were restocked successfully. Some native prairie remnants are recovering because of reduced impacts from agricultural and industrial activities, but there has been increased invasion by woody plants. There has also been an increase in invasive non-native species on the site.

Since transfer of land to the Forest Service, further changes have occurred. To provide grassland bird habitat, some croplands have been converted into agricultural grasslands. Several tracts have been taken out of pasture to reduce impacts on wetlands, native vegetation remnants, and sensitive plant species. Fences were installed to exclude cattle from streams and wetlands. Some croplands were converted to seed production beds and fields. Other croplands were taken out of production for eventual restoration to native vegetation. Alfalfa hayfields have been planted temporarily in row crops, to prepare them for conversion to grassland habitat or prairie restoration. The prairie biome, with its rich interactions among a diversity of species, no longer exists as a whole, functioning ecosystem, but discrete elements still survive in the highly fragmented Midewin landscape.

3.6.3.1.3. Cumulative Effects Area - Historical Context

The geographic area considered in this analysis is the Central Till Plains Section, Prairie Parkland Province, Prairie Division, (Keys Jr. et al. 1995).

The Central Till Plains Section lies entirely within the *prairie peninsula,* and was dominated by the tallgrass prairie ecosystem. Typic prairie (both upland and wet) was the dominant vegetation type, perhaps including at least 84% of the CTPS (Iverson et al, 1989). Dolomite prairie was restricted to major river valleys, where dolomitic bedrock was at or near the surface. These areas occur along the lower Des Plaines, lower Kankakee, and upper Illinois rivers. Other prairie subtypes present were sand prairie, gravel prairie, and hill prairie, each associated with specific substrates or topography.

Variation in distribution of species and habitat was reflected in moisture regimes. Forests and woodlands were largely restricted to dissected regions along major streams. Hill prairies were often present on southwesterly exposures in dissected regions. Savannas existed as an ecotone between woodlands and the open prairie but isolated groves were often present on more sloping terrain associated with end moraines, valley sides, and stream terraces. Wetlands were often associated with major drainages; complexes of wet prairie, sedge meadow, marsh, and bottomland forests could be found in stream valleys, but upland depressions and swales also contained wetlands dominated by herbaceous graminoids. Extensive areas of level landscapes existed and were seasonally inundated or saturated; these areas often supported wet prairies. Seeps and fens were present along valley sides, at the edges of terraces, and below end moraines.

Wetlands (including wet prairies) probably comprised at least 30% of the CTPS, based on coverage by hydric soils (Suloway and Hubbell 1994). Many wetlands in this region were associated with major drainages, including the Illinois,

Kankakee, Des Plaines, Fox, Mackinaw, Sangamon, Kaskaskia, both Vermilions, and Wabash rivers; extensive complexes of wet prairie, sedge meadow, marsh, and bottomland forests were found in stream valleys. Upland depressions and swales contained wetlands dominated by herbaceous graminoids, such as wet prairies and pothole marshes. There were also extensive areas of level landscapes that were seasonally inundated or saturated; these areas often supported wet typic prairie. Seeps and fens were present along valley sides, at the edges of terraces, at the heads of ravines, and lower slopes of end moraines.

Climatic fluctuations over the last 12,000 years had major impacts on the flora and fauna. These changes have allowed the assemblage of a diverse biota within the Central Till Plains Section. A prolonged dry period, approximately 7,000 years ago, allowed the incursion of many Great Plains organisms into the section; many of these have survived to present in sand prairies, hill prairies, and other dry habitats (Schwegman et al. 1973, Smith 1957). Some organisms that probably entered the CTPS during this period include prairie satin grass, scurfy pea, prairie dogtooth lily, plain leopard frog, six-lined racerunner, and western box turtle. Other elements (mostly plants) appear to be disjuncts from the southeastern USA, where they occur in glades and barrens; these species include leafy prairie-clover, false mallow, Butler's quillwort, glade onion, and woolly croton. These species were largely restricted to dolomite prairies.

Few species are endemic to the CTPS; perhaps Kankakee mallow is the only endemic plant. Several species are considered endemic to the Great Lakes Region and the Prairie Peninsula that were present within the CTPS. These include red-veined prairie leafhopper, lakeside daisy, eastern prairie white-fringed orchid, prairie milkweed, glade mallow, Riddell's goldenrod, Michigan lily, Hill's thistle, Kirtland's snake, eastern massasauga, fox snake, and Blanding's turtle.

Other species were more widespread, often widely distributed in eastern or central North America. A few bird species present in the CTPS are widespread throughout the northern hemisphere.

Before 1830, major disturbance factors in the CTPS were fire, periodic droughts, and ungulate grazing; the effects did not differ appreciably from those discussed previously in the introduction. Tornados and other extreme storms were a lesser disturbance factor; ice storms and tornados can damage and destroy individual trees or even entire groves. Abnormally heavy snows may have affected the degree of grazing, by killing herds of bison and elk through starvation.

Other past activities affecting biodiversity within historical times on the CTPS and the relevant portion of the Southwestern Great Lakes Morainal Section are similar to those discussed under the relevant section for Midewin. However, there are some important differences.

As on Midewin, the largest single impact on biodiversity within the CTPS was the widespread conversion of native vegetation (especially prairies and wetlands) to agricultural land, and associated fire suppression. Most of the natural vegetation was destroyed, including >99.99% of typic prairie (White 1978, Illinois Natural Heritage Database 2001). Through extensive draining of wetlands by tiling and ditching operations; perhaps over 98% of the natural wetlands of the CTPS have been converted to agricultural use (Suloway and Hubbell 1994). Most large ungulates and large predators were extirpated, and many small animals declined or disappeared because of commercial trapping or persecution as vermin. Many prairie birds disappeared, either through habitat loss or commercial hunting. As on Midewin, many prairie species survived in small remnants, or in agricultural grasslands. Fragmentation increased, and many isolated populations declined or disappeared because of stochastic factors or the loss of critical interactions with other species.

During the middle 1900's, however, many land changes occurred throughout the CTPS that did not occur on Midewin (or occurred to a lesser degree). Most large, permanent pastures and agricultural grasslands were converted to row crop production. Smaller, temporary grass fields were established to fill local needs for hay or pasture. Grassland birds dependent on these habitats underwent drastic declines (Glass 1994). Most fencerows and hedgerows were removed to enlarge fields and accommodate larger farm equipment. Throughout the CTPS, agricultural chemical use increased for crop production and to control undesirable species. Herbicides and insecticides were often applied in right-of-ways or other small remnants of native vegetation, to control brush, weeds, and mosquitoes, reducing in the loss of populations of native plants, insects, and amphibians.

Presently urbanization and conversion of agricultural land and remaining natural vegetation to industrial, residential, and commercial uses is an increasingly important impact in the CTPS, especially immediately north of and around Midewin. New roads and utility corridors are associated with urbanization. Throughout much of the lower Des Plaines River valley, most wetlands and dolomite prairies were destroyed by quarrying and industrial uses. The valley is now a major industrial region and transportation corridor; the few remnants of the prairie and wetlands are now protected.

Non-native species were introduced throughout the CTPS, and additional species spread in from adjacent regions. Since 1830, there has been a gradual acceleration in the establishment and spread of additional non-native organisms, and they now dominate much of the landscape of the CTPS.

For the Illinois portion of the CTPS, no more than 12,000 acres (approximately 0.08%) of natural communities are believed extant; many of these remnants are

small (<10 acres) and highly isolated (Illinois Natural Heritage Database). The percentage of surviving natural vegetation in the Indiana portion is probably similar to the condition in Illinois. Many of these remnants are continuing to disappear and degrade under the current conditions. Flora and fauna continue to disappear from many remnants, either through lack of management, competition from invasive species, degradation from incompatible uses, loss of interacting organisms (e.g., pollinators) or stochastic events that impact small populations.

Some remnants within the CTPS have received protection and management, including prescribed burning, removal of woody vegetation, and control of exotic plant species. Approximately 1,400 acres of native vegetation (mostly prairie and wetlands) are included within Goose Lake Prairie State Park; this is the largest single tract of tallgrass prairie surviving in Illinois, and supports viable populations of many prairie birds, reptiles, insects, and plants. Additional restoration has added to the significance of this site. However, many important species remain lacking or in small numbers, such as bison, northern harrier, eastern massasauga, upland sandpiper, eastern prairie white-fringed orchid, and Mead's milkweed (*Asclepias meadii*). This absence is a consequence of a relatively small size (compared to original extent of prairie), historical extirpation, or lack of sufficient habitat diversity (another consequence of area). Many smaller tracts totalling at least 1,500 acres occur throughout the CTPS are managed to mainatain and rehabilitate the natural communities; however, many of these tracts are less than 10 acres in size and cannot support the full range of prairie biodiversity.

Protected and managed examples of dolomite prairie exist at Lockport Prairie Nature Preserve, Romeoville Prairie Nature Preserve, Des Plaines Conservation Area, and a few smaller sites in the lower Des Plaines River valley. Together, these remnants do not exceed 700 acres. Other dolomite prairies can be found in the region, but most unprotected dolomite prairie remnants are quite small and often highly degraded.

3.6.4. ENVIRONMENTAL CONSEQUENCES

3.6.4.1. Direct and Indirect Effects

Alternative 1 will do little to improve existing biodiversity, and conditions are likely to decline. Existing vegetation remnants (although protected and managed) will lose plant and insect species through competition from invasive native and non-native plant species, and as a result of stochastic events on small, isolated populations. Populations of native plants may disappear because of lack of pollinators, lack of recruitment from appropriate disturbance regimes, and other factors. Because no additional land will be acquired and no additional restoration projects will be initiated, opportunities to add to biodiversity will be limited.

Positive effects can be expected from the ongoing restoration projects, but these may be temporary. These restoration projects will be sizable, but will exist in relative isolation, and the full range of natural processes and disturbances cannot be restored. Agricultural grasslands will remain at 2,800 acres, but continue to be fragmented by fencerows, hedgerows, and roads. Grassland bird populations will remain below the minimum needed for viability. Some species are likely to be lost from Midewin through stochastic events or increased predation. Colonization by additional birds of the prairie ecosystem is unlikely.

It will become more difficult to manage all components of the prairie ecosystem under Alternative 1 because of several factors.

- Additional dispersion of seed from woody plants into natural and restored communities as surrounding land becomes dominated by invasive woody species;
- Adverse impacts through herbivory and predation as the number of species associated with successional habitats (crows, raccoons, deer) increases.
- Probable decline of stream-associated organisms as degradation elsewhere in the watershed would not be offset by stream restoration on Midewin.

Impacts from recreation use and facilities are minimal under Alternative 1, which proposes no permanent recreation development and only one administrative building.

All action alternatives (alternatives 2 through 6) are expected to result in positive impacts to biodiversity. Aggressive but appropriate management of existing native vegetation remnants will raise their quality. Invasive plants will be removed and natural disturbance processes (especially fire) will return. Previously unrecorded species may reappear. Population of native prairie species will increase. Native vegetation will expand into surrounding areas, reducing fragmentation and isolation. Acquiring additional lands, especially from the Army, may increase the amount and diversity of natural communities and biota.

Some native vegetation remnants will be managed with grazing to control invasive species or create proper disturbance regimes required by specific plants for recruitment. Deer hunting, if used to control population size and encourage movement, is expected to have positive impacts on natural communities.

Maintaining and expanding agricultural grasslands will positively impact biodiversity by increasing populations, and thus the viability of certain grassland birds. Positive effects to grassland birds are expected to be greatest under Alternative 2, which provides the most agricultural grasslands (10110 acres), then Alternative 3 (9150 acres) and Alternative 4 (6690 acres) and finally

Alternatives 5 and 6 (3920 acres). (Note: These acreages differ slightly from Table 3.17 because of include wetland inclusions.) The wetlands will be managed to restore native vegetation (wet prairie, sedge meadow, marsh) and reduce fragmentation by woody species. Other species, such as ground squirrels, voles, smooth green snakes, northern leopard frogs and monarch butterflies may also benefit from an increase in agricultural grasslands. Permanent pastures west of Illinois Route 53 support populations of certain prairie plants, and several of these species may colonize be introduced into agricultural grasslands. If these native plants can be incorporated without effecting habitat structure, then agricultural grasslands will be suitable for an increasing diversity of associated organisms, including certain prairie insects; thus, agricultural grasslands have the potential to restore diversity and processes of the prairie ecosystem beyond the grassland bird component.

Alternatives 2 through 6 restore from 6,060 to 12,590 acres of native vegetation. All cropland and much successional vegetation will be restored to native vegetation or grassland habitat. This will reduce adverse effects to the prairie ecosystem (fragmentation, predation by generalists, seed raid from invasive plants) associated with shrublands, fencerows, and successional woodlands. Savannas, shrub prairies, and woodland edges will become restricted to their pre-1830 habitats.

All action alternatives will result in a 15 to 30-fold increase in prairie and associated communities over existing amounts of native vegetation. Restoration will result in a mosaic of dolomite, upland and wet typic prairies, with smaller amounts of sedge meadows, marshes, savannas, woodlands, forests, and seeps. These habitats will generally conform to their approximate distribution before 1830, with all dolomite prairie occurring west of Illinois Route 53. Savannas, woodlands, and forests will be concentrated along Prairie and Jackson creeks, with a few outliers.

It will take time to restore native habitats from disturbed land. Native grasses, sedges and forbs begin to dominate within three to five years after restoration planting in prairies, sedge meadows and marshes. But it may take additional decades of management and enrichment before composition, structure and species richness, begins to resemble natural communities. It may take 50 to 80 years of growth to restore the canopy structure of savannas, woodlands, and forests. During these restoration periods, species diversity will gradually increase as populations grow, interactions increase among individuals, populations, and species, and ecological functions and processes become restored.

All action alternatives restore the same amount of dolomite prairie (approximately 1380 acres) and may restore smaller areas of dolomite prairie in abandoned rock quarries along Prairie Creek. Restoring this expansive area of dolomite prairie allows the potential to provide the full diversity of moisture gradient once present

in dolomite, including microhabitats required by specific plant species. Isolated remnants of dolomite prairie will be linked by restored habitat. Many rare, endangered, or sensitive plant and insect species will be able to expand and increase their populations to viable levels, lessening their vulnerability to stochastic events. Because of the large size of the area, landscape processes such as fire, grazing and hydrology can be restored.

The amount of typic prairie, sedge meadow, and marsh to be restored varies considerably among the action alternatives, with the smallest amount in Alternative 2, ranging up to Alternative 6. The areas proposed for restoring typic prairie are relatively contiguous in Alternatives 3, 4, 5, and 6, being interrupted only by Illinois Route 53 and some recreation facilities to be developed under Alternatives 3 and 4. Recreation facilities are less interruptive in Alternative 5 and do not exist in Alternative 6. Restored native vegetation adjacent to recreation facilities may be impacted and full site restoration (including hydrologic restoration) may be limited because of increased runoff from paved surfaces and drainage requirements of public use areas. The impact of these facilities will not be known until site-specific analysis is done.

The amount of restored savanna, woodland, and forest is roughly the same in all the action alternatives (910 to 920 total acres). However, the alternatives do differ in how landscape-scale effects of fire and other natural disturbances can be applied. The location and configuration of recreation developments in the alternatives may limit how disturbance processes, especially fire, can be applied to adjacent ecosystems. The proximity of agricultural grasslands to savanna and wooded tracks may also serve to reduce landscape scale effects of fire and other natural disturbances. Alternatives 2, 3, and 4, have some savanna and forest/woodland areas adjacent to agricultural grasslands. Alternative 2 has the most isolated savanna and woodland tracts, especially near Prairie Creek west of Illinois Route 53.

Despite these disruptions, the action alternatives have sufficient area for restoring landscape-scale processes, such as fire, grazing, and hydrology. Cattle will be managed so as to stimulate grazing effects of native ungulates in restored prairie and associated habitats. Many isolated, fragmented or small populations of flora and fauna will be able to expand and increase their populations to viable levels, making them less vulnerable to stochastic events. Re-introductions may be required to restore some species, genetic diversity, or specific interactions, such as pollination, host-mycorrhizal associations, and root-parasitism. Bird species not currently known to breed on Midewin may begin nesting.

As a result of any future land acquisitions, the amount of land available for restoration could increase beyond the acreage in Table 3.17 under all action alternatives.

After acreage available for restoration, the next largest impact on the prairie ecosystem comes from trail location, configuration, and use (Table 3.18). Alternative 3 has the greatest potential for adverse effects on recovery of biodiversity. It has the most trails (87 miles), the highest density of hiking trails in unfragmented grasslands (potential disturbance of nesting birds), and extensive equestrian trails west of Illinois Route 53, often close to sensitive habitats. Alternative 2 has somewhat lesser impacts. It has fewer trails (72 miles) and no equestrian trails. The location of an environmental learning center by Jackson Creek Woods could have either positive or adverse impacts, depending upon how the facility is managed. Intensive use could lead to increased trampling and disruption of vegetation and soils; conversely, by limiting visitor use to environmental and interpretive programs, potential adverse impacts could be minimized.

Alternative 6 proposes only minimal recreation development and therefore has the least potential adverse effects from recreation. The low trail mileage (27 miles) reduces management conflicts and impacts from recreation use. Equestrian use is restricted to a multi-use trail east of Illinois Route 53, which reduces impacts on sensitive habitat resulting from potential (and illegal) off trail use. Locating the multi-use trail on periphery of the east side reduces potential for dispersing invasive species into interior of Midewin, and reduces disturbance to nesting birds and other wildlife. Alternative 6 has the least roads (8 miles), resulting in less fragmentation. It also has the lowest impacts to existing and restored natural communities along Jackson Creek; all other action alternatives feature some of facility here, most often trails.

Alternatives 4 and 5 are similar with regard to impacts from recreation developments and use. Both have similar amounts of trails (49 and 52 miles) in roughly similar configurations, including a limited amount of trails available to equestrians west of Illinois Route 53. Although trails are not adjacent to sensitive habitats, off-trail equestrian use could impact sensitive habitats by trampling, disturbing soil, and introducing and spreading invasive species. Both alternatives probably have an intermediate potential for conflicts between management activities and visitor use. Alternatives 4 and 5 have recreation developments in different locations, and both propose a shuttle route, but Alternative 4 does propose an auto-loop. The location of the visitor center in Alternative 5 causes greater fragmentation, and recreation facilities in Alternative 5 cover more acreage, and affect a greater diversity of potential restored habitat. The impact of the shuttle route is difficult to assess until site-specific proposals and analysis are done.

3.6.4.2. Cumulative Effects

Less than 1/10 of 1 percent (12,000 acres) of the pre-1830 prairie ecosystem still exists in the Illinois portion of the CTPS (Illinois Natural Heritage Database 2001). Most tracts are small, often isolated remnants, usually containing one or a few types of natural communities. Many remnants are expected to disappear or degrade in quality, through destruction, invasion by non-native plants, fragmentation, and gradual attrition of native species.

Many existing native vegetation remnants are now protected and managed in the CTPS. The Prairie Parkland around Midewin has at least 2300 acres of these remnants, the largest being Goose Lake Prairie State Park, which has 1,400 acres of typic prairie and associated wetlands. Smaller but important tracts are present within Iroquois County Conservation Area, Des Plaines State Fish and Wildlife Area, Kankakee River State Park, and the Forest Preserve District of Will County. It is likely that federal, state, county, and municipal agencies and non-governmental organizations will continue to purchase and manage some of the existing native vegetation remnants that are currently unprotected.

As other restoration projects get underway, the acreage of restored prairie and other natural communities will increase. The largest of these is 7,000 acres (The Nature Conservancy), but projects of similar scale (600-30,000 acres) are proposed in Illinois and Indiana. Because most of these restorations are on sandy soils, the main vegetation types being restored will be sand prairie, sand savanna, and associated wetlands. Restoration of typic prairies on silt-loam soils is fairly rare, with most efforts under 10 acres. The largest efforts are at Goose Lake Prairie State Park with approximately 1400 acres of restored typic prairie (W. Glass, pers. comm.).

Agricultural grasslands consist of less than 13% of the CTPS (approximately 2,000,000 acres), with the amount dropping steadily since the 1920's, with over 75% lost since the early 1900's, when coverage peaked (Herkert 1991). Most existing agricultural grasslands are temporary, under 20 acres in size, and unlikely to provide habitat for most native grassland wildlife (Herkert *et al.*, 1996). The largest concentration of agricultural grasslands greater than100 acres in the CTPS is in Will County, Illinois, and includes Midewin.

Given the existing natural communities and limited ongoing restoration projects under Alternative 1, Midewin will contribute to the prairie ecosystem within the CTPS. Under Alternative 1, Midewin also provides approximately 16% of the current acreage of habitat suitable for grassland birds in the CTPS. Because of the limited scale and management, the natural and restored communities are expected to eventually degrade and become dominated by invasive species (both native and non-native). With the amount of agricultural grasslands declining elsewhere in the ecological section, Midewin's populations of grassland birds will

become even more important, but there is not sufficient habitat to support viable populations of all species. Some components of the prairie ecosystem are more likely become extirpated from the CTPS under alternative 1, especially certain grassland birds (upland sandpiper, loggerhead shrike) and plants restricted to dolomite prairie.

The amount of native habitat restored increases from Alternative 2 through Alternative 6. These alternatives provide large tracts where landscape-scale processes (especially fire and hydrology) can be restored, and also provide for smaller-scale interactions, such as pollination and gene flow. Under all five action alternatives, Midewin provides a significant positive effect on biodiversity in the ecological section, by providing a diverse landscape where ecosystem processes, functions, and populations can be restored.

Although Alternative 6 provides the best situation for these processes to occur, in terms of the largest acreage of native restoration, it may not have the best outcome for all components of the ecosystem. Organisms unable to survive in early successional stages of native restoration may become extirpated, because of insufficient suitable habitat (short-stature and medium-stature grasslands); Alternative 6 provides only 22% of the available habitat for grassland birds in the CTPS, which could lead to local extirpation for certain species. The outcome for Alternative 5 may be slightly different from Alternative 6, because of the greater impacts from site recreational development and uses.

Alternative 2 provides a significant amount of agricultural grasslands in the CTPS (58%) but the lowest amount of native restoration among the action alternatives. While some sensitive habitats, such as dolomite prairie, would be fully restored, most of the restored prairie ecosystem would be limited to two large but isolated tracts, separated by agricultural grasslands and Illinois Route 53. Some landscape processes would not be fully restored and some populations would remain isolated. Certain grassland birds requiring tall grasses may not have sufficient suitable habitat to maintain viable populations. However, some of this habitat is also provided on nearby areas within the Prairie Parklands, such as Goose Lake Prairie State Park.

Alternative 3 provides a more even division between agricultural grasslands and native restoration, and provides 52% of the grassland bird habitat in the CTPS. The location, configuration, and types of trails in Alternative 3 may result in some negative impacts on sensitive habitats such as dolomite prairie and unfragmented grasslands).

Alternative 4 also provides a balance between native restoration and agricultural grasslands (37% of the short and medium-stature grassland bird habitat in the CTPS). Alternative 4 has fewer trails than Alternative 3, and trail configurations and locations would likely have lesser impacts on sensitive habitats.

Under Alternative 4, there is potential for Midewin to contribute to the tallgrass prairie ecosystem in the CTPS, by restoring sufficient amounts of contiguous native vegetation to allow disturbance factors, ecological processes, and species interactions to function on the landscape scale. By providing agricultural grasslands as habitat for certain grassland birds, Midewin will also allow this component of the prairie ecosystem to persist in the CTPS.

Over time, as restored vegetation matures and approaches natural vegetation in its structure and function, these bird species may again occupy native prairie, as they did in the past. Other prairie elements, such as bison, may eventually need to be restored. Bison may effect the vegetation (through grazing) so that the resulting habitat structure is suitable for these grassland birds, allowing for the eventual conversion of the agricultural grassland to native vegetation. Until such time, if ever, that bison are restored, the agricultural grasslands will provide for a variety of native species, not just grassland birds. Many native animals occur in agricultural grasslands on Midewin. As restoration continues, it is likely that the agricultural grasslands will include an increasing prairie component.

Opportunities to add additional components to the prairie ecosystem at Midewin will occur as the restoration continues over the next few decades. Some insects, a few plants, and several grassland and wetland birds may colonize Midewin on their own; others will need to be re-introduced through management techniques. Eventually, Midewin will be become a source of these species, with excess population moving out to re-colonize nearby natural communities and restorations.

3.6.5. MITIGATION

Mitigation measures listed in standards and guidelines of the Prairie Plan are sufficient to reach the goals and objectives of the desired conditions (restoring tallgrass prairie ecosystem, including fire and grazing as disturbance factors; protecting, managing and enhancing existing native vegetation; establishing and managing sufficient grassland bird habitat; and restoring and managing ecologically accurate natural vegetation). These standards and guidelines appear in the Prairie Plan under the headings for Ecological Sustainability (especially under Threatened and Endangered species, Sensitive Species, Species Restoration, Seed Provenance, Noxious Weeds and Invasive Plant Species, Native Vegetation Remnants, Habitat Restoration, and Wildlife) and Recreation and Interpretation (General Standards and Guidelines, Trails). Reaching the desired conditions will also require that monitoring and law enforcement be used to detect and prevent actions incompatible with goals and objectives.

3.6.6. MONITORING

Monitoring for biodiversity will consist of the sum of all monitoring programs, but especially: Threatened, Endangered, and Sensitive species; Vegetation; Noxious Weeds; and Management Indicators. These indicators will gauge the success of the restoration, and help identify threats. The monitoring described under management indicators will help assess the return of ecosystem structure and function, particularly those concerning species diversity, native plant cover, habitat structure, and seasonal flowering diversity. The latter especially will indicate our ability to restore a full complement of prairie forbs necessary to support insect pollinators.

Trail corridors and sensitive habitats will be monitored for evidence of inappropriate use that may cause damage to restored vegetation, habitat fragmentation, or lead to new infestations by invasive species.

3.7. *THREATENED, ENDANGERED, AND SENSITIVE SPECIES*

3.7.1. INTRODUCTION

Species listed by the US Fish and Wildlife Service (FWS) and Illinois Endangered Species Protection Board (IESPB), and Regional Forester Sensitive Species (RFSS) were considered for analysis. Each alternative was examined for its impact on these species both within Midewin as well as a larger area, primarily the Central Till Plains (Keys et al. 1995). For some species, additional area was examined based on the distribution of the species.

3.7.1.1. Species of Concern

3.7.1.1.1. Species listed by the U.S. Fish and Wildlife Service. Federally listed threatened and endangered species are those plant and animal species formally listed by the FWS under authority of the Endangered Species Act (ESA) of 1973, as amended. An endangered species is defined as one in danger or extinction throughout all or a significant portion of its range. A threatened species is defined as one likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

All species listed as endangered or threatened by the FWS and which could occur within the boundaries of Midewin, were examined. This list of species was developed through consultation with the US Fish and Wildlife Service (Barrington, Illinois Field Office). Eight species were excluded from further analysis while two species were brought forward for further analysis.

1. Leafy Prairie Clover (*Dalea foliosa*) is Endangered and known from Midewin and was analyzed.

2. Prairie White Fringed Orchid (*Platanthera leucophaea*) is Threatened and known from adjacent property. There is similar habitat on Midewin and there is a likelihood that this species occurs at Midewin. For these reasons this species was analyzed further.

3. Hine's emerald dragonfly (*Somatochlora hineana*) is Endangered and was excluded from further analysis because surveys for this species have failed to find any at Midewin or in the immediate vicinity, and appropriate high quality habitat is lacking.

4. American burying beetle (*Nicrophorus americanus*) is Endangered and was excluded from further analysis because surveys for this species have failed to find any at Midewin or in the immediate vicinity. This species may be considered for introduction in the future.

5. Lakeside Daisy (*Hymenoxys herbacea*) is Threatened and was excluded from further analysis because surveys for this species have failed to turn up any at Midewin or in the vicinity. This species may be considered for introduction in the future as appropriate habitat is established.

6. Karner Blue Butterfly (*Lycaeides melissa samuelis*) is Endangered and was excluded from further analysis because surveys have failed to turn up any at Midewin. There is no high quality habitat at Midewin, and no larval food plants, wild lupine (*Lupinus perennis*) is not found at Midewin.

7. Indiana Bat (*Myotis sodalis*) is Endangered and was excluded from further analysis since they are not known to occur on site. Midewin appears to be north of the normal breeding range for this species.

8. Mead's milkweed (*Asclepias meadii*) is Threatened and was excluded from further analysis since its not known from Midewin or the vicinity. This species may be considered for introduction in the future as appropriate habitat is established.

9. Prairie Bush Clover (*Lespedeza leptostachya*) is Threatened and was excluded from further analysis since its not known from Midewin or the vicinity. This species may be considered for introduction in the future as appropriate habitat is established.

10. Bald Eagle (*Haliaeetus leucocephalus*) is Threatened and known to migrate through Midewin occasionally. Bald Eagles are also known to winter in some years along the Des Plaines River to the north of Midewin. Since there is no breeding habitat and no known wintering habitat at Midewin, the bald eagle was excluded from further analysis although guidelines are provided for protection during migration in the Prairie Plan.

3.7.1.1.2. Regional Forester Sensitive Species

Regional Forester Sensitive Species (RFSS) for Midewin were selected based upon the following selection process. A list of potential RFSS species was generated using the following sources:

1. Lists of "species of concern" generated by other agencies and other organizations, including:
    a. American Bird Conservancy (Partners in Flight),
    b. Illinois Endangered Species Protection Board,
    c. Illinois Department of Natural Resources (Endangered, Threatened, and Watch lists),
    d. Illinois Natural History Survey,
    e. National Audubon Society,

   f. The Nature Conservancy,
   g. US Fish and Wildlife Service (Threatened and Endangered Species);

2. Contacts with knowledgeable individuals;
3. Public comments to scoping letters;
4. Lists of vascular plants, breeding birds, mammals, reptiles, amphibians, fishes, mussels, and insects known to be present on Midewin National Tallgrass Prairie.

Organisms were evaluated for RFSS status based on the following criteria:

1. For breeding birds, species known to be nesting on or likely to be nesting on Midewin, based on nesting records or presence of habitat of habitat and nesting records from nearby sites.
2. For other organisms (plants and animals) present on or likely to be present, based on records from Midewin or presence of suitable habitat on Midewin and records from adjacent sites.
3. Species ranked as G1 (Globally Critically Imperiled), G2 (Globally Imperiled), or G3 (Globally Vulnerable) by The Nature Conservancy's Natural Heritage Network.
4. Subspecies, varieties, or other taxa below species level ranked as T1 (Globally Critically Imperiled), T2 (Globally Imperiled), or T3 (Globally Vulnerable) by The Nature Conservancy's Natural Heritage Network.
5. Species (or subspecies) listed as Endangered or Threatened by the Illinois Endangered Species Protection Board (1999).
6. Species recently de-listed by the Illinois Endangered Species Protection Board (1998).
7. Species on the Illinois Watch List (Illinois Endangered Species Protection Board 1994).
8. Species on lists generated by National Audubon Society, American Bird Conservancy, and other groups.
9. Species with population trends suggesting precipitous declines likely to lead to listing or loss of viable populations in the region.
10. Species restricted to habitats, natural communities, or vegetation types considered regionally unique, restricted, or of conservation concern (e.g., dolomite prairie).
11. Species (or groups of species) for which Midewin can or does provide sufficient habitat that contributes to regional viability (dolomite prairie plants, grassland birds).
12. Widespread species at the periphery of their ranges, for which Midewin can provide habitat that may reduce range shrinkage or loss of peripheral populations, again contributing towards maintaining regional viability for these species.

Risk evaluations were conducted for all potential RFSS species. These evaluations focused on: 1) species abundance, 2) distribution, 3) population trends, 4) habitat integrity (including known direct and indirect threats), and 5) population vulnerability (including potential for recovery).

Twenty-six species were proposed as RFSS; these species were evaluated using the lists above and against the five risk factors. The list was approved and signed by the Regional Forester, February 29, 2000 (USDA Forest Service 2000a). These species are listed in Table 3.19.

Table 3.19
Federal Endangered & Threatened, and Regional Forester's Sensitive Species
Midewin National Tallgrass Prairie

Scientific Name	Common Name	Status[1]	IL[2]	TNC[3]
Plants:				
Carex crawei	Crawe's Sedge	RFSS	--	G5
Cirsium hillii	Hill's Thistle	RFSS	ST	G3
Dalea foliosa	Leafy Prairie-Clover	FE	SE	G2G3
Hydrastis canadensis	Goldenseal	RFSS	--	G4
Isoëtes butlerii	Butler's Quillwort	RFSS	SE	G4
Malvastrum hispidum (= *Sphaeralcea angusta*)	False Mallow	RFSS	SE	G3G5
Minuartia patula (= *Arenaria p.*)	Pitcher's Sandwort	RFSS	ST	G4
Napaea dioica	Glade Mallow	RFSS	--	G3
Panax quinquefolius	American Ginseng	RFSS	--	G3G4
Platanthera leucophaea	Eastern Prairie White-fringed Orchid	FT	SE	G2
Rudbeckia fulgida var. *sullivantii*	Sullivant's Coneflower	RFSS	--	T3T4
Tomanthera auriculata (= *Agalinis auriculata*)	Earleaf False-Foxglove	RFSS	ST	G3
Valeriana edulis var. *ciliata*	Hairy Valerian	RFSS	--	G5T3
Animals:				
Aflexia rubranura	Red-veined Prairie Leafhopper	RFSS	ST	G1G2
Ammodramus henslowii	Henslow's Sparrow	RFSS	SE	G4
Asio flammeus	Short-eared Owl	RFSS	SE	G5
Bartramia longicauda	Upland Sandpiper	RFSS	SE	G5
Circus cyaneus	Northern Harrier	RFSS	SE	G5
Dendroica cerulea	Cerulean Warbler	RFSS	SW	G4
Dolichonyx oryzivora	Bobolink	RFSS	SW	G5
Emydoidea blandingii	Blanding's Turtle	RFSS	ST	G4
Ixobrychus exilis	Least Bittern	RFSS	ST	G5
Lanius ludovicianus migrans	Migrant Loggerhead Shrike	RFSS	ST	5T3
Papaipema beeriana	Blazing-star Stem-borer (moth)	RFSS	--	G3
Papaipema eryngii	Rattlesnake-master Stem-borer (moth)	RFSS	SE	G1G2
Rallus elegans	King Rail	RFSS	ST	G4G5
Rana blairi	Plains Leopard Frog	RFSS	--	G5
Venustaconcha ellipsiformis	Ellipse (mussel)	RFSS	SW	G3G4

[1] FE = Federal Endangered Species; FT = Federal Threatened Species; RFSS = Regional Forester's Sensitive Species
[2] SE = Endangered by Illinois Endangered Species Protection Board (1998); ST = Threatened by Illinois Endangered Species Protection Board (1998); SW = Watch List by Illinois Endangered Species Protection Board (1995)
[3] Species ranks: G1 = Globally Critically Imperiled, G2 = Globally Imperiled, G3 = Globally Vulnerable; Subspecies, varieties, or other taxa below species level ranked: T1 = Globally Critically Imperiled, T2 = Globally Imperiled, T3 = Globally Vulnerable; The Nature Conservancy's Natural Heritage Network.

3.7.1.2. Significant issues and concerns that require analysis

Species were analyzed to determine their likelihood or persistence under each alternative. The goal is to maintain habitat conditions that would maintain a high likelihood of persistence of viable populations within the planning area or contribute to the extent possible to providing habitat conditions that would maintain a high likelihood of persistence of viable populations in the cumulative effects area.

3.7.1.3. Relevant Actions common to all action alternatives

Each action alternative provides for restoration of existing natural communities. Each action alternative provides a mix of restored/reconstructed prairie, wetland, woodland and savanna habitat along with areas managed for grassland bird habitat. Amounts of these habitat types vary by alternative, but approximate minimum amounts are provided in each alternative.

Table 3.20 - Comparison of proposed habitat types by alternative.

Habitat Type	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Upland Prairie (acres)	560	2120	2,670	4020	6130	6200
Wet Prairie/Wetland (acres)	1,670	3030	3540	4640	5460	5470
Grassland Bird Habitat (acres)	2,800	10110	9150	6690	3810	3920
Savanna (acres)	40	490	490	490	490	490
Forest/Woodland	190	420	430	430	430	430

Each alternative provides for specific amounts of habitat for each sensitive species. The amounts of historic and potential sensitive species habitat can be estimated using soils, topography, anticipated grass and forb structure, and plant species diversity. Table 3.21. shows the estimated historic habitat at Midewin, along with the potential habitat anticipated for each sensitive species. The derivation and assumptions in developing these acreages are discussed under each specific sensitive species. The exact size of these developed areas hasn't been determined, but will be less than the area mapped. The exact location hasn't been determined, but will be somewhere within the areas mapped. (See Figures 3,5,7,9,11, for Habitat Allocation by Alternative).

Table 3 21.
Estimated amount of habitat (acres) available for Regional Forester's Sensitive Species (RFSS)

RFSS	Hist.	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Henslow's Sparrow	14921	6067	7660	8373	10124	12105	12105
Northern Harrier							
breeding	14635	3379	5245	6215	8560	11050	11050
foraging	16499	10770	16499	16499	16499	16499	16499
Short-eared Owl							
breeding	14921	6067	7660	8373	10124	12105	12105
foraging	16499	10770	16499	16499	16499	16499	16499
Eryngium Borer Moth	11016	14	3620	4326	6102	8146	8146
Blazing Star Stem Borer	11023	161	3627	4343	6109	8153	8153
Red-veined Leaf Hopper	8942	10	2231	2780	4214	6241	6241
Hairy Valerian	11754	17	2562	2918	5388	7886	7886
Earleaf Foxglove	9441	22	2730	3279	4713	6740	6740
Hill's Thistle	9441	3	2730	3279	4713	6740	6740
Prairie White-fringed Orchid	13581	17	4743	5635	7813	10188	10188
Leafy Prairie Clover	1376	6	1376	1376	1376	1376	1376
Butler's Quillwort	1376	5	1376	1376	1376	1376	1376
False Mallow	1376	24	1376	1376	1376	1376	1376
Pitcher's Stitchwort	1376	14	1376	1376	1376	1376	1376
Crawe's Sedge	2091	12	1852	2089	2089	2091	2091
Sullivant's Coneflower	4805	494	3844	4722	4727	4805	4805
Cerulean Warbler	429	74	429	429	429	429	429
American Ginseng	429	17	429	429	429	429	429
Goldenseal	429	17	429	429	429	429	429
Glade Mallow	1538	114	895	1287	1322	1495	1495
Bobolink	7600	2396	6328	5277	2716	2000	2000
Blanding's Turtle	7035	911	3349	3852	4978	5745	5745
King Rail	7035	911	3349	3852	4978	5745	5745
Least Bittern	7035	911	3349	3852	4978	5745	5745
Plains Leopard Frog	7035	911	3349	3852	4978	5745	5745
Loggerhead Shrike	1788	2923	8774	7833	5559	3171	3171
Upland Sandpiper	1788	2396	8328	7277	4716	1923	1923
Ellipse[1]	10	3.5	10	10	10	10	10

[1]Miles of streambed

3.7.1.4. Direct and indirect and cumulative effects

A number of effects have resulted in decreased populations of the species of concern. Many are general and apply to all or most of the species. These general effects or threats are listed below. Further species or group specific effects or threats are examined in the particular species or groups.

1. The most important threats are habitat loss, either through destruction of habitat or because of habitat change resulting from lack of management or inappropriate management.

2. Encroachment into habitat by exotic plant species. Exotics can pose a threat by out-competing or suppressing native plants through shading, competition for water and nutrients, changes in substrate conditions, and increased duff accumulation. Changing the composition and structure of native plant communities can pose a threat to animal populations associated and dependant upon the native plant communities.

3. Prescribed burning or wildfire could be a direct threat. A badly timed fire, burning under inappropriate conditions, or a poorly placed brush pile could result in the loss of individuals or portions of populations.

4. Fire suppression is an indirect threat to many species of concern. In the absence of prescribed fire, fire climax communities can be invaded by shrubs and other woody plants changing the species composition and structure.

5. Browsing by deer, rabbits, or other herbivores may pose a direct threat to plant species by reducing seed production or killing entire plants. Loss of or decrease in numbers of food plants and nesting plants can be a threat to animals.

6. Large ungulates (domestic or wild) and humans may have direct impacts on plants through trampling and grazing (ungulates only). Trampling causes soil structure changes that will affect other soil properties (water-holding capacity, aeration, soil chemistry). Ungulates may have indirect effects, as their manure may cause rises in soil nutrients, especially nitrogen and phosphorus. These changes may be toxic to some species and the increased nutrient levels may allow some species (native or exotic) to gain a competitive advantage over other plant species. Animals associated with these impacted plants or plant communities will also by impacted.

7. Absence of grazing ungulates may have indirect impacts on certain plant species. Grazing ungulates, by disturbing the soil surface and reducing litter cover, may create habitats for recruitment by some species plants.

Grazing ungulates can selectively remove grasses and other competitive plants, benefiting some plant species. Animals of special concern associated with these plant species or impacted plant communities could be impacted along with the plants.

8. Changes in hydrology may directly impact plant species. Some plants and plant communities are subject to varying periods of soil/substrate saturation and/or inundation. Increases or decreases in these periods, or changes in the seasonality of these periods, may result in declines of some plant species through plant death, reduced flowering or seed set, and lowered recruitment. Long-term changes in hydrology may also favor certain species over others, resulting in changes of composition and structure in plant communities. Certain invasive species are likely to increase, especially reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), and cattails (*Typha* spp.). Changes in plant populations and plant communities can have impacts on associated animals.

9. Other impacts from water quality may cause indirect effects, especially if the water source contains agricultural runoff. Some plant communities on outwash plains may receive overflow from streams, as from Jackson Creek on Midewin. Other plant communities (including a few small examples on Midewin) contain seeps; these seeps are vulnerable to groundwater contamination. Either groundwater or stream overflow may contain agricultural or industrial chemicals. Animals associated with these plant communities could also be impacted by changes in species numbers, composition and structure. Aquatic species could be directly impacted by poor water quality through such factors as lower oxygen levels and increases of pathogens.

10. Collecting of species may have effects on small populations, especially if large numbers of adults or propagules are removed, and the process is continued over many years. This includes collection for scientific, horticultural, and recreational purposes.

11. Herbicide drift may kill or damage individual plants or portions of populations. Animals associated with these plants or plant communities could also be impacted. However, careful use of herbicides may be necessary to control encroaching woody plants or invasive exotic species.

12. Small, isolated populations of plant and animal species may be susceptible to genetic drift and stochastic events. Loss of extant populations from unprotected or unmanaged natural communities could prevent restoration of genetic diversity to populations on Midewin. Conversely, introduction of plant and animal species of inappropriate

provenance could have impacts on the viability of populations, perhaps through outbreeding depression or other outcomes.

13. Size and “connectedness” of natural communities may have effects on the genetic diversity and reproductive success of certain plant and animal species. Populations may need to be of certain size or within a certain distance of one another for effective gene flow to be mediated by pollinators. This may not be an important impact on all species, as some are wind-pollinated (Crawe’s Sedge), have floral mechanisms that favor self-pollination (False Mallow) or are very mobile (birds).

14. The proper selection of species and provenance of seed used in restoring native habitats may indirectly impact some plant and animal species. Heavy seeding rates for tall, warm-season grasses (*Andropogon gerardii, Panicum virgatum, Sorghastrum nutans*) or use of non-local provenance seeds for restoration may create restored habitat that is unsuitable for establishment and persistence of diverse plant species, because of increased competition, increased depth of litter, changes in fire behavior, and other factors. These restored habitats may also be unsuitable for breeding, foraging and loafing of animal species.

15. Many external, uncontrollable threats may also impact species of concern. A newly established exotic species or a host shift by a native herbivore or pathogen could impact plant species or an organism on which these plants are dependent (insect pollinator, mycorrhizal associate, *Rhizobium*). There are organisms (plants, animals, and microorganisms) for which preventative management or control may be difficult, because of life history, ecology, or physiology. For example, earthworms (Lumbricidae) are now nearly ubiquitous in much of the northeastern USA, and have doubtless had substantial impacts of nutrient cycling and soil structure in many natural habitats. Other uncontrollable impacts may include increased nutrients derived from air pollution, climatic change resulting from increased greenhouse gases, a catastrophic explosion at an adjacent industrial facility, and isolation of Midewin by surrounding urban sprawl. Shifts in plant species may impact animal species as well.

3.7.1.5. Cumulative effects area

Central Till Plains Division -- The geographic area considered in this analysis is the Central Till Plains Section, Prairie Parkland Province, Prairie Division (Keys Jr. et al. 1995). This Ecological Unit encompasses the Grand Prairie Natural Division of Illinois (Schwegman et al. 1973) and Grand Prairie Natural Division of Indiana (Homoya et al. 1985).

3.7.2. Analysis Process

(See Appendix A, Summary of Population Viability Assessment Outcomes for more detailed information on the process and Expert Panel results. Additional information is available in the Planning Record at the Midewin office in Wilmington, IL.)

The National Forest Management Act (NFMA) regulations require National Forests (including Midewin) to provide habitat in order "to maintain viable populations of existing native and desired non-native vertebrate species in the planning area" (36 C.F.R. §219.19). USDA Regulation 9500-4 extends this mandate to include plants.

NFMA regulations (36 C.F.R. §219.29) define a viable population as "one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area." The regulations direct that "habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area." At Midewin the planning area is defined as the lands owned and managed by the Forest Service and included in the Prairie Plan.

Conservation assessments were drafted for each sensitive species. The assessments compiled information on the status, range, habitat, species description, life history, natural and human land use threats, viability, management, monitoring and research needs. The draft assessments were reviewed by a panel of experts in November 1999 and changes made where suggested. The panel of experts was reconvened in November 2000 to analyze the outcomes each alternative would have on the species. This panel of experts provided an independent analysis related to the effects of the alternatives on two Federal Threatened and Endangered species (FT&E) and 26 Regional Forester Sensitive Species (RFSS). A brief summary of the expert panel process is included below.

3.7.2.1. Summary of Expert Panel

The expert panel was designed to provide information on the likelihood of persistence that implementing the alternatives would pose to each of the Federal T&E and RFSS, across the landscape at Midewin and in the CTPS eco-region. The evaluations were not precise analyses of the likelihood of particular conditions, but rather professional judgments made by knowledgeable experts about possible future outcomes. The panel included 30 scientists specializing in the different species, facilitators, scribes, local resource experts, and observers. After presentations of local resource and planning information, panel members individually rated each alternative based on several possible outcomes prior to discussion. Following their initial evaluations, the panel engaged in facilitated discussions of their ratings. These were intended to clarify the assignment of particular likelihood points, identify differing interpretations of available

information, and point out knowledge gaps. There was no attempt to force consensus; however the expert panel members were free to reassign likelihood points based on what they had learned from the discussions.

A likelihood approach was used for assessing the level of risk. For each alternative, a total of 100 likelihood points were assigned across the array of possible outcomes. Assigning all 100 points to a single outcome would express complete certainty in that particular outcome. Uncertainty is expressed by spreading points across the outcomes. These outcomes represent degrees of belief, based on best professional judgment of the experts. The outcomes are most appropriately used for comparing the relative likelihood of persistence projected for each alternative, and are not to be considered as a measurement of the absolute level of likelihood of persistence for any alternative.

Different outcome statements were used for Midewin and the Central Till Plains Section:

1) OUTCOMES BASED ON MIDEWIN ENVIRONMENTAL CONDITIONS

Outcome A. Suitable environments are broadly distributed and of high abundance across the historical range of the species. The combination of distribution and abundance of environmental conditions provides opportunity for continuous or nearly continuous intra-specific interactions for the species.

Outcome B. Suitable environments are either broadly distributed or of high abundance across the historical range of the species, but there are gaps where suitable environments are absent or only present in low abundance. However, the disjunct areas of suitable environments are typically large enough and close enough to permit dispersal among subpopulations and potentially to allow the species to interact as a meta-population across its historical range.

Outcome C. Suitable environments are distributed frequently as patches and/or exist at low abundance. Gaps where suitable environments are either absent, or present in low abundance, are large enough that some subpopulations are isolated, limiting opportunity for species interactions. There is opportunity for subpopulations in most of the species range to interact as a meta-population, but some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations. For species for which this is not the historical condition, reduction in overall species range from historical may have resulted from this isolation.

Outcome D. Suitable environments are frequently isolated and/or exist at very low abundance. While some of the subpopulations associated with these environments may be self-sustaining, there is limited opportunity for population interactions among many of the suitable environmental patches. For species for which this is not the historical condition, reduction in overall species range from historical may have resulted from this isolation.

Outcome E. Suitable environments are highly isolated and exist at very low abundance, with little or no possibility of population interactions among suitable environmental patches, resulting in strong potential for extirpations within many of the patches, and little likelihood of re-colonization of such patches. There has likely been a reduction in overall species range from historical, except for some rare, local endemics that may have persisted in this condition since the historical period.

2) OUTCOMES BASED ON CUMULATIVE EFFECTS IN GRAND PRAIRIE PROVINCE:

Outcome A. The combination of environmental and population conditions provides opportunity for the species to be broadly distributed and of high abundance across its historical range. There is potential for continuous or nearly continuous intra-specific interactions at high population size.

Outcome B. The combination of environmental and population conditions provide opportunity for the species to be broadly distributed and/or of high abundance across its historical range, but there are gaps where populations are potentially absent or present only in low density as a result of environmental or population conditions. However, the disjunct areas of higher potential population density are typically large enough and close enough to other subpopulations to permit dispersal among subpopulations and potentially to allow the species to interact as a meta-population across its historical range.

Outcome C. The combination of environmental and population conditions restrict the potential distribution of the species, which is characterized by patchiness and/or areas of low abundance. Gaps where the likelihood of population occurrence is low or zero, are large enough that some subpopulations are isolated, limiting opportunity for species interactions. There is opportunity for subpopulations in most of the species range to interact as a meta-population, but some subpopulations are so disjunct or of such low

density that they are essentially isolated from other populations. For species for which this is not the historical condition, reduction in overall species range from historical may have resulted from this isolation.

Outcome D. The combination of environmental and population conditions restrict the potential distribution of the species, which is characterized by areas with high potential for population isolation and/or very low potential abundance. While some of these subpopulations may be self-sustaining, gaps where the likelihood of population occurrence is low or zero are large enough that there is limited opportunity for interactions among them. For species for which this is not the historical condition, reduction in overall species range from historical has likely resulted from this isolation.

Outcome E. The combination of environmental and population conditions restricts the potential distribution of the species, which is characterized by high levels of isolation and very low potential abundance. Gaps where the likelihood of population occurrence is low or zero are large enough there is little or no possibility of interactions, strong potential for extirpations, and little likelihood of re-colonization. There has likely been a reduction in overall species range from historical, except for some rare, local endemics that may have persisted in this condition since the historical period.

For these assessments, the experts had preliminary versions of Alternative 1-6. It is not likely that the small adjustments made in the alternatives presented here would have made any difference in panel ratings. Details specific to the panel are discussed in a more detailed summary included in Appendix A and in the planning record.

3.7.3. Plants Restricted to Dolomite Prairie

3.7.3.1. AFFECTED ENVIRONMENT

Each of these four species, leafy prairie clover (*Dalea foliosa*), Butler's quillwort (*Isoëtes bulteri*), false mallow (*Malvastrum hispidum*) and Pitcher's Stitchwort (*Minuartia patula*) are restricted to dolomite prairie communities within Midewin. The area for analysis was expanded to a larger area than just Midewin to include part of the lower Des Plaines River valley where most of the dolomite prairie in the Midwest can be found. The lower Des Plaines River valley is in both the Central Till Plains and Southwestern Great Lakes Morainal Sections.

Dolomite prairie restricted plants are restricted to a special prairie subtype associated with dolomite bedrock. These dolomite species have declined in numbers and are under various general threats outlined above. Besides these general threats, a number of specific threats have been identified below:

During the expert panel session, closeness of trails to the dolomite restricted plant sensitive species was identified as a potential adverse impact. Trails and roads were identified as possible impacts to these species, directly by trampling plants and indirectly by bringing in exotic and invasive species seeds that could change the habitat.

3.7.3.1.1. Leafy Prairie Clover

Leafy prairie clover is a short-lived, herbaceous perennial that occurs in dolomite prairie, barrens, and cedar glades (Baskin and Baskin 1973; NatureServe 2000c; USFWS 1996; Schwegman and Glass, unpublished date). Browsing and grazing by native herbivores and domesticated cattle have been identified as specific threats to leafy prairie clover (Schwegman and Glass unpublished; USFWS 1996). At least one population was lost due to over collecting (USDA Forest Service 2000b).

3.7.3.1.2. Butler's Quillwort

Butler's Quillwort is an herbaceous perennial that arises from a corm-like rootstock (Lellinger 1985). This species occurs in shallow soils over calcareous bedrock, including glades and dolomite prairie; within these habitats, it is often associated with shallow depressions that are seasonally moist or inundated (USDA Forest Service 2000c). Nutrient pollution from manure from cows or horses has been identified as a possible threat to Butler's quillwort (USDA Forest Service 2000c).

3.7.3.1.3. False Mallow

False mallow is a summer annual herb of glades, dolomite prairies, limestone barrens, and other thin-soiled prairie habitats (Herkert 1991; Steyermark 1963; USDA Forest Service 2000d). Grazing has been identified as a specific threat to

this plant because of it palatability. Conversely, grazing ungulates may break up the soil, providing habitat for new seedlings (USDA Forest Service 2000d). Nutrient addition from manure associated with grazing has also been identified as a potential threat to False Mallow (USDA Forest Service 2000d).

3.7.3.1.4. Pitcher's Stitchwort

Pitcher's stitchwort is a winter annual herb of calcareous, rocky habitats. Some of these habitats include glades, limestone barrens, rock outcrops, and dolomite prairies (Gleason and Cronquist 1991; Steyermark 1963; Swink and Wilhelm 1994). Nutrient addition from manure associated with grazing has been identified as a possible threat to Butler's quillwort (USDA Forest Service 2000e).

3.7.3.1.5. Occurrences and trends at Midewin

Approximately 1,376 acres of Midewin has soils associated with dolomite bedrock. These areas historically had a matrix of different moisture gradients of dolomite prairie. Leafy prairie clover, Butler's Quillwort, False mallow, and Pitcher's stitchwort occur only in a small tract of degraded mesic dolomite prairie at the northwest margin of Midewin (Drummond Dolomite Prairie). Most of the populations occur on private land, but a portion of the dolomite prairie occurs on Midewin. The exact number of plants on Midewin is unknown since the boundary isn't marked in this area, but probably less that one half of these populations occur on Midewin.

3.7.3.1.5.1. Leafy Prairie Clover

Leafy prairie clover may have been found throughout this area where the microhabitat conditions were appropriate. Leafy prairie clover is frequently found today in mesic and wet-mesic dolomite prairie. The population was discovered in 1997 and has fluctuated from 130-178 individual plants since discovery (B. Molano-Flores, pers. comm.).

3.7.3.1.5.2. Butler's Quillwort

Butler's quillwort may have been found throughout this area where the microhabitat conditions were appropriate; these are associated with shallow depressions that are seasonally moist or inundated (USDA Forest Service 2000). The population was discovered in 1994 and consists of approximately 250 individual plants (B. Molano-Flores, pers. comm.).

3.7.3.1.5.3. False Mallow

False mallow may have been found throughout this area where the microhabitat conditions were appropriate. The population was discovered in 1996. The population probably consists of several thousand plants, but fluctuates annually, because of the effects of weather conditions on this annual herb (USDA Forest Service 2000c, B. Molano-Flores, pers. comm.). The exact number of plants on

Midewin is unknown, but there are probably hundreds to thousands of plants during a favorable year.

3.7.3.1.5.4. Pitcher's Stitchwort

Pitcher's stitchwort may have been found throughout this area where the microhabitat conditions were appropriate. The population was discovered in 1993. The population varies from several hundred plants to several thousand plants, but fluctuates annually, because of the effects of weather conditions on this annual herb (USDA Forest Service 2000d, B. Molano-Flores, pers. comm.).
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3.7.3.1.6. Historic range

3.7.3.1.6.1. Leafy prairie clover was historically known from a number of river valleys within the Central Till Plains (Des Plaines, Kankakee, Fox, Illinois and Rock). Although leafy prairie clover was known from a number of sites, it was probably only locally common, since it's association with a relatively rare community, dolomite prairie. Most of the dolomite prairie was found in the Kankakee and lower Des Plaines River valleys. Presently leafy prairie clover is only found within the lower Des Plaines River valley within the entire Midwest. A total of seven populations are known within this area, one that was introduced. The largest populations are located along the lower Des Plaines River valley within the Southwestern Great Lakes Morainal Section (Keys et al. 1995). Most of the populations are on public property, with the exception of the portion on private property adjacent to Midewin, and another small population in the Southwestern Great Lakes Morainal Section. The populations within public ownership are protected and being managed. The populations in private ownership are presently safe, but could be threatened by land use changes. The populations of this species within the lower Des Plaines River valley appear stable.

3.7.3.1.6.2. The historic range for **Butler's quillwort** is unknown since it was only recently discovered in the Central Till Plains Section. It may have been restricted to the lower Des Plaines River valley where most of the wet dolomite prairie was found. Currently Butler's quillwort is only found within the Central Till Plains portion of the lower Des Plaines River valley. It has been reported from the adjacent Southwestern Great Lakes Morainal Section, but the occurrence was not confirmed. There are five known populations; of which two entire populations and ½ of another are in public ownership. The remaining populations are in private ownership. The populations within public ownership are protected and are being managed. Both populations within private ownership are currently under threat from development.

3.7.3.1.6.3. Within the Central Till Plains **false mallow** has historically been known from the lower Des Plaines River valley and along the Illinois River valley. Currently within the Central Till Plains, false mallow is only known from the lower

Des Plaines River valley and in the vicinity, although there is similar habitat within the lower Des Plaines River valley portion of the Southwestern Great Lakes Morainal Section. There are seven known populations; of which four populations and ½ of another is in public ownership. The remaining populations are in private ownership. The populations within public ownership are protected and are being managed. The populations within each of these areas presently appear to be stable.

3.7.3.1.6.4. Pitcher's stitchwort has been historically found along the lower Des Plaines River valley with the Central Till Plains and Southwestern Great Lakes Morainal Section. Pitcher's stitchwort is currently known from the lower Des Plaines River valley and in the vicinity within the Central Till Plains Section and Southwestern Great Lakes Morainal Section. There are 10 known populations, 6 populations and two partial populations are in public ownership. The remaining populations are in private ownership. The populations within public ownership are protected and are being managed. Two populations completely within private ownership and one of the partial populations are currently under threat from development. One population in public ownership may also be under threat because of hydrologic changes.

3.7.3.2. ENVIRONMENTAL CONSEQUENCES

3.7.3.2.1. Direct and Indirect Effects

All existing dolomite prairie communities at Midewin would be restored and managed in all action alternatives. Alternatives 2-6 would restore and reconstruct native vegetation in areas where dolomite prairie was historically found based on soil types (approximately 1,376 acres). The no-action alternative would not manage for the existing dolomite prairie communities or reconstruct dolomite communities. Action alternatives 2-6 with the associated standards and guidelines of the Prairie Plan, will be most beneficial and have an increased likelihood of persistence of these dolomite prairie associated species at Midewin. Implementation of the Prairie Plan standards and guidelines is not expected to result in a loss of species viability.

Alternatives 2, 3, 4 and 5 have trails systems running near existing dolomite prairie and through potential dolomite prairie reconstruction areas. Alternatives 2 and 3 have hiking trails going through potential dolomite prairie reconstruction areas terminating near existing dolomite prairie where the dolomite prairie restricted species are located. Alternatives 4 and 5 have hiking trails through potential dolomite prairie restoration areas, but do not go near the existing habitat of these species. Alternative 3 has a multi-use trail through potential dolomite prairie reconstruction, terminating within ¼ mile of existing dolomite prairie (the dolomite prairie restricted species currently aren't known from this area).

Trails will bring more visitors to these areas with the possibility of impacting these species, unless mitigated. Without trails leading to the dolomite prairie, it is doubtful that many visitors would travel cross-country to these more remote areas.

Each action alternative has two administrative roads along strips adjacent to potential dolomite prairie reconstruction areas. These administrative roads are existing roads and portions will be available for hiking.

Trail standards and guidelines in the Prairie Plan minimize impacts to sensitive species, and discourage off-trail use. These standards and guidelines will mitigate concerns of trails in the dolomite prairie areas. Alternatives with less trails in the dolomite prairie are more favorable to dolomite restricted sensitive plants.

Cattle grazing as management tool for current habitat and potential reconstructed habitat of the dolomite prairie restricted species could be used in Alternatives 2 through Alternative 6. Grazing was identified a potential negative impact on the dolomite prairie restricted species. However, grazing could benefit false mallow and Pitcher's Stitchwort by increasing habitat through the removal of competing species. Conversely, grazing can have a negative impact by compacting the soil. However, usual grazing practices result in an overall negative impact to false mallow. Grazing impacts are the same in all alternatives. Standards and guidelines in the Prairie Plan avoid permanent adverse damage to these species from grazing. The standards and guidelines utilize grazing as a management tool to improve prairie habitat.

3.7.3.2. 2. Cumulative effects

Overall Midewin has significant dolomite prairie habitat within the Central Till Plaines Section and lower Des Plaines River valley portion of the Southwestern Great Lakes Morainal Section. With the addition of dolomite prairie restoration acreage, Midewin could become the most important area for preservation of dolomite prairie and the associated dolomite prairie plants including these sensitive species.

3.7.3.2.3. Leafy Prairie Clover

Within the Central Till Plains Section, leafy prairie clover is only found at Midewin. There are also populations within the lower Des Plaines River valley portion of the Southwestern Great Lakes Morainal Section. The Midewin population is the only known population within the Prairie Parklands. The population at Midewin is quite important for the continued survival of leafy prairie clover within the area of analysis since there are so few populations. If leafy prairie clover is successfully reintroduced into dolomite prairie reconstructions, the population at Midewin may become more important based on size of the

planned restoration. With no trails planned for the dolomite prairie area, Alternative 6 would be slightly better than the other action alternatives. Implementation of the Prairie Plan standards and guidelines is not expected to result in a loss of species viability.

3.7.3.2.4. Butler's Quillwort

Within the Central Till Plains Section, Butler's quillwort is only found at Midewin and nearby areas within the Prairie Parklands. The population at Midewin is quite important for the continued survival of Butler's quillwort within this area. If Butler's quillwort is successfully reintroduced into dolomite prairie reconstructions, the population at Midewin may become more important based on size of the planned restoration. Implementation of the Prairie Plan standards and guidelines is not expected to result in a loss of species viability.

3.7.3.2.5. False Mallow

Within the Central Till Plains Section, false mallow is only found at Midewin and nearby areas within the Prairie Parklands. False mallow isn't known from the lower Des Plaines River valley portion of the Southwestern Great Lakes Morainal Section. The most significant and currently most important populations are found on nearby state property. The population at Midewin is smaller, yet still important for the continued survival of false mallow since there are so few populations. Implementation of the Prairie Plan standards and guidelines is not expected to result in a loss of species viability.

3.7.3.2.6. Pitcher's Stitchwort

Within the Central Till Plains Section, Pitcher's stitchwort is found at Midewin and nearby areas within the Prairie Parklands Pitcher's stitchwort is also found within lower Des Plaines River valley portion of the Southwestern Great Lakes Morainal Section. The population at Midewin is important for the continued survival of Pitcher's stitchwort, within this area, although other areas may presently be more important. If Pitcher's stitchwort is successfully reintroduced into dolomite prairie reconstructions, the population at Midewin may become more important based on size of the planned restoration. Implementation of the Prairie Plan standards and guidelines is not expected to result in a loss of species viability.

3.7.3.3. MITIGATION

3.7.3.3.1. The following standards and guidelines have been developed to protect these species:

- Restoration would be considered in appropriate soils for each sensitive dolomite restricted species.
- Current populations of each species would be maintained and improved.
- Projected activities would be planned to avoid adverse impacts to these species during the growing season.

3.7.3.3.2. Butler's Quillwort

- Measures will be taken to reduce sediment and nutrient run-off from agricultural, construction or recreational activities from reaching habitat for Butler's quillwort.

3.7.3.4. MONITORING

Yearly demographic monitoring of the federally-listed leafy prairie clover population, a Management Indicator Species, will be implemented. Periodic monitoring of the other dolomite prairie restricted species should be done at least once every 5 years. The amount of dolomite prairie restored yearly should be monitored and the success of the restoration monitored periodically, at least once every 5 years. If trails or other development occur near these populations, site specific monitoring may be necessary.

3.7.4. Plants Associated with Dolomite Prairie

3.7.4.1. AFFECTED ENVIRONMENT

Dolomite prairie associated plants are frequently found within a special prairie subtype associated with dolomite bedrock or can also be found in typic prairie upon the outwash plain at Midewin and other habitats (seeps, wetland edges and woodlands). These dolomite-associated species have declined in numbers and are under various general threats described above. Besides these general threats, a number of specific threats have been identified below.

3.7.4.1.1. Crawe's Sedge

Crawe's sedge is a low stature, perennial, rhizomatous sedge of calcareous habitats. Some of these habitats include glades, calcareous typic prairie, dolomite prairie, pannes, alvars, and calcareous fens (Gleason and Cronquist 1991; Herkert 1991; Swink and Wilhelm 1994; USDA Forest Service 2000f; Yatskievitch 1999).

3.7.4.1.2. Sullivant's Coneflower

Sullivant's coneflower is a rhizomatous, perennial herb of calcareous, mesic habitats. Some of these habitats include glades, seeps, calcareous prairies, limestone barrens, stream banks, and open forests (Gleason and Cronquist 1991; NatureServe 2000j; Swink and Wilhelm 1994; USDA Forest Service 2000g).

Sullivant's coneflower may be threatened by the introduction of cultivated varieties of *Rudbeckia fulgida*. Hybridization and introgression may result in the loss of this taxon's distinctiveness. Cultivars of *R. fulgida* are commonly planted in the Central Till Plains Section, and seeds of other wild forms are available through native plant nurseries.

Grazing could have a positive effect; although little is known other than the species has maintained itself and has not apparently decreased with past grazing.

3.7.4.1.3. Occurrences and trends at Midewin

3.7.4.1.3.1. Crawe's sedge

Approximately 1,376 acres of Midewin has soils associated with dolomite bedrock. These areas historically had a matrix of different moisture gradients of dolomite prairie. Crawe's sedge may have been found throughout this area where the microhabitat conditions were appropriate. Additionally Crawe's sedge could have been found in typic prairie on the outwash plain where soils where appropriate (Brenton and Warsaw soils). Crawe's sedge may have occupied

localized portions of this habitat where the microhabitat was appropriate. The historic acreage at Midewin is estimated to be 2,091 acres. Crawe's sedge may also have been found in calcareous fen areas along the river and stream valleys. These were probably small inclusions within other natural communities and are difficult to map today and not included in the estimate of historic acreage.

At Midewin, Crawe's sedge occurs in a small tract of degraded dolomite prairie at the northwest margin of National Forest land (Drummond Dolomite Prairie). The population occurs on private land as well as on Midewin. The population was discovered in 1993; it consists of 15-20 discrete "patches" of Crawe's sedge, each covering from 4-30 square meters (E. Ulaszek, pers. obs.). It is unknown if each of the "patches" consists of one or several genetic individuals. Other populations may be present on Midewin, in at least two calcareous prairie remnants west of Illinois Route 53.

3.7.4.1.3.2. Sullivant's coneflower

Approximately 1,376 acres of Midewin has soils associated with dolomite bedrock. These areas historically had a matrix of different moisture gradients of dolomite prairie. Sullivant's coneflower may have been found throughout this area where the microhabitat conditions were appropriate. Additionally Sullivant's coneflower could have been found in typic prairie on the outwash plain where soils where appropriate (Brenton, Drummer, Joliet, La Hogue, Millbrook, Millsdale, Morley, Proctor soils). Sullivant's coneflower may have occupied localized portions of this habitat where the microhabitat was appropriate. The historic acreage at Midewin is estimated to be 4,805 acres. Sullivant's coneflower may also have been found in fen areas of Midewin, especially along stream and river valleys. These were probably small inclusions within other natural communities and are difficult to map today and not included in the estimate of historic acreage.

At Midewin, Sullivant's coneflower is locally common west of Illinois Route 53, in outwash plain soils. Habitats include wetland margins, dolomite prairie, other prairie remnants, seeps, permanent pastures, roadsides, open forests, and woodland edges. These populations each consist of 50-1000 individuals; because this species is rhizomatous, it is likely that some populations consist of one or few genetic individuals (USDA Forest Service 2000g). A few, small populations (<10) occur east of Illinois Route 53, primarily on outwash plain or floodplain soils, but also in roadsides. The upland habitat within the outwash plain at Midewin is potential habitat for Sullivant's coneflower (approximately 1,821 acres). A portion of the wetland habitat (primarily seeps, fens and wet prairie) is also potential habitat.

3.7.4.1.4. Historic range

The area used for cumulative effects analysis is the Central Till Plains ecological section as described above, with the addition of the lower Des Plaines River valley which is a part of the Southwestern Great Lakes ecological section. The cumulative effects area was expanded for the same reason that the dolomite prairie restricted species was expanded.

3.7.4.1.4.1. Crawe's sedge was historically known from locations with dolomite prairie, calcareous typic prairie and other calcareous habitats. Crawe's sedge is known from Grundy, Kankakee, Will, and possibly Champaign counties in Illinois (Herkert 1991; Mohlenbrock 1999; Bowles 1991) and Newton County, Indiana (Indiana Natural Heritage Database 2000). Crawe's sedge also occurs in the lower Des Plaines River valley portion of the Southwestern Great Lakes Morainal Section. Most of the populations in the Central Till Plains seem to be restricted to dolomite prairie. Populations within the Central Till Plains appear to be small, while the populations within the lower Des Plaines River valley of the Southwestern Great Lakes Morainal Section are much larger. Some other small populations also exist within the Prairie Parklands. The status of the populations is difficult to determine because its difficult to determine genetic individuals in the field and the size of a population can fluctuate from year to year. Midewin has a fairly small population of Crawe's sedge.

3.7.4.1.4.2. Sullivant's coneflower was historically known from calcareous habitats such as dolomite prairie, glades, seeps, open forests and stream banks. Within the Central Till Plains Section, Sullivant's coneflower is found scattered in six counties in Illinois (Mohlenbrock and Ladd 1978; Swink and Wilhelm 1994). The status of Sullivant's coneflower in the Indiana portion of the Central Till Plains Section is not available, but it probably does occur in scattered locations. Most of the larger populations occur near Midewin within the Prairie Parklands area. Most of the larger populations seem stable. Midewin has significant populations of Sullivant's coneflower.

3.7.4.2. ENVIRONMENTAL CONSEQUENCES

3.7.4.2.1. Direct and Indirect Effects

All existing dolomite prairie communities at Midewin would be restored and managed in all action alternatives. All action alternatives would restore and reconstruct native vegetation in areas where dolomite prairie was historically found based on soil types (approximately 1,376 acres). Each action alternative would also restore and reconstruct varying amounts of typic prairie, woodlands and wetlands that could serve as habitat for these species. Table 3.20 shows the

amounts of native vegetation to be restored. Some fraction of these amounts would be appropriate for these species depending upon how calcareous the soils are. The no action alternative would not manage the existing native plant communities or reconstruct native plant communities. The action alternatives would all have a beneficial impact on these species. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.4.2.2. Cumulative Effects

Overall Midewin has significant dolomite prairie habitat within the Central Till Plaines Section and lower Des Plaines River valley portion of the Southwestern Great Lakes Morainal Section. With the addition of dolomite prairie restoration acreage, Midewin could become the most important area for preservation of dolomite prairie and the associated dolomite prairie plants including these sensitive species. Midewin also has significant acreage that will be restored to other calcareous habitat.

3.7.4.2.2.1. Crawe's Sedge

Within the Central Till Plains Section, Crawe's sedge is primarily found at Midewin and nearby areas within the Prairie Parklands. There are a few scattered populations within other portions of the Central Till Plains Section. Crawe's sedge is also found within lower Des Plaines River valley portion of the Southwestern Great Lakes Morainal Section. The population at Midewin is small and thus would seem not be too important for the continued survival of Crawe's sedge within the cumulative effects analysis area, however many other populations within the analysis area are also small.

3.7.4.2.2.2. Sullivant's Coneflower

Within the Central Till Plains Section, Sullivant's coneflower is primarily found at Midewin and nearby areas within the Prairie Parklands, with some scattered populations in other parts of the natural section. Sullivant's coneflower is also found within lower Des Plaines River valley portion of the Southwestern Great Lakes Morainal Section. The population at Midewin is large and thus may be very important for the continued survival of Sullivant's coneflower, within this area of analysis. Not a lot is known about Sullivant's coneflower in other areas of the Central Till Plains Section and thus the importance of the Midewin population is difficult to access.

3.7.4.3. MITIGATION

Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

The following standards and guidelines have been developed to protect these species:

- Restoration would be considered in appropriate soils for each of these sensitive species.
- Current populations of each species would be maintained and improved.
- Projected activities would be planned to avoid adverse impacts to these species during the growing season.

3.7.4.3.1. Sullivant's coneflower

- Manage habitat for Sullivant's coneflower to provide suitable conditions for recruitment of new seedlings (i.e. openings).

3.7.4.4. MONITORING

Periodic monitoring of the dolomite prairie associated species should be done at least once every 5 years. The amount of dolomite prairie restored yearly should be monitored and the success of the restoration monitored periodically, at least once every 5 years.

3.7.5. Plants of Typic Prairie

3.7.5.1. AFFECTED ENVIRONMENT

Typic prairie restricted plants are restricted to typic prairie associated with deep loamy soils. These typic prairie species have declined in numbers and are under various general threats as outlined above.

3.7.5.1.1. Hairy Valerian

Hairy valerian is a gynodioecious, perennial herb that grows from a perennial rhizome (USDA Forest Service 2000h). The plant does not form extensive colonies by rhizomes; most reproduction is probably through sexual reproduction. The plants flower in late April and May, and seed dispersal occurs in late May and June; the plants go dormant in early summer, although some growth may occur in fall (E. Ulaszek, pers. obs.). Certain disturbances (dormant season fire) may be important to promote flowering and recruitment, but late spring fires may prevent flowering and seed set by injuring immature inflorescences. Hairy valerian is a perennial herb of wet and mesic tallgrass prairies, sedge meadows, and fens (NatureServe 2000l; Swink and Wilhem 1994). Because of its edibility, grazing by deer, cattle, etc. can have a negative impact on Hairy Valerian individuals.

3.7.5.1.2. Earleaf Foxglove

Earleaf foxglove is an annual herb that flowers in late August and September. Plants are partial root parasities on various perennial grasses and forbs, including Sullivant's coneflower. After a dormant season prescribed burns, this species often shows a population increase, along with increased vigor and reproduction (flowering and seed set)(W. Handel, pers. comm.). Because this species is an annual herb, it is likely that a considerable seed bank exists where populations are present (USDA Forest Service 2000m). This plant has a strong positive reponse to fire. Earleaf foxglove is an annual herb of mesic prairies, but is sometimes present in drier prairies, dolomite prairies, open savannas, hayfields, and old fields (Gleason and Cronquist 1991; NatureServe 2000; Swink and Wilhelm 1994; USDA Forest Service 2000i). Light is required for germination, and disturbances such as fire may provide the openness needed to provide the required light.

3.7.5.1.3. Hill's Thistle

Hill's thistle is a relatively-short-lived perennial herb; many plants die after flowering and seed set (USDA Forest Service 2000j). Successful recruitment of seedlings requires some periodic disturbance of grasslands by fire, animal burrowing, grazing, mowing (Ostlie and Bender 1990; The Nature Conservancy 1999). Sufficient area is required for long-term of persistence of populations, because of the interaction between population dynamics and disturbance (USDA

Forest Service 2000j). This prairie thistle occurs in a diversity of well-drained grasslands, including dolomite prairie, hill prairie, mesic prairie, gravel prairie, alvars, and pastures (Swink and Wilhelm 1994; The Nature Consevancy 1999).

Herbicide application has destroyed many populations as a consequence of misidentification of the species with other non-native *Cirsium* species (The Nature Conservancy 1999) and other species such as *Carduus nutans* (Steven R. Hill per. comm.). Hill's thistle needs open areas (i.e. bare soil areas) for seed germination and seedling establishment. Lack of some sort of disturbance could be bottleneck for germination. Grazing may be an aid to germination.

3.7.5.1.4. Eastern Prairie White-fringed Orchid

Eastern prairie white-fringed orchid is a perennial monocot, growing from a compact tuber; evidence suggests that individual plants are dependent on a mycorrhizal association (the fungus *Rhyzoctonia*) for health. Plants may enter dormancy for a growing season; they can be long-lived perennials (up to 30 years) but some plants may die following the third year after initial flowering (Bowles et al. 1992, Case 1987). A disturbance regime appears important for seedling establishment and to induce flower; this disturbance may include prescribed fire during the dormant season (NatureServe 2000n). The eastern prairie white-fringed orchid occurs in wet and mesic tallgrass prairie, sedge meadows, fens, bogs, wet hay meadows, and moist abandoned fields (NatureServe 2000n). These communities are usually dominated by a diverse mixture of native grasses, sedges, forbs, but this species has been documented from more degraded habitats, including wet meadows dominated by exotic grasses; the latter habitat, may not provide long-term habitat for viable populations (Bowles and Bell 1999). Eastern Prairie White-fringed Orchid is a long-lived herbaceous perennial that blooms in northeastern Illinois from June 22nd to July 22nd (Swink and Wilhelm 1994).

A number of threats have been identified (USDA Forest Service 2000k). Grazing by cattle and deer are reported as threats. Cutting hay in midsummer prevents populations from dispersing seeds. Although grazing and mowing may be threats it has persisted under intensive grazing and mowing, but numbers do decrease under these regimes. Lack of suitable pollinators has been identified as a threat to some populations. Insecticides may have a detrimental impact on pollinators. Collection by orchid fanciers and wildflower gardeners were also identified as a problem.

3.7.5.1.5. Occurrences and trends at Midewin

3.7.5.1.5.1. Hairy Valerian

Historic habitat was estimated at 11,754 acres based upon soils that might have supported hairy valerian (Ashkum, Brenton, Elliot, Joliet, Varna, Warsaw soils). Hairy valerian may have been found throughout this area where the microhabitat

conditions were appropriate. At Midewin, hairy valerian is restricted to a prairie remnant along the western boundary. Only a few plants (<10) are present, but these are part of a larger population present on adjacent IDNR land (Eric Ulaszek per. com.).

3.7.5.1.5.2. Earleaf False-foxglove

Historic habitat was estimated at 9,441 acres based upon soils that might have supported upland prairie and savanna. At Midewin, earleaf foxglove is present at two localities. Both localities are disturbed remnant typic prairie communities. Population size can fluctuate yearly. It appears both populations have on the average between 50-100 plants yearly (Bill Glass per. obs.).

3.7.5.1.5.3. Hill's Thistle

Historic habitat was estimated at 9,441 acres based upon soils that might have supported upland prairie and savanna. Hill's thistle has not been found on Midewin; however, a population of this species is present on adjacent land owned by IDNR, and individual plants occur within 100 feet of the boundary. Plant communities containing this thistle are contiguous from IDNR onto Midewin and other suitable habitat also exist here.

3.7.5.1.6. Historic Range

3.7.5.1.6.1. Eastern Prairie White-fringed Orchid

Historic habitat was estimated at 13,581 acres based upon 85% of the upland prairie soils plus 85% of the hydric soils. The percentages exclude estimated acreage which are either too dry or too wet, respectively for this species. Eastern prairie white-fringed orchid has not been found on Midewin; however, a population of this species is present on adjacent IDNR land, and individual plants occur within 100 feet of the boundary. Plant communities containing this orchid are contiguous from IDNR onto Midewin.

3.7.5.1.6.2. Hairy Valerian.

In the Central Till Plains Section the species can be found in DeKalb, DuPage, Grundy, Henry, Kendall, and Will counties in Illinois and La Porte County Indiana. The number of current populations within the Central till Plains Section is unknown since the species isn't tracked in Illinois, only three populations are currently known within the Indiana portion of the section (Indiana Natural Heritage Database 2000). No information is available regarding population trends for the species within the Central Till Plains Section.

3.7.5.1.6.3. Earleaf Foxglove

Currently, in the Central Till Plains Section this species can be found in Bureau, Champaign, Grundy, Henry, Lee, Logan, Kendall, and Will counties in Illinois (Illinois Natural Heritage Database 2000). In Indiana's Central Till Plains Section, Earleaf foxglove was last observed in 1930 in Benton County (Indiana Natural

Heritage Database 2000). Overall there are ten known populations within the Central Till Plains Section (Illinois Natural Heritage Database 2000). Four of these populations are medium sized (50-200 plants), the remaining populations appear to be small, but because of the sporadic nature of this plant population estimates are difficult. Five populations are known from within the Prairie Parklands. Five of the populations (all the medium sized) are completely in public ownership and protected. Four populations are entirely in private ownership, while one is found partially in private and public.

3.7.5.1.6.4. Hill's Thistle

Currently, in the Central Till Plains Section the species can be found in Bureau, Cass, DeKalb, Grundy, Henry, Lee, Marshall, Mason, Menard, Peoria, Whiteside, Will, and Woodford counties in Illinois (Illinois Natural Heritage Database 2000). There are only historic records of Hill's thistle within the Central Till Plains in Indiana (Indiana Natural Heritage Database 2000). There are currently twenty known populations within the Illinois portion of the Central Till Plains (Illinois Natural Heritage Database 2000). Twelve of these populations are either in public ownership or have some form of permanent protection. Most populations are small (< 20 plants). Only a few are medium to large in size. Two populations are known within the Prairie Parklands, one large and one medium in size. Both of these populations seem fairly stable (Bill Glass per. obs.). Little is known about population trends for the other populations, but because of the small population sizes and number of unprotected populations, this species may be at threat within the section.

3.7.5.1.6.5. Eastern Prairie White-fringed Orchid

Currently, in the Central Till Plains Section this species can be found in Grundy, Henry, Iroquois, and Will counties in Illinois, each represented by a single population (Illinois Natural Heritage Database 2000). Two of these four sites are within the Prairie Parklands. Three of the populations are either in public ownership or have some form of permanent protection. The private site has the largest population, and has some informal protection by the landowners. Another site within the Prairie Parklands has been a seed reintroduction site, but plants haven't been located yet. Two of the populations are large, one medium and one fairly small. Its difficult to determine population trends for this species because of the yearly variation in populations noted with this species.

3.7.5.2. ENVIRONMENTAL CONSEQUENCES

3.7.5.2.1. Direct and Indirect Effects

The action alternatives have varying degrees of typic prairie restoration as indicated in Table 3.20. The more typic prairie habitat restored the greater benefit for each of these species. The no action alternative would not manage for existing typic prairie communities or reconstruct typic prairie communities. All typic prairie species would be negatively impacted by the no action alternative and positively impacted by the action alternatives with the Prairie Plan standards and guidelines.

3.7.5.2.1.1. Hairy Valerian

Potential hairy valerian habitat was determined by summing the acreage of appropriate soils (Ashkum, Brenton, Elliot, Joliet, Varna, and Warsaw) and subtracting grassland habitat. See Table 3.21 for the acreages by alternative. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.5.2.1.2. Earleaf Foxglove

Potential earleaf foxglove habitat was determined by summing the acreage of planned savanna and upland upland prairie restoration; see Table 3.21. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.5.2.1.3. Hill's Thistle

Summing the acreage the planned savanna and upland prairie restoration determined Hill's thistle habitat; see Table 3.21. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.5.2.1.4. Eastern Prairie White-fringed Orchid

Potential eastern prairie white-fringed orchid habitat was determined by summing 85% of the upland prairie acreage (15% of this habitat is assumed to be too dry) and 85% of the wet prairie/sedge meadow habitat (15% of this habitat is assumed to be too wet); see Table 3.21. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.5.2.2. Cumulative Effects

Historically, typic prairie was the major natural community within the Central Till Plains Section. Overall there is very little high quality typic prairie left in the Central Till Plains Section. In the Illinois portion of the Central Till Plains Section there is less than 200 acres of high quality typic prairie (White 1978). There is probably even less in Indiana. There is probably less than 5000 acres of prairie (high quality and degraded but with a prairie component), within the Central Till Plains Section today.

Midewin currently has only a small amount of habitat that has enough of a typic prairie component to be considered prairie (85 acres). Most of this is highly disturbed, but even this small amount is significant because of the rarity of the prairie habitat. Midewin has the potential to be a significant, if not the most significant typic prairie habitat within the Central Till Plains Section through restoration and reconstruction. The action alternatives call for different amounts of typic prairie to be restored. If wet prairie is excluded from the figure the amount will vary from 1,855 acres to 5,930 acres. The addition of wet prairie to these figures will increase most of the amounts. This is a significant amount especially since it will be in huge blocks instead of isolated remnants. With successful prairie restoration, Midewin could become the most important site within the Central Till Plains Section for preservation. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.5.2.2.1. Hairy Valerian

Hairy valerian is uncommon within the Central Till Plains Section. In Illinois this species isn't tracked so the number of populations is unknown. There are two other known populations within the Prairie Parkland, both of which are larger than that at Midewin. Although the population of hairy valerian is small at Midewin, there is a prospect of Midewin being quite important in preserving this species in the Central Till Plains Section. With the large amounts of potential typic prairie restoration there is the possibility of a large population. If hairy valerian successfully spreads and is restored into portions of Midewin, then Midewin may become one of the more important populations within the Central Till Plains Section and Prairie Parklands. We expect that successful restoration on a large scale at Midewin can make a slight difference.

3.7.5.2.2.2. Earleaf Foxglove

Five populations are known from within the Prairie Parklands. The two populations at Midewin aren't large, but are probably as large as any of the other populations within the Prairie Parklands. There is a prospect of Midewin being quite important in preserving this specie in the Central Till Plains Section. With

the large amounts of potential typic prairie restoration there is the possibility of a large population. If Earleaf foxglove successfully spreads and is restored into portions of Midewin, then Midewin may become one of the more important populations within the Central Till Plains Section.

3.7.5.2.2.3. Hill's Thistle

Within the Prairie Parklands, there are two populations. Although Midewin presently doesn't have a population there is an adjacent population and similar habitat. With the amounts of potential typic prairie restoration there is potential to have a quite large population. If Hill's thistle is discovered at Midewin or is successfully restored, Midewin may become one of the more important populations within the Central Till Plains Section, and the amount of restoration will make Midewin are largest potential site within the Central Till Plains Section and Prairie Parklands

3.7.5.2.2.4. Eastern Prairie White-fringed Orchid

Within the Prairie Parklands, there are just two populations. Although Midewin presently doesn't have a population, there is an adjacent population and similar habitat. With the amounts of potential typic prairie restoration there is potential to have a quite large population. This species has been successfully restored in the past. If eastern prairie white-fringed orchid turns up at Midewin or is successful restored at Midewin, then Midewin may become one of the more important populations within the Central Till Plains Section and Prairie Parklands based on its sheer size.

3.7.5.3. MITIGATION

Prairie Plan standards and guidelines developed to protect these species include:

- Restoration would be considered in soils for each of these sensitive species.
- Current populations of each species would be maintained and improved.
- Projected activities would be planned to avoid adverse impacts to these species during each species growing season.

3.7.5.3.1. Eastern Prairie White-fringed Orchid

- Consult with US Fish and Wildlife Service on any activities that could potentially impact populations of eastern prairie white-fringed orchid.

3.7.5.3.2. Hill's Thistle

- Evaluate grasslands dominated by cool season grasses as habitat for potential restoration of Hill's thistle.
- Manage Hill's thistle habitat to provide suitable conditions for recruitment of new seedlings.

3.7.5.3.3. Earleaf False Foxglove

- Establish populations of suitable host plants in potential habitat for earleaf false foxglove.

3.7.5.4. MONITORING

Yearly demographic monitoring of the federally threatened eastern prairie white-fringed orchid should be implemented if populations get established. Periodic monitoring of the other typic prairie species should be done at least once every 5 years. The amount of typic prairie restored yearly should be monitored and the success of the restoration monitored periodically, at least once every 5 years.

3.7.6. Glade Mallow (Riparian Plants)

3.7.6.1. AFFECTED ENVIRONMENT

Glade mallow is a perennial forb of floodplains and alluvial terraces; some populations survive along drainage ditches and stream banks (Robertson and Phillippe 1992). Glade mallow is a perennial, dioecious forb that grows from spreading rhizomes. The original habitat is unknown, but suspected to have been bottomland prairies on alluvial terraces and floodplains (Robertson and Phillippe 1992; Swink and Wilhelm 1994).

This species is not present in undisturbed prairie remnants, but instead can be found associated with a variety of successional habitats associated with floodplains and stream terraces. Open areas with little or no shade are required for vigorous growth and prolific flowering (Robertson and Phillippe 1992). Certain disturbances (perhaps including fire) may be required to maintain habitat (prevent woody encroachment) (Robertson and Phillippe 1992). Glade mallow has declined do to general threats. Browsing and grazing by deer and cattle have been identified as specific threats.

3.7.6.1.1. Occurrences and trends at Midewin

Approximately 1,538 acres have been identified as former habitat for this species at Midewin; see Table 3.21. This historic habitat was determined by summing the soils that were likely to have supported glade mallow (Brenton, Camden, Lawson, Lorenzo, Millbrook, Proctor and Warsaw soils). At Midewin, this species is restricted to the Jackson Creek floodplain, near the northwest boundary of the site. Here it occurs in former hay meadows, wet dolomite prairie, and thickets dominated by young growth of trees and shrubs. This population is small (perhaps <30 plants) and scattered over at least 250 acres (Eric Ulaszek per. comm.).

Glade mallow is tracked within Indiana, but not Illinois. Within the Indiana portion of the Central Till Plains Section there is one record (Indiana Natural Heritge Database 2000). The number of Illinois populations is unknown, but at least nine Illinois counties that are entirely or partially within the Central Till Plains Section have known populations (Robertson and Phillippe 1992). Within the Prairie Parklands, two populations are known. Populations trends are unknown, but most populations are in disturbed areas such as right-of-ways and are presummed to be threatened. Several populations are in public ownership and are protected. The Midewin population is the only one known within the Prairie Parklands.

3.7.6.2. ENVIRONMENTAL CONSEQUENCES

3.7.6.2.1. Direct and Indirect Effects

Glade mallow should benefit from restoration of riparian habitat through restoration and reconstruction with the associated standard and guidelines. Each action alternative preserves and restores all the major riparian areas. Minor riparian areas will also be restored with associated wetland restoration, see the goals, standards and guidelines of the Prairie Plan associated with wetland restoration. With more wetland restoration, the greater the likelihood for more habitat, (associated minor riparian areas), suitable for glade mallow. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.6.2.2. Cumulative Effects

Midewin presently has a small population probably not too significant relative to the Central Till Plains Section. With the amount of restoration and reconstruction planned at Midewin, this significance could change. With restoration it may be possible to have a quite large and significant population within the Central Till Plains Section. It maybe possible to have one of the few populations that is in a natural habitat within the section. With these potential outcomes, Midewin could become very important for this species within the Central Till Plains.

3.7.6.3. MITIGATION

The following standards and guidelines have been developed to prevent any adverse affects and not result in a loss of species viability:

- Restoration would be considered on appropriate stream terraces and floodplains as sites for restoration of glade mallow populations.
- Manage glade mallow habitat to provide suitable conditions for recruitment of new seedlings (i.e. develop terraces).
- Plan project activities to avoid adverse impacts to glade mallow, particularly during the growing season from March 15th to October 30th.

3.7.6.4. MONITORING

Periodic monitoring of the glade mallow should be done at least once every 5 years. The amount of riparian restored yearly should be monitored and the success of the restoration monitored periodically, at least once every 5 years.

3.7.7. Woodland Plants and Birds

3.7.7.1. AFFECTED ENVIRONMENT

These species, Cerulean warbler *(Dendroica cerulea)*, American ginseng *(Panax* quinquefolius) and goldenseal (*Hydrastis canadensis*) are associated with open and/or closed woodland areas. These species have declined in numbers and are under a number of specific threats.

3.7.7.1.1. American Ginseng

American ginseng is a long-lived herbaceous perennial with a thick taproot that abruptly narrows into a rhizome (Lewis and Zenger, 1982). The plant blooms from June to July. The roots are harvested for their supposed medicinal properties. This species can be found in undisturbed mesic upland forest and woodland. Anderson et al. (1993) reported that this shade-tolerant species has a light saturation of 10% of full sunlight and that maximum growth will occur with 8 to 30% full sunlight.

The major threat to American ginseng is the intense and destructive root harvesting that the populations endure because of the supposed medicinal properties of the root. Trails near populations may increase the likelihood of increased harvesting. Herbivory by deer and insects can be a problem for American ginseng.

3.7.7.1.2. Goldenseal

Goldenseal is a long-lived rhizomatous herbaceous perennial that blooms from April to May. The rhizomes are harvested for their supposed medicinal properties. This species can be found in moist upland forests and woodlands. Goldenseal is usually found in forest understory with approximately 40% to 80% shade. The major threat to goldenseal is the intense and destructive root harvesting that the populations endure because of the supposed medicinal properties of the root. Trails near populations may increase the likelihood of increased harvesting. The small number of populations may be a threat in that few genotypes are represented in the population.

3.7.7.1.3. Cerulean Warbler

Cerulean warblers typically nest in mature deciduous forest, but the composition of the forests they inhabit appears to vary across the range of the species (S.K. Robinson, per. comm.; C.J. Whelan, per. obs.). These warblers have been observed in upland and lowland sites during the breeding season, but apparently prefer floodplain sites.

Fragmentation of existing deciduous forest constitutes a serious threat for the Cerulean warbler. The species prefers large forest tracts. In some parts of their

range, Cerulean warblers appear to be negatively impacted by death of native elms (*Ulmus* species) and loss of white oak (*Quercus alba*); (S.K. Robinson, per comm.). Brood reduction due to the obligate, generalist brood parasite, the brown-headed cowbird (*Molothrus ater*) constitutes a direct threat to the Cerulean warbler (S.K. Robinson, per comm.). Cowbird parasitism is frequently related to forest fragmentation and small habitat size of tracts.

3.7.7.1.4. Occurrences and trends at Midewin

3.7.7.1 4.1. American Ginseng

Approximately 194 acres of Midewin are considered native forest or woodland. 429 acres of Midewin is associated with woodland soils. American ginseng could historically have been found throughout theses areas where the microhabitat was appropriate. Currently at Midewin, American ginseng is restricted to one native woodland remnant (Eric Ulaszek pers. comm.). This population is quite small (<10 mature plants). There may be more juvenile plants that haven't been located.

3.7.7.1 4.2. Goldenseal

Approximately 194 acres of Midewin are considered native forest or woodland. There are 429 acres of Midewin is associated with woodland soils Goldenseal could historically have been found throughout theses areas where the microhabitat was appropriate. At Midewin, golden seal is restricted to one native forest remnant (Eric Ulaszek, per. comm.). There are only a few small clumps.

3.7.7.1 4.3. Cerulean Warbler

Approximately 194 acres of Midewin are considered native forest or woodland. Approximately 429 acres of Midewin has soil that is usually associated with forest. These areas could have served as habitat for the Cerulean warbler historically. At Midewin, Cerulean warbler is not a regular breeder; it has been found in the Jackson Creek Woods. Adults have been recorded during the breeding season, but actual breeding hasn't been confirmed on Midewin. Additional habitat is adjacent and north of Midewin on the Joliet Army Training Area.

3.7.7.1.5. Historic Range

3.7.7.1.5.1. American Ginseng

American ginseng isn't tracked by either the Illinois or Indiana Natural Heritage Databases so exact numbers of populations or estimates of individuals is difficult to determine. American ginseng has been found in at least 13 counties within the Central Till Plains. Limited information is available regarding population trends for American ginseng. However, it is believed that American Ginseng has been declining within the Central Till Plains Section, as a result of intense harvesting. Records show that populations have been decimated. For example a large

populations (211 individuals) was eradicated by root diggers within weeks of recording the data for a study (Lewis 1984).

3.7.7.1.5.2. Goldenseal

Goldenseal isn't tracked by either the Illinois or Indiana Natural Heritage Databases so exact numbers of populations or estimates of individuals is difficult to determine. Goldenseal has been found in at least 13 counties within the Central Till Plains. Limited information is available regarding population trends for Goldenseal. It is believed that goldenseal has been declining within the Central Till Plains Section, as a result of intense harvesting.

3.7.7.1.5.3. Cerulean Warbler

Cerulean warbler is tracked in Indiana, but not Illinois. There are 3 records for the Indiana portion of the Central Till Plains Section (Indiana Natural Heritage Database 2000). The exact numbers of populations or estimates of individuals in Illinois is difficult to determine. Cerulean warblers have been found in several Illinois counties within the Central Till Plains Section, but are not common. It would appear that Cerulean warblers are uncommon thoughout the Central Till Plains Section.

3.7.7.2. ENVIRONMENTAL CONSEQUENCES

3.7.7.2.1. Direct and Indirect Effects

All the action alternatives will preserve the existing woodland/forest habitat and restore forest soils over time to woodland/forest where appropriate. There are currently 194 acres of woodland/forest communities and 235 acres of additional potential woodland/forest habitat.

Each species is expected to benefit from restoration and reconstruction of the 429 acres woodland and forest habitat that is proposed in each action alternative. The amount of potential habitat for each species wouldn't vary between the action alternatives; see Table 3.21. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.7.2.2. Cumulative Effects

High quality forest and woodland habitat in the Central Till Plains Section is only a fraction of what it was historically. In the Illinois portion of the Central Till Plains Section there is only a little over 2,000 acres of high quality upland forest left (White 1978). There are many more acres of degraded forest (similar to that at Midewin) within the Central Till Plains Section, but many of these are small fragmented areas under severe threat of exotic species. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects

on these populations and habitats and is not expected to result in a loss of species viability.

3.7.7.2.3. American Ginseng

American ginseng is found in a number of locations within the Central Till Plains Section, but probably was never very common in any one location. There is little exact population data, but it's assumed that American ginseng is declining throughout the Central Till Plains Section and other portions of the range. This scenario is probably similar for the Prairie Parklands. Because of the small amount of forest/woodland currently existing and planned for Midewin its unlikely that Midewin would be a critical population within the Central Till Plains Section, although because of the protection of the population it may become more important. The population at Midewin is important for the Prairie Parklands area.

3.7.7.2.4. Goldenseal

Goldenseal is found in a number of locations within the Central Till Plains Section, but probably is never very common in any one location. There is little exact population data, but it's assumed that goldenseal is declining throughout the Central Till Plains Section and other portions of the range. This scenario is probably similar for the Prairie Parklands. Because of the small amount of forest/woodland currently existing and planned for Midewin, it is unlikely that Midewin would be a critical population within the Central Till Plains Section, although because of the protection of the population it may become more important. The population at Midewin may be important for the Prairie Parklands area.

3.7.7.2.5. Cerulean Warbler

Cerulean warbler is found sporadically in the Central Till Plains Section. It is probably nowhere common within the Central Till Plains Section. It's assumed that the Cerulean warbler has declined throughout the Central Till Plains Section and is probably rare within the Prairie Parklands.

3.7.7.3. MITIGATION

The following standards and guidelines have been developed to provide for protection for these populations and habitat:

- Protect, manage and enhance 420+ acres of forest/woodland that was historically found at Midewin.

3.7.7.3.1. American Ginseng

- Prohibit harvest of American ginseng for commercial or personal use.
- Consider restoration or introduction of American ginseng into suitable habitat including mesic upland forest and mesic woodland.

- Protect known populations of American ginseng by limiting impact from new trail construction or other land disturbing activities (keep such activities at least 82 feet away).
- Protect habitat by limiting new trail construction within a contiguous tract of suitable habitat (mesic forest, mesic woodland).
- When restoring new populations of American ginseng, locate new populations at least 82 feet from existing or planned trails.
- Manage and improve habitat by providing 8% to 30% full sunlight for maximum growth.
- Allow woody debris material to accumulate on the forest or woodland floor.
- Plan project activities to avoid or minimize adverse impacts to goldenseal, particularly during the growing season from April 30th to October 15th.

3.7.7.3.2. Goldenseal

- Prohibit harvest of goldenseal for commercial or personal use.
- Consider restoration or reintroduction of goldenseal into suitable habitat including mesic upland forest and mesic woodland.
- Protect known populations of goldenseal by limiting impact from new trail construction or other land disturbing activities (keep such activities at least 82 feet away).
- Protect habitat by limiting new trail construction within a contiguous tract of suitable habitat (mesic forest, mesic woodland).
- When restoring new populations of goldenseal, locate new populations at least 82 feet from existing or planned trails.
- Manage goldenseal habitat areas for 40% to 80% shade for maximum growth.
- Allow woody debris material to accumulate on the forest or woodland floor.
- Plan project activities to avoid or minimize adverse impacts to goldenseal, particularly during the growing season from April 30th to October 15th.

3.7.7.3.3. Cerulean Warbler

- Maintain and enhance existing native forest/woodland vegetation for habitat for Cerulean Warbler.
- Initiate management of forest/woodland habitat using practices (periodical prescribed burns, exotic plant species control) that promote oak regeneration within five years of implementation of Midewin land and resource management plan.

3.7.7.4. MONITORING

Populations of American ginseng and goldenseal should be monitored on a yearly basis. For Cerulean warblers, periodic monitoring of the health of forest/woodland habitat should be done. The amount of forest/woodland restored

yearly should be monitored and the success of the restoration monitored periodically, at least once every five years.

3.7.8. Wetland Animals

3.7.8.1. AFFECTED ENVIRONMENT

Each of these four animal species, Blanding's turtle (*Emydoidea blandingii*), King *Rail (Rallus elegans*), Least Bittern (*Ixobrychus exilis*) and plains leopard frog (*Rana blairi*) are dependent upon wetlands at least for a portion of their life history. These wetland species have declined in numbers or are uncommon within the analysis area. Wetlands and the associated animals are under various general threats as outlined above. A number of specific threats have been identified as outlined below.

3.7.8.1.1. Blanding's Turtle

Blanding's turtle is a semi-aquatic medium-sized turtle that requires large areas of wetlands within a mosaic of relatively undisturbed uplands (Smith 1961; Mike Redmer pers. comm.). Barriers to movement within wetlands, between wetlands and between uplands and wetlands can be a problem. Road maintenance activities have been associated with nest destruction (Sajwaj et.al 1998). People collecting turtles could effect populations (Mike Redmer pers. comm.).

3.7.8.1.2. King Rail

The King Rail is a large rusty rail with slender bill, longer than head and slightly de-curved. This rail prefers tidal freshwater and brackish marshes, non-tidal freshwater marshes, and successional stages of marsh-shrub swamp. In areas where muskrats are trapped, King Rails often become casualties because they use runways where traps are placed (USFS 2000).

3.7.8.1.3. Least Bittern

The Least Bittern is the smallest member of the heron family. Least Bittern is found primarily in cattail marshes, and it prefers extensive marshes dominated by dense emergent vegetation where it nests.

3.7.8.1.4. Plains Leopard Frog

Plains Leopard Frog is a medium sized frog associated with lentic wetlands. Predation by introduced game fish has been identified as a threat. Detrimental management practices on *Rana pipiens* a closely related species include mowing right up to the edge of wetlands, stocking fish or bullfrogs, application of herbicides, pesticides, and poisons such as rotenone (Phillips 1996).

3.7.8.1.5. Occurrences and Trends At Midewin

Approximately 7,035 acres of Midewin are associated with wetland soils. Some of these wetlands would have provided habitat for each of these species. Currently there are approximately 1,077 acres of wetlands at Midewin that could provide habitat for each of the species.

3.7.8.1.5.1. Blanding's Turtle

Currently only one population is known from the Blodgett Road wetlands. The population was discovered in 1993 and the population size is unknown.

3.7.8.1.5.2. King Rail

King Rail nesting at Midewin was documented in 1993 in wetlands associated with the Drummond Dolomite Prairie. Individuals have been heard in the Doyle Lake area. The yearly use of Midewin by King rails is unknown other than these few records.

3.7.8.1.5.3. Least Bittern

Least bitterns were found nesting at the Blodgett Road wetlands in 1999 and 2000. The yearly use of Midewin by least bitterns is unknown other than these few records.

3.7.8.1.5. 4. Plains Leopard Frog

Plains leopard frogs have been found sporadically over the past four years on the west side (west of Illinois Route 53). Only a few individuals have been found in any year and breeding ponds haven't been located.

3.7.8.1.6. Historic Range

3.7.8.1.6.1. Blanding's turtle

Blanding's turtles were probably found throughout the wetlands of the Central Till Plains Section prior to habitat destruction. Today, Blanding's turtles are only found in scattered wetlands through the section. A total of 13 populations are currently known from the Central Till Plains Section (Illinois Natural Heritage Database 2000, Indiana Natural Heritage Database 2000). There have also been a few isolated sightings of Blanding's turtles, but these may represent lone individuals and not populations. Some of the known populations are within public ownership and are protected. The population trends are not known, but only a few populations are thought to be large. Three of these populations are within the Prairie Parklands, one of which is the larger population.

3.7.8.1.6.2. King Rail

King rails were probably found throughout the wetlands of the Central Till Plains Section prior to habitat destruction. Today king rails are only found in scattered wetlands through the section. Only seven locations within the Central Till Plains are thought to have breeding records of king rails (Indiana Natural Heritage

Database, 2000, Illinois Natural Heritage Database 2000). Several of these are in public ownership and protected. Population trends within the Central Till Plains are unknown. The population size at Midewin is unknown, but thought to be small. Two populations are known from the Prairie Parklands. The other population within the Prairie Parklands is in an area with large amounts of habitat, and king rails are thought to breed annually.

3.7.8.1.6.3. Least Bittern

Least bitterns were probably found throughout the wetlands of the Central Till Plains Section prior to habitat destruction. Today least bitterns are only found in scattered wetlands through the section. Only 12 locations within the Central Till Plains are thought to have breeding records of least bitterns (Illinois Natural Heritage Database 2000, Indiana Natural Heritage Database 2000). Population trends within the Central Till Plains are unknown. The population size at Midewin is unknown, but thought to be small. Two populations are known from the Prairie Parklands. The other population within the Prairie Parklands is in area with large amounts of habitat and least bitterns are thought to breed annually.

3.7.8.1.6.4. Plains Leopard Frog

Historically the plains leopard frog was probably found throughout the Central Till Plains Section. Today the plains leopard frog is still fairly common in wetlands within the western portion of the section, but rare in the eastern portion of the section. Midewin is near the northeastern edge of its range. Since this species isn't tracked by the Indiana or Illinois Natural Heritage Database its difficult to know the extent of the populations and population trends. There is one population at Midewin. There is one other population within the Prairie Parklands, and another one known from Will County (but outside of the Prairie Parklands) (M. Redmer, pers. comm.)

3.7.8.2. ENVIRONMENTAL CONSEQUENCES

3.7.8.2.1. Direct and Indirect Effects

The amount of wetland to be restored and possibly be used by each of these species vary in the action alternatives, from 2,287 acres to 4,400 acres, see Table 3.21. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.8.2.2. Cumulative Effects

Midewin will have significant wetlands with associated prairie and grassland habitat within the Central Till Plains Section as the desired future condition is met. This amount of habitat may make Midewin important for these species within the section. Currently some other areas within the Prairie Parklands are

more important than Midewin for these species, but this will probably change as more habitat is restored at Midewin. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.8.3. MITIGATION

The following standards and guidelines have been developed to provide for protection for these populations and habitat:

- Wetlands would be restored and protected where appropriate based on standards and guidelines developed for wetlands in the Prairie Plan.

3.7.8.3.1. Blanding's Turtle

- Consider removing redesigning where possible, existing structures such as roads, railroad beds, fences and trails that restrict movement of Blanding's turtle between wetlands
- Plan project activities to avoid adverse impacts to Blanding's turtle, i.e. avoid prescribed burns when Blanding's turtle are active.
- Evaluate the effectiveness of enhancing Blanding's turtle populations through release and translocation programs, if population increases do not naturally occur within 10 years of Prairie Plan approval.

3.7.8.3.2. King Rail

- Maintain king rail habitat of existing wetland areas with high native plant species diversity, with emphasis on species of sedges (*Carex* spp.), smartweeds (*Polygonum* spp.), bulrushes (*Scirpus* spp.), and bur reed (*Sparganium eurycarpum*).
- Consider restoration of additional wetland with emergent aquatic vegetation, including cattails (*Typha* spp.), bulrushes, bur reed and smartweeds in areas at Midewin with appropriate soils and hydrology (past and present) when feasible and not in conflict with other objectives.
- Maintain a matrix of predominately upland grasses around the core wetland king rail habitat.
- Plan project activities to avoid adverse impact to least bittern. Restrict management and recreational activities within 656 feet of known least bittern nests that could disrupt successful breeding, particularly from April 15 to August 31.

3.7.8.3.3. Least Bittern

- Maintain existing natural wetlands with emergent aquatic vegetation (habitat for least bittern), including cattails, bulrushes, bur reed and smartweeds.
- Consider restoration of additional wetland with emergent aquatic vegetation, including cattails (*Typha* spp.), bulrushes, bur reed and smartweeds in areas

at Midewin with appropriate soils and hydrology (past and present) when feasible and not in conflict with other objectives.
- Maintain a matrix of predominantly upland grasses around the core least bittern wetland habitat.
- Plan project activities to avoid adverse impact to least bittern. Restrict management and recreational activities within 656 feet of known least bittern nests that could disrupt successful breeding, particularly from April 15 to August 31.

3.7.8.3.4. Plains Leopard Frog

- Consider restoration of additional palustrine wetlands for plains leopard frog.
- Consider removing or redesigning existing structures such as roads, railroad beds, fences and trails that restrict movement of plains leopard frog between wetlands.
- Evaluate the effectiveness of enhancing plains leopard frog populations through release and translocation programs, if population increases do not naturally occur within 10 years of the Plan approval.

3.7.8.4. MONITORING

Periodic monitoring of these wetland species should be done at least once every five years. Breeding wetland for plains leopard frogs should be determined. The amount and type of wetland restored yearly should be monitored and the success of the restoration monitored periodically, at least once every five years.

3.7.9. Short-stature Grassland Birds

3.7.9.1. AFFECTED ENVIRONMENT

Two Regional Forester Sensitive grassland bird species fit into this category, upland sandpiper (*Bartramia longicauda*) and migrant loggerhead shrike (*Laniuis ludovicianus migrans*). Both of these grassland birds species are associated with a short grass structure, during at least one phase of their breeding season short grasses are necessary.

Both species require open habitat characterized by short grasses and forbs of short stature. This habitat can be maintained by fire, grazing and mowing. Grazing may be the best tool to maintain habitat, because of the resulting heterogeneity of the habitat structure. Both of these birds have adapted well to Eurasian grasslands and pastures following the loss of the prairie habitat. These two species have experienced declines in population numbers in portions of their ranges. Some specific threats are listed below.

3.7.9.1.1. Loggerhead Shrike

The Loggerhead Shrike is a predatory songbird slightly smaller than the American Robin (*Turdus migratorius*). Loggerhead shrikes prefer short grasses with some scattered trees. The following habitat requirements are based on Brooks and Temple (1990). Loggerhead shrikes require a territory of at least 25 acres, which consists of at least a 90% herbaceous ground cover. Potential foraging habitat (i.e. pasture, upland prairie, grassland and hay land) should cover 80% or more of each potential shrike territory. Each potential shrike territory should consist of 18% or greater cover of a usable foraging habitat (i.e. potential foraging habitat that is with 59 feet of an elevated hunting perch. Each potential shrike territory should contain at least 10 nesting trees or shrubs in the range of 5 to 30 feet. Because loggerhead shrikes are high in the food chain, pesticides have been implicated as a potential threat (USFS 2000m). In Illinois nest predation is the greatest cause of nest failure (Jim Herkert, pers. comm.)

3.7.9.1.2. Upland Sandpiper

The Upland Sandpiper is a long distance migrant shorebird that prefers relatively short-stature grasslands and prairies. Upland sandpipers require large open relatively treeless areas with short grasses. The following habitat requirements are based on Herkert (1997c). Upland Sandpipers require open areas that are as large as possible, preferably more than 1235 acres Grasslands should be managed to keep woody cover to a minimum; optimal habitat is treeless. Herbaceous cover should exceed 60% live vegetative cover. Nesting cover should be between 6 to 12 inches in height in late May. Brood cover should be maintained at 8 inches or less from mid-June to mid-July. Upland sandpipers are dependant upon disturbances such as grazing (USFS 2000m). Too little grazing can be a threat.

3.7.9.1.3. Occurrences and Trends

3.7.9.1.3.1. Loggerhead Shrike

It's difficult to determine the historic habitat of the loggerhead shrike because we don't know the extent of the shorter stature grasses at Midewin, and we don't know the extent of grazing by bison in the past. An estimate is 1,788 acres; see Table 3.21. This amount is based on taking 20% of the prairie soils, believed to represent the amount of shorter grass areas. The actual number could have been higher with bison grazing. Loggerhead shrikes nest primarily in or adjacent to grazing tracts at Midewin. Short herbaceous plants, scattered thorny trees, and shrubs characterize these areas. Most nests have been located in Osage orange (*Maclura pomifera*) trees, but a few have been found in red cedar (*Juniperus virginiana*), multiflora rose (*Rosa multiflora*) and cockspur hawthorn (*Crataegus crus-galli*). Over the past 6 years, the number of nests per year at Midewin and the former Joliet Army Ammunition Plant has varied from 6 to 13 (Bill Glass per. obs.). The population has been relatively stable over this time period.

3.7.9.1.3.2. Upland Sandpiper

It's difficult to determine the historic habitat of the upland sandpiper because we don't know the extent of the shorter stature grasses at Midewin, and we don't know the extent of grazing by bison in the past. An estimate is 1,788 acres; see Table 3.21. This amount is base on taking 20% of the prairie soils; this amount is believed to represent the amount of shorter grass areas. The actual number could have been higher with bison grazing. Upland sandpipers nest primarily in or adjacent to grazing tracts at Midewin. These areas are characterized by short herbaceous stature and lack of woody vegetation. The dominant grasses of upland sandpiper nesting tracts include Kentucky bluegrass (*Poa pratensis*) and smooth brome grass (*Bromus inermis*). Brood habitat has been in pastures grazed by cattle at Midewin. Upland sandpipers have been known from the site since 1983. The population estimates since 1985 have varied from 43 to 158. Over the past nine years the population has been around 45-60 birds.

3.7.9.1.4. Historic Range

3.7.9.1.4.1. Loggerhead Shrike

The loggerhead shrike was probably known from throughout the Central Till Plains where scattered thorny trees could be found in short grassy areas. Today only scattered pairs can be found. There are 31 records from the Illinois portion of the Central Till Plains and 2 records from the Indiana portion (Illinois Natural Heritage Database 2000, Indiana Natural Heritage Database 2000). Most of these records are of single nests. Midewin is the only site with a large population. The loggerhead shrikes at Midewin are one of last remaining truly fully migrant loggerhead shrike populations within the range of the migrant subspecies in

North America; there is possibly one other in Canada (Pruitt 2000). The loggerhead shrikes at Midewin are the largest and most persistent population in the Central Till Plains Section (J. Herkert per. comm.). Within the Prairie Parklands there are two other records, both are single nests noted over a several year period and may no longer be active.

3.7.9.1.4.2. Upland Sandpiper

Upland sandpipers were probably found throughout the Central Till Plains wherever their necessary habitat requirements were met. Today other than at Midewin, there are only scattered pairs found. There are 18 records from Illinois and 14 records from Indiana (Illinois Natural Heritage Database 2000, Indiana Natural Heritage Database 2000). Most of these records are of singe pairs and may not still be extant. The upland sandpiper population at Midewin is the largest most stable population in the Central Till Plains Section (J. Herkert per. comm.). There are a few other upland sandpiper records from the Prairie Parklands, but these are individual pairs and most aren't extant.

3.7.9.2. ENVIRONMENTAL CONSEQUENCES

3.7.9.2.1. Direct and Indirect Effects

The action alternatives provide for between 1,860 to 7,710 acres of grassland habitat to be managed for prairie wildlife preferring short stature grasses. These acres would be idea habitat for these species. Additionally between 2,321 and 6,241 acres of prairie restoration is provided for under the action alternatives. These acres could provide some additional habitat although it would be less desirable than the short grass habitat.

3.7.9.2.1.1. Loggerhead Shrike

Potential loggerhead shrike habitat differs from alternative to alternative. All the action alternatives are better than the no action alternative. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.9.2.1.2. Upland Sandpiper

Potential upland sandpiper habitat differs from alternative to alternative. Potential upland sandpiper habitat was determined by taking the grassland habitat less 2,000 acres for bobolink habitat. Some percentage of the bobolink habitat might be used, but it wouldn't be prime habitat. All the action alternatives are better than the no action alternative. Implementation of the Prairie Plan standards and guidelines under Alternatives 2, 3 and 4 are expected to prevent any adverse effects on these populations and habitats and is not expected to

result in a loss of species viability. Alternatives 5 and 6 would not have enough acreage of prime habitat to maintain species viability over the long term.

The action alternatives provide for between 3,318 to 6,103 acres of unfragmented grassland habitat to be managed for prairie wildlife preferring short grasses. These acres are ideal for upland sandpipers if kept at short height.

3.7.9.2.2. Cumulative Effects

Within the Central Till Plains, Midewin has the largest and most stable populations of both of these species. Because of the rarity of these species elsewhere within the Central Till Plains, Midewin maybe important for the future survival of these species. Within in the Prairie Parklands only sporadic occurrences of these two species are known.

3.7.9.2.2.1. Loggerhead Shrike

Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability.

3.7.9.2.2.2. Upland Sandpiper

Implementation of the Prairie Plan standards and guidelines under Alternatives 2, 3 and 4 are expected to prevent any adverse effects on these populations and habitats and is not expected to result in a loss of species viability. Alternatives 5 and 6 would not have enough acreage of prime habitat to maintain species viability over the long term.

3.7.9.3. MITIGATION

The following standards and guidelines have been developed to provide for protection for these populations and habitat:

3.7.9.3.1. Loggerhead Shrike

- Protect and maintain habitat of large grassland areas (totaling at least 480 ha or 1186 acres) with short-stature grasses and scattered thorny trees (preferably native hawthorn, Crataegus spp.) and/or shrubs (preferably native rose, Rosa spp., blackberry, Rubus spp., etc.), so that at least 90% of ground cover consists of herbaceous vegetation and at least one tree 1.5 to 10 m (4.9 to 32.8 ft) in height occurs per hectare (2.47 acres), using practices that may include fire management, grazing, and/or mowing.
- Maintain migrant loggerhead shrike habitat consisting of at least 1.8 ha (4.45 acre) of usable foraging habitat, in which short grassy areas are within 18 m (59 ft) of an elevated perch, per every 10 ha of total habitat.

3.7.9.3.2. Upland Sandpiper

- Maintain large unfragmented areas > 500 ha (1235 acres) totaling at least 1620 ha (4,000 acres) of prime upland sandpiper habitat on a yearly basis within five years of implementation of Midewin land and resource management plan.
- Maintain the prime upland sandpiper habitat with a mosaic of cover between 10 and 30 cm (4 to 12 in) in height.
- Maintain an average yearly population of 123 pairs of upland sandpiper.
- Cooperate and coordinate with state and other Federal agencies to determine a grazing animal stocking rate that will maintain a mosaic of grass heights between 10 and 30 cm (4 - 12 in) tall.
- Provide a low density of fence posts, tree stumps, or rock piles for upland sandpiper display perches within one year of implementation of Midewin land and resource management plan.

3.7.9.4. MONITORING

Yearly monitoring of each species should be implemented. The average height of the grasses should be monitored in each grassland area yearly. Amounts of grassland established and the success of planting should be monitored at least once every 5 years.

3.7.10. Bobolink (Mid-Stature Grassland Birds)

3.7.10.1. AFFECTED ENVIRONMENT

Bobolinks are grassland birds that prefer intermediate grass height. Bobolinks have been declining for various reasons. Bobolinks probably nested in native prairie where the appropriate microhabitat existed. Since the loss of the prairie habitat, bobolinks have adapted to Eurasian grasslands and almost exclusively use this habitat today. Some general threats to this bird are listed below:

Bobolinks are area-sensitive grassland birds, and require grassland tracts exceeding 30-50 ha (75-123 acres) for breeding (Herkert 1997b). Bobolinks prefer grasslands with grass heights of 20-35 cm (8-14 inches), litter depth of 2-4 cm (0.8-1.6 inches), and are exceedingly sensitive to presence of woody species in open grasslands (Herkert 1997b). Heavy or moderate grazing may create grassland conditions unsuitable for bobolinks for the first breeding season following this activity; however, rank grassland with litter depths > 4 cm (> 1.6 inches) and grass heights >40 cm (16 inches) become increasing unsuitable as breeding habitat for this species (Herkert 1997b). Evidence suggests that properly timed burning and hay mowing may have similar (and positive effects), by removal of deep duff or rank vegetation and topkilling of shrubs, resulting in a more homogenous grassland (Dechant et al. 1999).

3.7.10.1.1. Occurrences and Trends At Midewin

It's difficult to determine the historic habitat of the bobolink because we don't know the extent of the mid-stature grasses at Midewin and we don't know the extent of grazing by bison in the past. An estimate is 7,600 acres, see Table 3.21. This estimate is based on 85% of the prairie soils. This is the amount estimated to be mesic to wet/mesic prairie. At Midewin, bobolinks are present as a breeding species in many lightly-grazed pastures, hayfields, and other grasslands that meet the above requirements. Estimated current habitat for bobolinks is 2,396 acres. The total population is unknown, but estimated to be between 800 and 900 birds on a yearly basis.

Bobolinks were probably historically found throughout the Central Till Plains Section, wherever the habitat requirements were met. Neither Illinois nor Indiana Natural Heritage Databases track the bobolink, so it's difficult to known the exact status. Bobolinks are much more rare today than in the past. In the Midwest bobolinks have declined by more than 60% (3.2% per year) since 1966 (Sauer et al. 1997). Recent farm programs have provided some additional habitat within the Central Till Plains Section, yet there are no other populations as large or significant as that found at Midewin.

3.7.10.2. ENVIRONMENTAL CONSEQUENCES

3.7.10.2.1. Direct and Indirect Effects

Potential bobolink habitat was determined by subtracting 4,000 acres for upland sandpipers from the grassland habitat total. Potential habitat amount varies from 2,000 to 6,328 acres; see Table 3.21. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on bobolink populations and habitat and is not expected to result in a loss of species viability.

3.7.10.2.2. Cumulative Effects

Midewin has the largest population of bobolinks within the Central Till Plains Section and with the increase in habitat may become more important. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on bobolink populations and habitat and is not expected to result in a loss of species viability.

3.7.10.3. MITIGATION

The following standards and guidelines have been developed to provide for protection for these populations and habitat.

- Maintain large unfragmented areas > 1,500 acres totaling at least 2,400 acres of prime bobolink habitat on a yearly basis within 5 years of implementation of the Plan.
- Maintain prime bobolink habitat to provide nesting cover that is between 20-35 cm (8-14 inches) high by late May.
- Remove woody vegetation from outside the boundary of tracts maintained for bobolink habitat so that there is no woody edge within 50 m (164 feet) of the boundary of those tracts.
- Maintain litter depth of prime bobolink habitat between 13-28 cm (5-11 inches) in late May through the use of prescribe fire, grazing or mowing.
- Maintain an average yearly population of at least 600 pairs of bobolink, once there is sufficient habitat.
- Plan project and management activities to avoid adverse impacts to bobolink, including but not limited to mowing and prescribe burning. Limit activities that may cause disturbance to nesting pairs and young during the nesting period April 15th to August 15th.

3.7.10.4. MONITORING

Monitor select areas of bobolink habitat on a yearly basis to determine an estimate of the overall population and success or failure of management.

3.7.11. Birds of Tallgrass Prairie

3.7.11.1. AFFECTED ENVIRONMENT

This group of birds consists of Henslow's sparrow (*Ammodramus henslowii*), northern harrier (*Circus cyaneus*) and short-eared owl (*Asio flammeus*. The prefered breeding habitats on Midewin for these three bird species are large grasslands with herbage >20-40 cm (8-16 inches) in height, with significant grass/forb litter accumulation (averaging 3-4 cm [1-1.5 inches] deep). Tallgrass prairie is suitable breeding habitat, as are unmowed hayfields and ungrazed grasslands. Specific threats are listed below.

- Agricultural practices during the breeding season could constitute a direct threat. For instance, when hayfields are mowed, nests may be destroyed, killing either eggs or nestlings.

- High stocking rates of cattle may constitute a direct threat for the Henslow's Sparrow. Grazing management with short-term rotations can be too frequent to allow for sufficient litter buildup and a high density of standing dead vegetation.

- Contaminants constitute a direct threat to the Northern Harrier and possibly the short-eared owl. During the late 1940's to late 1960's, eggshell thinning of 4-24% was detected in harrier eggs collected in Wisconsin, Ontario, Alberta, and British Columbia (Anderson and Hickey 1974). Peak spraying of DDT occurred in central Wisconsin during this period. Behavior was noticeably different and fewer nests were initiated.

- Interactions with people during incubation can constitute a direct threat to the Northern Harrier and Short-eared Owl. Disturbance from humans may cause the female to abandon the nest. Even nest surveys could be a problem. Light recreation does not seem to impact nesting areas but moderate to heavy recreation could (Jim Herkert pers. comm.).

3.7.11.1.1. Henslow's Sparrow

The Henslow's Sparrow is a long-distance migrant songbird that breeds in a variety of grassland habitats with tall, dense grass and herbaceous vegetation. Henslow's Sparrow has declined significantly across its range and can no longer

be considered common anywhere. Preferred breeding habitat for Henslow's sparrow is relatively tall grassland; with standing herbage 40-80 cm (16-31 inches) tall and accumulated litter averaging 3-4 cm (1-1.5 inches) in depth (Herkert 1997c). If prescribed burning, hay cutting, or grazing are used as management tools, such grasslands become unsuitable for nesting by Henslow's sparrow until recovery of grass height and litter, usually one to two growing after management (Herkert 1997c). However, periodic burning may be essential, as maximum use by this species occurs two to five years after burning, with subsequent declines more than five years after burning (Herkert and Glass 1999). Henslow's sparrow is considered an area-sensitive grassland bird, susceptible to fragmentation of habitat; prime breeding habitat is contiguous grassland greater than 55 ha (135 acres) (Herkert 1997c). As invading woody plants reach 2m (6.5 feet) tall, grassland habitat becomes unsuitable for this species (Herkert 1999).

3.7.11.1.2. Northern Harrier

Northern Harrier is a strongly sexual dimorphic hawk of slim body, long wings and tail, and long, slender legs. Northern harriers are an area-sensitive grassland species, requiring a minimum of 30 ha (75 acres) of breeding habitat, but prefer contiguous grassland of more than 60 ha (150 acres); pairs will nest on very small grasslands (~ 25 acres) if they are part of a larger grassland complex (Herkert 1997d). Preferred breeding habitat is open grassland or wetlands with dense herbaceous cover (i.e., ungrazed, unburned, or unmowed), including native prairie (Herkert 1997d). Following a prescribed burn, such grasslands will be unsuitable for nesting by harriers until standing dead and litter cover return to sufficient levels (>20-40% of area) (Herkert 1997d). Northern harriers begin nesting in April (Dechant et al. 2001a); late spring burns may destroy active nests. Since breeding is largely dependent on the abundance of small mammals, factors that effect prey populations may impact this raptor; prescribed burns may cause short-term in small mammal populations, primarily by removing vegetative cover (Beck and Vogl 1972; Birney, Grant, and Baird 1976; Harty et al. 1991).

3.7.11.1.3. Short-eared Owl

Short-eared owls require large tracts of contiguous open habitat for foraging, but areas selected for use vary from year to year. This species is highly nomadic, and its presence or absence is often determined by prey (small rodents) population cycles (Holt and Leasure 1993). Although tall nesting cover may be a requirement for nesting sites, this species has been recorded nesting in crop stubble, shortgrass prairie, and active pastures (Holt and Leasure 1993). Because this species may begin nesting in late March, nests may be vulnerable to prescribed burns conducted in late spring. However, this species will re-nest if the first clutch is destroyed (Dechant et al. 2001b). Prescribed burns may also remove cover required for nesting (USDA-FS 2000o). Since breeding is largely dependent on the abundance of small mammals, factors that effect prey

populations may impact this raptor; prescribed burns may cause short-term in small mammal populations, primarily by removing vegetative cover (Beck and Vogl 1972; Birney, Grant, and Baird 1976; Harty et al. 1991).

3.7.11.1.4. Occurrences and Trends At Midewin

3.7.11.1.4.1. Henslow's Sparrow

Historic Henslow's sparrow habitat at Midewin was estimated at 14,921 acres, see Table 3.21. This estimate was determined by summing the prairie soils and 85% of the hydric soils (non-forest or savanna). The 85% represents the amount of prairie thought to have had taller grasses. This amount may have been less depending upon grazing by bison. There are only occasional breeding season records for Henslow's Sparrow from Midewin; however, since 1996, the number of breeding birds increased to 10-15 pairs in 1999 (W. Glass, pers. obs.). At Midewin, Henslow's sparrows have primarily nested in former pastures that have been taken out the cattle grazing rotation.

3.7.11.1.4.2. Northern Harrier

Historic breeding northern harrier habitat at Midewin was estimated at 14,635 acres, see Table 3.21. This estimate was determined by taking 85% of the prairie soils plus the hydric soils minus the Romeo soils. These soils could provide the necessary height of vegetation for northern harriers. This amount may have been less depending upon grazing by bison. Foraging habitat was estimated to be 16,499 acres. Northern harriers would have foraged over most of the open portions of the site. At Midewin, northern harriers have been observed foraging over most of the grassland areas over the years. Most observations have been during early spring, fall, and winter, and the birds involved appear to be migrants or winter visitors. Northern harriers have nested at the former Joliet Army Ammunition Plant prior to closing, but not in an area now managed by the Forest Service (Bill Glass pers. ob.). It is likely nesting has occurred on Midewin in the past.

3.7.11.1.4.3. Short-eared Owl

Historic breeding short-eared owl habitat at Midewin was estimated at 14,921 acres, see Table 3.21. This estimate was determined by taking the prairie soils plus 85% hydric soils (non-forest or savanna). These soils could provide the necessary height of vegetation for northern harriers. This amount may have been less depending upon grazing by bison. Foraging habitat was estimated to be 16,499 acres. Short-eared owls would have foraged over most of the open portions of the site. Short-eared owls have not been recorded nesting on Midewin, although nesting has been recorded at nearby Goose Lake Prairie SP. Further grassland restoration (both native prairie and/or agricultural grasslands) may be required to ensure regular nesting at Midewin (USDA-FS 2000p). At present, however, short-eared owls occur on Midewin as winter visitors

3.7.11.1.5. Historic Range

3.7.11.1.5.1. Henslow's Sparrow

In recent years, Henslow's sparrows have been found breeding in nineteen locations within the Central Till Plains Section, of which eight are within the Prairie Parklands. The largest, longest established population within the Central Till Plains Section and Prairie Parklands is at Goose Lake Prairie State Park within approximately 10 miles of Midewin (Jim Herkert per. comm.). The other populations tend to be smaller and are missing in some years.

3.7.11.1.5.2. Northern Harrier

In recent years, Northern harriers have been found breeding in thirteen locations within the Central Till Plains Section, of which two populations are within the Prairie Parkland area. All of these locations probably have only sporadic nesting.

3.7.11.1.5.3. Short-eared Owl

In recent years, Short-eared owls have been found breeding in four locations within the Central Till Plains Section; none of these locations are within the Prairie Parklands area. All of these locations probably have only sporadic nesting.

3.7.11.2. ENVIRONMENTAL CONSEQUENCES

3.7.11.2.1. Direct and Indirect Effects

All action alternatives provide prairie and wetland habitat that could serve as nesting habitat and grassland habitat that could serve as foraging area for the northern harrier and short-eared owl (See Table 3.21). All action alternatives will also include varying amounts of unfragmented areas habitat. Unfragmented prairie/wetland habitat will be suitable for nesting areas. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on populations and habitat and is not expected to result in a loss of species viability.

3.7.11.2.1.1. Henslow's Sparrow

Potential Henslow's sparrow habitat for the action alternatives was determined by taking the upland prairie, 85% of the wet prairie and 25% of the grassland habitat. Eight-five percent of the wet prairie and 100% of the upland prairie would be appropriate habitat. Some of the grassland habitat may also be appropriate, if it is being rested from grazing. This habitat ranges from 7,660 acres to 12,105 acres; see Table 3.21.

The species now occupies areas at Midewin that were formerly grazed, but are now in tall grass cover. Patches of this habitat are isolated, but the birds appear able to find and occupy suitable habitat. Populations are increasing, but are still

of relatively low abundance and patchy distribution, and some, but not most populations appear to interact.

3.7.11.2.1.2. Northern Harrier

Potential northern harrier habitat for the action alternatives was determined by taking 85% of the upland prairie soils with the hydric soils minus the Romeo soils. These soils should provide the necessary habitat. Habitat ranges from 5,245 acres to 11,050 acres, see Table 3.21.

3.7.11.2.1.3. Short-eared Owl

Potential short-eared owl habitat for the action alternatives was determined by taking the upland prairie with 85% of the hydric soils (non-forest and savanna). These soils should provide the necessary habitat. Habitat ranges from 7,660 acres to 12,105 acres, see Table 3.21.

This species, unlike the Northern Harrier and the Henslow's Sparrow, will use short grasses, and short grasses were likely to have had a patchy distribution under historic conditions. This habitat distribution would have led to an even more patchy distribution of Short-eared Owls than that of Northern Harriers. These factors make its historic status difficult to assess, and in areas as small as Midewin it may have occurred erratically. Nevertheless, the historic condition provided extensive amounts of prairie, which would have supported a large nesting habitat over the broad scale.

3.7.11.2.1.4. Cumulative Effects

Within in the Central Till Plains, Midewin could provide the most habitat for each of these three species of birds. Midewin could definitely become very important for Henslow's sparrows within the Central Till Plains and Prairie Parklands. Midewin may make a slight difference for northern harriers and possibly a positive impact on short-eared owls in some years. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on populations and habitat and is not expected to result in a loss of species viability

3.7.11.2.1.4.1. Northern Harrier

For the Central Till Plains, the historic habitat condition for Northern Harrier was a large unfragmented prairie; populations were likely widespread, and fluctuated in size depending on prey density. Under current conditions there is very little suitable habitat; the species is rare at the regional level, and the improved conditions provided by Alternatives 2-6 at Midewin would have little effect on Northern Harrier populations at the Central Till Plains scale.

3.7.11.2.1.4.2. Short-eared Owl

For the Central Till Plains, the historic condition for Short-eared Owls was that of a large, continuous prairie which likely supported healthy populations overall, although breeding habitat was patchily distributed, and populations were erratic and of relatively low densities. Under current conditions the population exists at very low to zero density, and is very isolated. The improved conditions provided by Alternatives 2-6 at Midewin were projected to have no effect on Short-eared Owl populations at the Central Till Plains scale.

Midewin National Tallgrass Prairie would have little impact within the Central Till Plains for the Northern harrier and short-eared owl. There might be a slight benefit for the Henslow's sparrow. The larger the amount of appropriate habitat the larger the impact.

3.7.11.3. MITIGATION

The following standards and guidelines have been developed to provide for protection for these populations and habitat.

3.7.11.3.1. Henslow's Sparrow

- Manage at least three tracts of 223 ha (550 acres) minimum for prime Henslow's sparrow habitat, of which no more than one tract may be prescribe burned in any year.
- Maintain prime Henslow's sparrow habitat with a well developed litter layer (> than 3 cm in depth in late May) and minimum woody encroachment.
- Maintain prime habitat for Henslow's sparrow with nesting cover that is between 40-80 cm (16 - 32 in) high in late May.
- Maintain prime habitat for Henslow's sparrow with moderate amounts of residual vegetation containing between 50-80% cover of dead herbaceous vegetation.
- Remove woody vegetation from outside the boundary of tracts maintained for Henslow's sparrow habitat so that there is no woody vegetation on the edge within 50 m (164 ft) of the boundary of those tracts.
- Maintain an average yearly population of at least 65 pairs of Henslow's sparrow.
- Plan project and management activities to avoid adverse impacts to Henslow's sparrow, including but not limited to mowing and prescribe burning. Limit activities causing disturbance to nesting pairs and young during the nesting period April 15th to August 15th.

3.7.11.3.2. Northern Harrier

- Maintain large unfragmented areas > 810 ha (2000 acres) of undisturbed (no grazing, mowing or burning) tallgrass prairie or emergent wetland habitat

with abundant residual cover on a yearly basis within five years of implementation of Midewin land and resource management plan.
- Restrict human activities, including but not limited to management, recreation, and wildlife surveying, within 400 m (1300 ft) of known, active harrier nest.
- Maintain suitable habitat to support a population of 3.5 pairs of northern harrier.

3.7.11.3.3. Short-eared Owl

- Maintain short-eared owl habitat of large, unfragmented areas of at least 200 ha (500 acres) with ungrazed, tallgrass prairie or cool season grasses on a yearly basis within five years of implementation of Midewin land and resource management plan.
- Maintain tracts managed for short-eared owl habitat with herbaceous ground cover between 30 and 50 cm (12 - 20 in) in height.
- Plan project activities to avoid adverse impacts to short eared owls and their habitat. Avoid disturbance of within 400 m (1300 ft) of active, known short-eared owl nests, particularly during nesting and brood rearing periods from April 1 to August 15.
- Manage short-eared owl habitat with fire, grazing, or mowing so that appropriate habitat exists at least one year after management activities.
- Manage short-eared owl habitat on a rotational basis to promote small mammal prey, particularly voles (Microtus spp.).

3.7.11.4. MONITORING

Monitoring of appropriate habitat should be done on an annual basis, as this species is a Management Indicator. Periodic monitoring of Henslow's sparrows should be done at least every five years. Incidental monitoring of northern harrier and short-eared owls should be done as needed.

3.7.12. Prairie Insect Group

3.7.12.1. AFFECTED ENVIRONMENT

Each of these insects are potentially found in typic or dolomite prairie where their host plant is found. Each species has a unique host plant that it's dependent upon for food during a portion of its life cycle. Each host plant species is restricted to typic and/or dolomite prairie habitats (as described above) and dependent upon the health of the prairie community they are found in. These prairie plant species are under various general threats as outlined above. Because of threats to their food plants, each of these insect species is also threatened.

Prescribed burning or wildland fires may result in direct adverse effects. Each of these insects is believed sensitive to prescribed burns, especially if the entire habitat is burned repeatedly. Lack of burning can also result in an indirect adverse effect. Each insect is dependent upon its host prairie plant. The host plants are dependant upon fire to maintain a prairie habitat. If the host prairie vegetation is lost, the insects will also be lost. The effects of prescribed burning can be beneficial or detrimental depending upon the timing of the burn and amount of habitat burned.

Grazing and mowing management activities could have direct and indirect impacts. Direct adverse impacts (killing of the larvae or adults) on or in the vegetation through these management activities could be significant if the activity occurs during the time the insects are above ground. Management activities (grazing and mowing) could impact the host food plants with resulting decreases of the insect populations. Mowing and grazing have been shown to have negative impacts on some prairie plants. There is little information on the impacts of these activities on these particular insects or similar species. Panzer and Bess (1997) mention grazing as a possible adverse impact, yet these species have survived in areas that were grazed for long periods of time. Light grazing and mowing during the dormant season may not be harmful. The impacts of grazing and mowing aren't completely known, and need to be further examined. Domesticated grazers (cattle) may have a greater negative impact on the prairie and wetland vegetation than native grazers (bison and elk) since they didn't co-evolve with the North American grasslands. Grazing could have a beneficial effect by controlling problematic plant species. Depending upon the timing, duration and amount, grazing could be beneficial or detrimental.

Panzer and Bess (1997) suggest that predation may impact *Papaipema* moth larvae. Losses from endoparastic wasps can be extensive, with entire populations wiped out within specific host plant patches (Wyatt 1942). Sources of larval mortality are numerous, and can include predators such skunks, mice and muskrats (Bird 1934). Little is known on the specific predators of the red-veined

leafhopper. Hedge rows, fence lines and woody encroachment in general could have an indirect negative effect due to increasing habitat and travel corridors for predators.

The *Papaipema* moth species are rare and somewhat desired by collectors. Collecting could have an adverse direct effect, but the difficulty of moth detection may protect them. There has been concern expressed about this threat, but hasn't been proven.

3.7.12.1.1. Red-veined Leafhopper

This flightless leafhopper is considered a prairie-restricted insect species (Panzer et al 1995; Panzer 1998). This leafhopper produces two generations annually (R. Panzer, per. comm.); the only known food plant is prairie dropseed (*Sporobolus heterolepis*). This species over-winters in the duff (grass and forb litter of prairies).

3.7.12.1.2. *Eryngium* Root-borer

This moth is considered a prairie-restricted insect species (Panzer et al 1995; Panzer 1998). This species only produces one generation annually; the only known food plant is rattlesnake-master (*Eryngium yuccifolium*, a forb of prairie remnants. The larvae live in the stems and roots or the host plant, the adults are out in early fall.

3.7.12.1.3. Blazing Star Stem-borer

This moth is considered a prairie-restricted insect species (Panzer et al 1995; Panzer 1998). This species only produces one generation annually; the only known food plant is the dense blazing-star (*Liatris spicata*), a forb of wet prairies, fens, and dolomite prairies. The larvae live in the stems and roots or the host plant, the adults are out in early fall.

3.7.12.1.4. Occurrences and Trends At Midewin

3.7.12.1.4.1. Red-veined leafhopper

Historic habitat for the red-veined leafhopper was determined by taking all the upland prairie soils (approximately 8,942 acres, see Table 3.21). This entire area could have supported prairie dropseed where the microhabitat was appropriate and potentially supported the red-veined leafhopper. Currently at Midewin this leafhopper is restricted to Drummond Dolomite Prairie. This site supports scattered populations of prairie dropseed. There's also limited habitat for this species in other areas where a few scattered prairie dropseed plants can be found. Prairie dropseed is also planted for seed production at Seed Production Area. These planted beds were first established in 1998 and are at least three miles from the nearest known site for this leafhopper; it is unlikely that this flightless, conservative prairie insect has been able to colonize these planted sites. The population size at Drummond Dolomite Prairie is presumed to be small

since the entire area is small. The population trend is unknown. This species can be hard to census.

3.7.12.1.4.2. *Eryngium* Root-borer

Historic habitat for the *Eryngium* root-borer was determined by taking 80% of the upland prairie soils and 55% of the wet prairie with the Romeo soils subtracted. The percentages were based up on the % of dry and wet prairie that could support the host food plant. Romeo soils were excluded since they are too shallow to support the host plant. The resulting historic habitat is 11,016 acres, see Table 3.21. This entire area could have supported rattlesnake master where the microhabitat was appropriate and potentially supported the *Eryngium* root-borer. At Midewin this moth is restricted to a prairie remnant along the western boundary. Only a few specimens have been discovered, but these are part of a larger population that is present on adjacent IDNR land (Glass 1994). There is also suitable habitat for this species at a small prairie remnant on the east portion of Midewin; this remnant supports a small population of rattlesnake-master (<80 plants; B. Molano-Flores, pers. comm.). This site has not been surveyed for the *Eryngium* root-borer; however, the food plant population is probably not sufficient to support a persistent population. Rattlesnake-master is also planted for seed production at Seed Production Area; these planted beds were first established in 1997 and are at least two miles from the nearest known site for this moth; it is unlikely that this conservative prairie insect has been able to colonize these planted sites. The population size is presumed to be small since there are few host plants on Midewin. The population trend is unknown.

3.7.12.1.4.3. Blazing Star Stem-borer

Historic habitat for the blazing star stem-borer was determined by taking 80% of the dry/mesic prairie soils and 55% of the wet prairie. The percentages were based up on the percentage of dry and wet/mesic prairie that could support the host food plant. The resulting potential habitat is 11,023 acres, see Table 3.21. At Midewin this moth is restricted to a prairie remnant along the western boundary. Only a few specimens have been discovered, but these are part of a larger population that is present on adjacent IDNR land (Glass 1994). There is also suitable habitat for this species at three small prairie remnants supporting populations of marsh blazing-star. Although specific surveys failed to find the blazing-star stem-borer (Glass 1994), there is a possibility that small populations could persist undetected at any of these three sites. Marsh blazing-star is also planted for seed production at the Seed Production Area; these planted beds were first established in 1997 and are at least two miles from the nearest known site for this moth; it is unlikely that this conservative prairie insect has been able to colonize these planted sites. The population is presumed to be small as the population of host plants at Midewin is small. The population trend is unknown.

3.7.12.1.5. Historic Range

3.7.12.1.5.1. Red-veined Leafhopper

The red-veined leafhopper appears to be a Great Lakes endemic. The actual historic range is unknown, but it's presumed to have been more common than today. The red-veined leafhopper may have been uncommon than it's food plant, which has a distribution outside the Great Lakes area. Today the red-veined leafhopper is known to occur in a few scattered populations from Illinois north into Canada (Ron Panzer, pers. comm.) The red-veined leafhopper is only currently known from four populations within the Central Till Plains Section and all four are within the Prairie Parklands area. One large prairie remnant contains a large population, while the population size of the others is unknown, but is presumed to be small, since they are located on smaller remnants and have fewer host plants. Each population is completely or partially in public ownership. The portions in private ownership are presently under management agreements with public agencies, therefore all populations within the Central Till Plains Section have some degree of protection.

3.7.12.1.5.2. *Eryngium* Root-borer

The *Eryngium* root borer was probably historically found throughout the Tallgrass Prairie where its larval food plant was found (USDA Forest Service 2000q). It's currently known from widely scattered populations in Illinois, Arkansas, Oklahoma, and Kentucky. Within the Central Till Plains the *Eryngium* root-borer is only known from nine locations. All of these populations are within the Prairie Parklands area. Two of the populations are quite large and apparently stable. The size of the other populations is unknown, but presumed to be small, since they are located on smaller remnants and have fewer host plants. The population at Midewin is a part of one of the large populations. Four of the populations are completely or partially in public ownership (the portions in private ownership are under a management agreement). These populations have some degree of protection. Five populations are completely in private ownership and have no protection.

3.7.12.1.5.3. Blazing Star Stem Borer

The blazing star stem borer moth was probably found throughout the Tallgrass Prairie region where it's larval food plant was found. Within the Central Till Plains the blazing star stem borer is only known from four locations. All of these populations are within the Prairie Parklands area. Three of the populations are quite large and apparently stable. The size of the other population is unknown, but presumed to be small, since this prairie remnant is smaller and has fewer host plants. The population at Midewin is a part of this smaller population. All of these populations are in public ownership and thus have some degree of protection.

3.7.12.2. ENVIRONMENTAL CONSEQUENCES

3.7.12.2.1. Direct and Indirect Effects

All existing prairie remnants at Midewin would be protected, managed and restored in all the action alternatives. Prairie restoration of degraded former prairie and reconstructed old fields and agricultural land is planned at Midewin in various amounts depending upon the action alternative. The minimum amount of prairie restoration would be 4,142 acres (upland prairie and wet prairie/wetland). Each of the three host plant species is a common prairie plant and will be a normal component of the prairie restoration and reconstruction. The more prairie restoration, the more habitat for these insect species and greater benefit. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on populations and habitat and is not expected to result in a loss of species viability

3.7.12.2.2. Red-veined Leaphopper

Potential habitat was determined by taking upland prairie soils and dolomite prairie soils.

3.7.12.2.3. *Eryngium* Root-borer Moth

Potential habitat was determined by taking 80% of the upland prairie soils and 55% of the wet prairie soils minus the Romeo soils. The resulting acreage should provide the microhabitat for the food plant.

3.7.12.2.4. Blazing Star Stem-borer Moth

Potential habitat was determined by taking 80% of the upland soils and 5% of the wet prairie soils. These soils should provide the appropriate microhabitat habitat for the food plant.

3.7.12.2.5. Cumulative Effects

Overall Midewin has apparently small populations of each of these prairie insects, but because of the rarity of these insects the populations at Midewin maybe important. With the addition of prairie restoration and reconstruction acreage, Midewin could become more important within the Central Till Plains Section. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on populations and habitat and is not expected to result in a loss of species viability.

3.7.12.3. MITIGATION

The following standards and guidelines have been developed to provide for protection for these populations and habitat.

- Maintain and enlarge existing prairie habitat for each of the insect species.
- Consider restoration of prairie communities in formerly disturbed areas and include the specific host plant for each insect species as a component where appropriate.
- Manage no more than 1/3 of each species habitat for prescribed burn in any one year.
- Consider reintroducing each species into restored prairie habitat once the appropriate host plant is established.

3.7.12.4. MONITORING

Monitoring of these species can be difficult. Periodic monitoring for presence on host plants should be done. Monitoring of host plant numbers should also be done on a regular basis.

3.7.13. Ellipse

3.7.13.1. AFFECTED ENVIRONMENT

The ellipse is a freshwater mussel found in clear, small to medium-sized streams in gravel or mixed sand and gravel, in riffles or runs with a swift to moderate current. The ellipse is dependent upon clear clean streams and will be impacted by general threats to stream water quality and habitat (i.e. point source pollution, non-point source pollution and siltation) as outlined above in the section on Water Quality. The ellipse, like all freshwater mussels are vulnerable to extirpation from exotic species. Zebra mussels (*Dreissena polymorpha*) are a severe threat if they get into streams with the ellipse. Loss of fish host species or restriction of fish host movement by structures such as dams is a threat. Domesticated animals with access to streams can threaten mussels due to trampling.

3.7.13.1.1. Occurrences and Trends At Midewin

The historic habitat is estimated to be 10 miles of streams; this is assuming that the ellipse was also found historically in Prairie Creek. The ellipse is presently only known from Jackson Creek. A 3.3 mile stretch of Jackson Creek runs through Midewin. Although ellipse mussels have been found along this stretch, they aren't common and the population is unknown.

3.7.13.1.2. Historic Range

Although historically the ellipse was probably found throughout the Central Till Plains Section, today it's primarily found in the middle portion of the Section. Since the ellipse isn't formally listed as threatened or endangered in Illinois or Indiana, the overall population trend isn't known with any certainty, but this species like many freshwater mussels may be declining.

3.7.13.2. ENVIRONMENTAL CONSEQUENCES

3.7.13.2.1. Direct and Indirect Effects

All action alternatives would protect and manage the streams within Midewin to improve the water quality and stream habitat to the extent possible. Factors outside Midewin will impact the streams and may not allow Midewin to reach the stated goals of improving the quality of the streams. Each action alternative would treat the streams equally. Domesticated animals would be fenced out of streams in all action alternatives.

The amount of stream miles within Midewin isn't going to change, but the quality may improve with subsequent improvement in ellipse populations. Ellipse isn't currently found within Jackson Creek. As stream restoration proceeds, Prairie Creek may also provide habitat for the ellipse. All action alternatives will provide the same amount of potential habitat; 10 miles (see Table 3.21). Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on populations and habitat and is not expected to result in a loss of species viability.

3.7.13.2.2. Cumulative Effects

The population and status of the ellipse within the Central Till Plains Section, Prairie Parklands, and within the Jackson Creek drainage isn't known with any precision. Midewin is thought to have a small population because it has only a small portion of Jackson Creek. The current population is probably not very significant, but contributes to the overall population in Jackson Creek. With the restoration of Prairie Creek and if the ellipse becomes established, the importance of Midewin within the Central Till Plains Section will increase. Implementation of the Prairie Plan standards and guidelines is expected to prevent any adverse effects on populations and habitat and is not expected to result in a loss of species viability.

3.7.13.3. MITIGATION

The following standards and guidelines have been developed to provide for protection for these populations and habitat.

- Degraded riparian areas will be restored to native vegetation and protected.

3.7.13.4. MONITORING

There are no good monitoring techniques for small populations of freshwater mussels such as found at Midewin. Jackson Creek should be examined periodically for live ellipse mussels. The water quality of Jackson Creek should be monitored as an indicator for the possible health of the stream for the ellipse. Jackson Creek should also be periodically checked for exotic species, specifically Zebra mussels.

3.8. *MANAGEMENT INDICATORS*

3.8.1. INTRODUCTION

This section documents the choices for selecting Management Indicators and Management Indicator Species to be considered for the Midewin Prairie Plan.

For the Prairie Plan, Management Indicators are defined as "plant and animal species, communities, or special habitats selected for their emphasis in planning, and which are monitored during forest plan (in this case, Prairie Plan) implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent" (FSM 2620.5, WO amendment 2600-91-5). Management indicators provide a means of monitoring and evaluating the effects of actions on biotic resources, including specific species, communities, habitats, and interrelationships among organisms. By selecting a limited but appropriate set of Management Indicators, inventory and monitoring efforts can be focused where needed.

We "select management indicators that best represent the issues, concerns, and opportunities to support recovery of federal listed species, provide continued viability of sensitive species, and enhance management of wildlife and fish for commercial, scientific, subsistence, or aesthetic values or uses" (FSM 2621.1). Given the direction in ILCA and Will County's socioeconomic setting, we did not consider commercial or subsistence values or uses. We used the following methods to select management indicators:

1. We considered all Federal-listed, State of Illinois-listed, and sensitive species that are known or are likely to occur on Midewin.

2. We considered species and ecological conditions most likely to indicate the effects of management.

3. We solicited suggestions and reviewed potential management indicator species, consulting experts from Federal and State agencies, and from educational, research, and private organizations. This was done as part of the Population Viability Assessment (PVA) conducted on 1 and 2 November 2000, in Champaign Illinois.

4. We considered species and ecological conditions of high public interest identified through the scoping process and public comments received while developing the Prairie Plan and individual projects.

Thirty-one Federal-listed, State-listed, and sensitive species were evaluated first. All but two were rejected as management indicators for diverse reasons. These reasons include limited seasonal presence (prairie insects), restricted natural range on site (mussel and certain plants), extreme fluctuations in population size caused by year-to-year climatic differences (many plants), adverse impacts on wintering grounds (grassland birds), and difficulty in monitoring (prairie insects, reptiles, amphibians).

Most of the analysis focused on species (and groups of species) considered most likely to provide indication of the effects of management. Many of these species were considered to be dominants or indicators of specific native vegetation communities (White and Madany 1978) or plant associations (Natureserve 2000) either present on or likely to be restored on Midewin. Other species (and groups of species) considered included birds considered specific to certain types of habitat structure (Brawn 1998) and aquatic organisms (Carr et al. 1986). These approaches present certain problems. Most native plant species lack specificity within prairie habitats on Midewin; others had extremely narrow requirements that result in very limited distribution. Many grassland, savanna, and forest bird species were considered unreliable indicators because of their vulnerability to impacts occurring on migration or within their wintering range. Other species were considered vulnerable to extreme population fluctuations resulting from annual variations in climatic conditions, such as timing, amount, and distribution of precipitation.

Additionally, selection of individual species as management indicators appears contrary to the focus of restoration and management at Midewin, and there were concerns that focusing on single species (or small groups of species) would not be sufficient to capture the success (or lack thereof) of these activities. For example, focusing on one MIS for dolomite prairie would not capture the importance of nectar sources throughout the growing season for maintaining a diverse range of insect pollinators. Monitoring specific pollinators for success would be difficult, because of the seasonality and difficulty of monitoring and identifying pollinators.

Another example that illustrates the difficulty of selecting single species as MIS is the native wetland vegetation (wet prairie, sedge meadow, marsh) that are often a mosaic of 2-4 dominant species, each of which forms extensive stands largely exclusive of other characteristic species. Monitoring MIS for these wetlands would require tracking at least six plant species. Similar problems were encountered with other habitats.

The concept of indicator species has been used widely and critiqued in management activities (Landres et al. 1988). As discussed by Landres (1988), the idea of indicator species is a relatively old concept (Hall and Grinnel 1919) and is intuitively pleasing because management for many species may be

simplified and made more cost-effective by considering only a small group of indicator species. Unfortunately, as further discussed by Landres et al. (1988), the implicit assumption in using indicator species is that habitat quality maintained for the indicator will be suitable for other species. Because these assumptions fail on both conceptual and empirical grounds, Landres et al. (1988) suggest, "this approach should be avoided." Neimi et al. (1997) found that the use of and monitoring MIS in the Cheqamegon National Forest with a large database was not useful and recommend that monitoring be focused on key habitat types instead of a few "representative" species.

For these reasons, we focused on using ecological conditions or selected vegetation communities as management indicators (see Table 3.22). We selected a few species or species groups that would detect effects of restoration and management, and combined with input on data collected from Threatened, Endangered, and Regional Forester sensitive species, would enable us to monitor the relative success and failure of management actions. We recognize the limitations that the selected biota or ecological conditions may have indicating the effects of resource management activities. However, using management indicators will provide a measure of quality and quantity of restoration and management on Midewin. Such knowledge provides the capacity to adjust management practices to preserve and facilitate the biological integrity of existing and restored habitat and communities on Midewin, and to ensure that potentially detrimental activities or projects are conducted or designed in an environmentally sensitive manner. We selected common conditions that could be applied across many management indicators, and could be easily sampled by following established transects or using spatial information. These types of management indicators allow us to make effective use of likely staffing and budgets. For species (or groups of species) we will rely on population estimates or, for benthic macroinvertebrates, an index of diversity.

Information concerning species (and groups of species) evaluated as potential MIS are included in the official planning records; this information is available for public review at the Prairie Supervisor’s Office.

Table 3.22: Management Indicators and associated species of interest..

Management Indicators	Species of interest or other conditions associated with the management indicators.
Dolomite Prairie	Tufted hair grass, flattened spikerush, low calamint, prairie dropseed, nodding wild onion, Butler's quillwort[1,4], false mallow[1,4], Pitcher's stitchwort[1,5], leafy prairie clover[2,4], red-veined prairie leafhopper[1,4]
Upland Typic Prairie	Prairie dropseed, shooting-star, rattlesnake master, *Eryngium* stem-borer moth[1,4], compass plant, prairie gentian, pale purple coneflower, Henslow's sparrow[1], red-veined prairie leafhopper[1,4]
Wet Typic Prairie	Prairie cordgrass, eastern prairie fringed orchid[3,4], chimney crayfish, common snipe, marsh phlox, prairie sundrops
Sedge Meadow	Tussock sedges, bluejoint grass, sora, common snipe
Marsh	Common bur-reed, river bulrush, great bulrush, marsh wren, least bittern[1,3], pied-billed grebe[4], sora, amphibians (breeding habitat)
Seep	Skunk cabbage, spotted Joe-pye weed
Savanna	Bur oak, red headed woodpecker, wild hyacinth
Woodland/Forest	White oak, red oak, American hazel, wild ginger, eastern wood peewee, red eyed vireo
Short-stature Grassland Habitat	Upland sandpiper[1,4], loggerhead shrike[1,5], grasshopper sparrow, thirteen-lined ground squirrel
Medium-stature Grassland Habitat	Bobolink[1], eastern meadowlark, savannah sparrow, smooth green snake
Tall-stature Grassland Habitat	Henslow's sparrow[1,4], northern harrier[1,4], sedge wren
Benthic Macroinvertebrates	Stream quality, orange-throated darter, slender madtom, northern hogsucker, ellipse[1], creek heelsplitter, smallmouth bass
Leafy prairie clover[2,4]	Mesic dolomite prairie
Henslow's sparrow[1,4]	Prairie management indicator
White-tailed Deer	Demand species, may have adverse impacts on certain native plants

[1]Regional Forester's Sensitive Species
[2]Federal Endangered Species
[3]Federal Threatened Species
[4]Illinois Endangered Species
[5]Illinois Threatened Species

3.8.2. AFFECTED ENVIRONMENT

Using management indicators provides information to the decision-maker because changes in their abundance, quality, or distribution and their population changes are believed to indicate the effects of management activities.

One of the goals for managing Midewin is to provide habitat to maintain viable populations well distributed throughout the planning area (36 C.F.R. §219.19, 1982). Analyzing the location and distribution of the selected management indicators will allow us to determine how each alternative meets these requirements.

The concept of “well distributed” is based on the species’ natural history and historical distribution, the potential distribution of its habitat, and recognition that habitat and population distribution are likely to be dynamic over time. It is most easily defined for broadly distributed species that occur across the landscape. For such species, a well-distributed pattern is one in which the species is either evenly distributed across the species range, or distributed in a pattern that allows dispersal of individuals or propagules among local populations that are distributed throughout the landscape. For other species, such as local endemics or those tied to naturally scarce or spatially disjunct habitats, a definition of well distributed must be developed reflecting the inherent constraints on the distribution of the species. It should not be expected that management on units of the National Forest System, including Midewin National Tallgrass Prairie, would provide broadly- or evenly-distributed habitat for all species. Appropriate standards for species are based on their life history requisites (home range size, dispersal capability, effect of habitat on dispersal, seasonal movements, etc.), historical distribution, potential habitat distribution and current condition.

The Prairie Plan is being developed following the guidance in the National Forest Management Act (NFMA) implementing regulations first published in 1982 and the Illinois Land Conservation Act. As noted previously, the scientific basis for the requirements for management indicators species has shifted. New planning regulations were developed and adopted in November 2000. Both the new and the old versions of the rule retain essentially the same requirement to maintain viability of all native and desirable non-native species within the planning unit. The new rule added an ecological system approach that focuses on ecosystem integrity to complement the 1982 rule focus on species viability.

The new NFMA regulations allow and encourage the use of surrogate species and species groups in evaluating viability for species-at-risk in some but not all situations. The regulations specify that functional, taxonomic, or habitat-based groups of species may all be used. Provisions for using individual surrogate species are adopted under the term “focal” species. The regulations clarify that focal species used to evaluate viability represent ecological conditions that provide for viability, and that it is not expected that the population dynamics of a focal species would directly represent the population dynamics of another species. This distinguishes the focal species concept from the concept of management indicator species (MIS) in the 1982 regulations. The 1982 regulation stipulated that MIS would be selected to indicate population dynamics of other species. This concept was widely criticized (Landres et al. 1988) because field studies demonstrated that species using the environment in very similar ways could experience markedly different population trends.

Our analysis includes both approaches. Our analysis included the categories of species in both sets of regulations and we have fully considered species (and groups of species) considered to be most likely to indicate the effects of

management. Many of these species were considered to be dominants or indicators of specific native vegetation communities (White and Madany 1978) or plant associations (Natureserve 2000) either present on or likely to be restored on Midewin. Other species (and groups of species) considered included birds considered specific to certain types of habitat structure (Brawn 1998) and aquatic organisms (Carr et al 1986).

The new NFMA regulations acknowledge “where species are inherently rare or not naturally well distributed in the plan area, plan decisions should not contribute to the extirpation of the species from the plan area and must provide for ecological conditions to maintain these species considering their natural distribution and abundance” (36 C.F.R. §219.19). Appropriately applying the requirement that conditions be provided in a well-distributed pattern across the species’ range also has the effect of providing for conservation of populations that are at the edge of the range, in addition to populations at the core of the range (Channell and Lomolino 2000; Lesica and Allendorf 1995).

Conservation assessments were drafted for each of the Regional Forester Sensitive Species that occur on Midewin. A panel of experts reviewed these assessments. A panel of experts also provided an analysis related to the effects of the alternatives on each of those species. Further information regarding the species viability evaluations for those species is found in the Threatened, Endangered, and Sensitive Species section and Appendix A of this FEIS.

Summary information about the historic, current, and desired future conditions for management indicators are found in the following sections of this document: Biodiversity; Vegetation; Threatened, Endangered, and Sensitive Species; Wildlife; and Invasive Species. More complete descriptions of the restored native vegetation communities and grassland habitats as desired future conditions are found in Appendix A, Prairie Plan.

3.8.2.1. Description of Resource

Most habitats are described in greater detail elsewhere in this document. Fire suppression, poor grazing management, and encroachment have degraded nearly all examples of native vegetation by woody plants, and invasion by non-native species, and hydrologic alterations. Specific requirements for leafy prairie-clover and Henslow’s sparrow are discussed under Threatened, Endangered, and Sensitive Species.

A. Dolomite Prairie -- Approximately 120 acres of dolomite prairie on Midewin; restoration of approximately 230 acres has been initiated.

B. Upland Typic Prairie -- Approximately 4 acres of upland typic prairie on Midewin; restoration of approximately 80 acres has been initiated.

C. Wet Typic Prairie -- Approximately 26 acres of wet typic prairie on Midewin; restoration of approximately 465 acres has been initiated.

D. Sedge Meadow -- Approximately 20 acres of sedge meadow on Midewin; restoration of approximately 55 acres has been initiated.

E. Marsh -- Approximately 58 acres of marsh on Midewin; restoration of approximately 32 acres has been initiated.

F. Seep -- Approximately 0.6 acres of seep on Midewin; no restoration initiated.

G. Savanna -- Approximately 25 acres of savanna on Midewin; no restoration initiated.

H. Woodland and Forest -- Approximately 150 acres of woodland and forest on Midewin; no restoration has been initiated.

I. Short-stature Grassland Habitat -- Approximately 2800 acres of agricultural grasslands available as grassland bird habitat. Approximately 50% is maintained as short-stature grassland habitat through livestock grazing and brush mowing.

J. Medium-stature Grassland Habitat -- Approximately 2800 acres of agricultural grasslands available as grassland bird habitat. Approximately 20% is maintained as medium-stature grassland habitat through low-intensity livestock grazing, hay-cutting, and brush mowing.

K. Tall-stature Grassland Habitat -- Approximately 2800 acres of agricultural grasslands available as grassland bird habitat. Approximately 30% is maintained as tall-stature grassland habitat through periodic mowing. An additional 150 acres of native prairie vegetation are also available as grassland bird habitat; many of these exist as inclusions within ungrazed agricultural grasslands.

L. Benthic Macroinvertebrates -- This is a group of invertebrate species that live on the bottom of streams; included are the aquatic larvae of certain insects (mayflies, stoneflies, caddisflies, dobsonflies, damselflies, midges, etc.), snails, worms, freshwater mussels, crayfish, leeches, and other invertebrates. Unlike fishes, they are relatively immobile within this habitat, and thus are good indicators of local stream conditions (Illinois River Watch 1997). Each species within this group has different tolerances to pollution. Thus the composition of macroinvertebrate samples can indicate the ecological health of a stream.

The Illinois RiverWatch program uses four measures to determine stream quality: taxa richness; sample density; macroinvertebrate biotic index (MBI); and percent composition by specific taxa. Taxa richness measures the abundance of different

types of organisms (mayflies, snails, etc.) as determined by the total number of taxa represented in a sample. Taxa richness increases with water quality, habitat diversity and habitat suitability increases. Sample density estimates the total number of organisms collected from a stream site after subsampling. Nutrient-rich water tends to have a high density while polluted waters tend to have a low density.

The MBI was developed by the Illinois EPA to detect organic pollution such as sewage. This biotic index is determined from the number of organisms identified by pollution tolerance rating, expressed as a numerical value. The index ranges from <6 to >9, with <6 rating indicating good water quality, 6.0-7.5 indicating fair water quality, 7.6-8.9 indicating poor water quality, and >9 indicating very poor water quality. Percent composition by macroinvertebrate taxa reflects stream quality. Streams with high percentages of mayflies and stoneflies are considered in good health. Those having high percentages of midge larvae and aquatic worms are considered in poor health (Illinois RiverWatch 1997).

M. Leafy Prairie-clover -- Leafy prairie-clover is listed as Endangered by both the USFWS and the Illinois Endangered Species Protection Board (1999). One of five extant populations in northeastern Illinois occurs on Midewin; a portion of this population also occurs on adjacent private land. This population has ranged between 130-180 individual plants since monitoring began in 1998, shortly after the population was discovered (October 1997). Leafy prairie-clover is now restricted to dolomite prairie habitat in Illinois, and occurs under specific soil moisture levels (mesic and wet-mesic).

N. Henslow's Sparrow -- Henslow's sparrow is a Regional Forester Sensitive species, and is listed as Endangered by the Illinois Endangered Species Protection Board (1999). Henslow's sparrows breed sporadically in Illinois; local populations winter the Southeastern United States.

Henslow's sparrow is an area-sensitive grassland bird, with a significant drop in use of grasslands as area drops below 100 acres. Henslow's sparrow uses both native prairie habitat and agricultural grasslands as breeding habitat; the management regime determines suitability. Henslow's sparrow has specific habitat requirements, requiring relatively tall grasses and dead standing vegetation, with relatively deep litter. Because of these requirements, Henslow's sparrow is sensitive to use of fire as a management tool. However, if the habitat is not periodically burned, then Henslow's sparrow use gradually declines (Herkert and Glass 1999); thus Henslow's sparrow can be an indicator of sufficient management frequency in tall-stature grassland habitats.

O. White-tailed Deer -- White-tailed deer are included because of their status as a game species in Illinois. Because of its location (northeastern Illinois), Midewin offers hunting of this species in a region where deer hunting is usually restricted

due to conflicts between high human population density and public safety. Visitors to Midewin may appreciate the presence of white-tailed deer for observation.

White-tailed deer negatively impact native vegetation, by selectively browsing certain shrubs (American hazel) or inflorescences and seedheads of certain forbs (leadplant, culver's-root, Michigan lily, downy sunflower) (Nelson, 2000). Deer population size and density can also adversely impact human health and safety, either as traffic hazards or as vectors for disease-carrying ticks.

White-tailed deer use most of the vegetation types at Midewin, including croplands, agricultural grasslands, native vegetation remnants, and successional vegetation. Deer are fairly widespread and often conspicuous on Midewin; deer hunting is allowed, in accordance with state regulations, on a limited portion of Midewin west of Illinois Route 53 and south of Prairie Creek.

3.8.2.2. Cause and Effect Relationship/Resource Pressures and Responses

Important impacts on management indicators are discussed in detail in the Biodiversity, Vegetation, Wildlife, Threatened, Endangered, and Sensitive Species, Wetlands and Aquatic Resources, and Invasive Species sections of this document. Impacts to management indicators will have corresponding effects on the conditions monitored, whether they are population measures, habitat structure, or species diversity, or management indicators and management indicator species. Monitoring these indicators will allow the staff at Midewin to determine the health of the communities and effectiveness of management.

3.8.2.3. Midewin National Tallgrass Prairie – Historical Context

The description of the area of analysis and reviews of past actions that have impacted the selected management indicators can be found in the above referenced sections of this document.

3.8.2.4. Cumulative Effects Area – Historical Context

The geographic area considered in this analysis is the Central Till Plains Section, as described by Keys Jr. et al. (1995). The Central Till Plains Section and reviews of relevant past actions are described the above referenced sections of this document.

3.8.3. ENVIRONMENTAL CONSEQUENCES

3.8.3.1. Direct and Indirect Effects

3.8.3.1.1. Midewin National Tallgrass Prairie

Actions described in the Biodiversity, Vegetation, Wildlife, Threatened, Endangered, and Sensitive Species, Wetlands and Aquatic Resources, and

Invasive Species sections are also relevant for management indicators. The common actions can be reviewed in the appropriate sections.

3.8.3.2. Cumulative Effects

Numerous uncontrollable actions may impact these management indicators. Other sections of the FEIS review all relevant impacts. These are the same as for the management indicators.

3.8.3.3. Effects Analysis

3.8.3.3.1. Midewin National Tallgrass Prairie

3.8.3.3.1.1. Alternative 1

Only limited management and certain ongoing projects will take place under Alternative 1 (the no action alternative). For seeps, savannas, and woodlands and forests, the existing amount of acreage will remain the same. Some dolomite prairie, upland typic prairie, wet typic prairie, sedge meadow, and marsh will be restored, so the acreages of these habitats will expand. However, these habitats are expected to degrade over time, because management will be restricted to few types of actions, such as mowing. Conditions that measure native species diversity, seasonal flowering diversity, and habitat structure should show declines.

All three existing grassland habitats should remain the same, with continued management of 2800 acres of agricultural grasslands. The structure and relative amount of short, medium, and tall stature grasslands will be maintained.

The leafy prairie-clover population is expected to decline under Alternative 1, as a consequence of habitat degradation. Encroachment by non-native plants and increasing herbivory from white-tailed deer are likely to adversely impact this species.

The response of benthic macroinvertebrates may not differ strongly from the action alternatives, as 8400 acres of land will be allowed to revert to permanent cover. This reflects the reduction in runoff and potential sheet erosion from agricultural lands. However, on-site events that degrade water quality may occur spontaneously, such as tile blowouts and soil erosion under dense stands of exotic shrubs. Because of increased woody cover and biomass, there may also be less water contributed to streams; decreased stream flow from Midewin lands will probably have adverse impacts on certain benthic macroinvertebrates.

Under Alternative 1, the Henslow’s sparrow population will probably increase temporarily as many successional habitats become suitable. However, in the

long term, these successional grasslands will disappear as they become invaded by shrubs and trees. Eventually, only 850-1200 acres of habitat (agricultural grasslands, restored prairie, and existing prairie remnants) will exist, but much of these will not be prime habitat, because of habitat fragmentation. Small numbers of Henslow's sparrows will probably continue to breed on Midewin, but these are likely to be satellite colonies of the larger population at nearby Goose Lake Prairie State Park.

White-tailed deer are likely to increase under Alternative 1. The limited amount of hunting, and increased woody growth will benefit deer for the short term. There will probably be negative impacts on certain native plants that are preferred browse species. The deer population may increase until it comes close to carrying capacity; loss of understory browse and winters of high snowfall will be the only limiting factors.

3.8.3.3.1.2. Action Alternatives (2, 3, 4, 5, and 6)

Each action alternative has the potential to affect the management indicators differently, depending upon the amount of each natural community restored, type of management, and degree of development. The Vegetation Section indicates the final acreage of different habitat types per alternative. Native plant species diversity should increase over time. Species composition will also change over time (e.g., invasive non-native species will be replaced by later successional species), but this shouldn't change by alternative. Many of the expected and characteristic upland typic prairie, wet typic prairie, sedge meadow, savanna, marsh, seep, woodland and forest species are currently found at Midewin, although there are some species missing. These missing species will be re-established in the restoration, but may reappear in existing native prairie remnants following management. There may be some minor differences in species diversity between alternatives. Population sizes of species of interest (Table 3.22) and all characteristic species should correspond to the amount of habitat type restored per alternative. Species of interest (Table 3.22) should increase in population with time, as restoration proceeds.

The only difference among alternatives is the location of trails. If the proximity of multi-use trails or the presence of hiking-only trails affects these habitats, the habitats should be monitored for threats and percent cover by native species.

3.8.3.3.2. Dolomite Prairie

All action alternatives restore the maximum amount of dolomite prairie possible as determined by appropriate soils (1380 acres). With plan implementation the amount of dolomite prairie will increase to 1380 acres over time. Some plant species that are now rare are likely to increase; characteristic species that are now absent may be re-established. Species diversity should not change across action alternatives

3.8.3.3.3. Upland Typic Prairie

The amount of upland typic prairie restored will vary from 2670 acres to 5930 acres depending upon the alternative. Alternatives 5 and 6 will take the longest, with Alternative 2 requiring the shortest amount of time to restore. Alternative 2 restores the least amount of upland typic prairie on the outwash plain and therefore, may have slightly lower species diversity. As full forb diversity is restored, there should be sufficient amounts of forbs flowering throughout the growing season to support adequate populations of insect pollinators.

3.8.3.3.4. Wet Typic Prairie

The amount of wet typic prairie restored will vary from 1940 acres to 3730 acres depending upon the alternative. Alternatives 5 and 6 will take the longest, with Alternative 2 requiring the shortest amount of time.

Alternatives 2 and 3 would likely have slightly lower species diversity than 4, 5, and 6. As full forb diversity is restored, there should be sufficient amounts of forbs flowering throughout the growing season to support adequate populations of insect pollinators.

3.8.3.3.5. Sedge Meadow

The amount of sedge meadow restored will vary from 230 acres to 440 acres depending upon the alternative. Alternatives 5 and 6 will take the longest, with Alternative 2 requiring the shortest amount of time. Alternative 2 has only slightly more than half the amount proposed under Alternatives 5 and 6.

3.8.3.3.6. Marsh

The amount of marsh restored will vary from 115 acres to 220 acres depending upon the alternative. Alternatives 5 and 6 will take the longest to restore, with Alternative 2 requiring the shortest amount of time. Alternative 2 has only slightly more than half the amount proposed under Alternatives 5 and 6.

The proportion of open water to dense emergent vegetation, along with water depth at critical seasons, will determine use by bird and amphibian species of special interest. These factors cannot be determined at present without detailed hydrological studies. Despite this difficulty, it can be safely assumed that the more marsh restored, the more appropriate habitat there will be for species of interest.

3.8.3.3.7. Seep

The amount of seeps that can be restored is difficult to determine, because they are often small (<0.1 acre) and produced by an interaction of topography, geology, and hydrology that cannot be easily detected Also, once they have been eliminated by diversion into drainage structures, the remaining indicators may be nearly impossible to detect. The estimates per alternative in Table 3.17, are based on the proportional amounts of native restoration, from >2.5 acres

(Alternative 2) to >10 acres (Alternatives 5 and 6). Alternatives 5 and 6 will take the longest, with Alternative 2 requiring the shortest amount of time to restore. Because of the previously mentioned difficulties in determining the potential for seeps under any action alternative, the total amount of seeps will probably be somewhat larger than the estimate.

The native plant species diversity of seeps will also increase over time. Although many of the expected and characteristic seep species are currently found at Midewin, many species are missing. These missing species will be re-established in the restoration, but may reappear in existing seeps following management. Some species may require redevelopment of specific substrates in seep soils before re-establishment; this may require decades.

Alternative 2 has only one quarter of the amount proposed under Alternatives 5 and 6. The different configurations of restoration between alternatives may also affect potential species diversity, as landscape diversity will effect seep diversity. Most potential seeps in Alternative 2 will occur within wooded habitats (savanna, woodland, and forest); there will be increasing amounts of seeps in prairie habitats under alternatives 3, 4, 5, and 6.

3.8.3.3.8. Savanna

The amount of savanna restored does not vary much between the action alternatives. Alternative 2 proposes to restore 485 acres, while the other action alternatives propose restoration of 490 acres. Here the limiting factor is growth of canopy trees, not potential acreage. The existing 25 acres of savanna will reach desired conditions first, because the tree canopy is intact; restoration of understory structure and species diversity will take longer. Where savanna restoration will begin from cropland or agricultural grassland, development of canopy structure may require 40-80 years of tree growth. Native plant species diversity of savannas will increase over time, but prairie forbs and grasses are likely to predominate until canopy trees mature. Some expected and characteristic savanna species are currently found at Midewin, but many species have been extirpated (mostly plants). There may be effects caused by adjacent land allocation (visitor facilities, agricultural grassland, or native prairie) that may affect species diversity. As full forb diversity is restored, there should be sufficient amounts of forbs flowering throughout the growing season to support adequate populations of insect pollinators. As the understory is restored in existing savannas, an increase is expected for summer and fall-flowering forbs. In savannas being restored on agricultural lands, the spring-flowering component should increase as the trees mature, and they will be slight declines in summer and fall- flowering forbs. Savannas are often considered an ecotone between prairie and woodland, so there are relatively few species restricted to savannas.

3.8.3.3.9. Woodland and Forest

The amount of woodlands and forests to be restored only varies by five acres among alternatives. As for savannas, it will require time to restore the amount proposed under each alternative; again, the limiting factor is growth of canopy trees, not potential acreage. The existing 150 acres of woodlands and forests will reach desired conditions first, because the tree canopy is intact; restoring understory structure and species diversity will take longer, but these communities do retain significant amounts of their herbaceous flora. Where woodland and forest restoration will begin from cropland or agricultural grassland, development of canopy structure may require 40-80 years of tree growth. Native plant species diversity of woodlands and forests will increase over time, but sun-loving forbs and grasses are likely to predominate until canopy trees mature. Most expected woodland and forest species are currently found at Midewin, but some species have very small populations or have been extirpated (mostly plants, but also some birds). These rare species are expected to increase as existing habitat is restored, then stabilize until additional habitat develops, then undergo additional increases.

Adjacent land allocation (visitor facilities, agricultural grassland, or native prairie) may affect species diversity. As full forb diversity is restored, there should be sufficient amounts of forbs flowering throughout the growing season to support adequate populations of insect pollinators, although woodlands are expected to be richer in summer-flowering species than forests. As the understory is restored in existing woodlands and forests, an increase is expected for summer and fall-flowering forbs. For woodlands and forests being restored on agricultural lands, the spring-flowering component should increase as the trees mature, and they will be slight declines in summer and fall-flowering forbs.

3.8.3.3.10. Short-stature Grassland Habitat

The amount of short-stature grassland varies from 1,923 acres (alternatives 5 and 6) to 8,328 acres (Alternative 2). Alternative 2 will take the longest, with Alternatives 5 and 6 requiring the shortest amount of time. Habitat structure will not vary between action alternatives; species diversity will probably not vary from existing short-stature grassland habitat. Over time, it is possible that increasing numbers of native species (both animals and plants) may be found in this habitat, but since the vegetation will be agricultural grassland dominated by non-native cool-season grasses, native plant species diversity is not a concern. Eventually, land managers at Midewin may learn to manage native prairie to produce short-stature grasslands, and the acreage will increase and overlap with native prairie habitat. Several other grassland birds that require short-stature grasslands do not breed at Midewin, but might in the future if sufficient habitat is restored. With a decrease in fragmentation and increased amounts of short-stature grassland habitats, there should be larger populations of short-stature grassland dependant species and species of interest, such as the upland sandpiper (Table 3.22).

3.8.3.3.11. Medium-stature Grassland Habitat

The amount of medium-stature grassland varies from 2,000 acres (Alternatives 5 and 6) acres to 6,328 acres (Alternative 2). Alternative 2 will take the longest, with Alternatives 5 and 6 requiring the shortest amount of time. Habitat structure will not vary between action alternatives; species diversity will probably not vary from existing short-stature grassland habitat. Over time, it is possible that increasing numbers of native species (both animals and plants) may be found in this habitat, but since the vegetation will be agricultural grassland dominated by non-native cool-season grasses, native plant species diversity is not a concern. Eventually, land managers at Midewin may learn to manage native prairie to produce medium-stature grasslands, and the acreage will increase and overlap with native prairie habitat. Several other grassland birds that require medium-stature grasslands do not breed at Midewin, but they may in the future if sufficient habitat is restored. With a decrease in fragmentation and increased amounts of medium-stature grassland habitats, there should be larger populations of medium-stature grassland dependant species and species of interest, such as the bobolink (Table 3.22).

3.8.3.3.12. Tall-stature Grassland Habitat

The amount of medium-stature grassland varies from 7,660 acres (Alternative 2) acres to 12,105 acres (Alternatives 5 and 6). Alternatives 5 and 6 will take the longest, with Alternatives 2 requiring the shortest amount of time. Habitat structure will not vary between action alternatives; species diversity will increase from existing tall-stature grassland habitat, as most habitat will eventually be tallgrass prairie. In the short term, some agricultural grassland may be managed to produce this habitat until they are restored to prairie. Over time, increasing numbers of native species (both animals and plants) may be found in this habitat, but these will monitored as indicators. Several other grassland birds that require tall-stature grasslands do not breed at Midewin, but they could in the future if sufficient habitat is restored. With a decrease in fragmentation and increased amounts of tall-stature grassland habitats, there should be larger populations of tall-stature grassland dependant species and species of interest, such as Henslow’s sparrow (Table 3.22).

3.8.3.3.13. Benthic Macroinvertebrates

The amount and management of perennial stream habitat for these species does not change between action alternatives. Instead, the RiverWatch protocols provide a way to gauge the rate of progress towards goals and objectives for stream restoration. As water quality increases, it may be possible to see an increase in the species of interest (Table 3.22) and an increase in the total native species diversity in streams. Some extirpated species may be able to re-colonize from the Kankakee River, or introduction programs may be possible. However, the ability of land managers to restore the streams on Midewin will be affected by off-site impacts higher in the watersheds.

Another difference between alternatives that may affect benthic macroinvertebrates will be the location of trails. If the location, configuration, types of use, or illegal use is having impacts on streams, then these activities should be detectable through use of both the Illinois RiverWatch protocol and general monitoring for threats.

3.8.3.3.14. Leafy Prairie Clover

Leafy prairie clover should benefit equally under all action Alternatives (2, 3, 4, 5, and 6), as they all propose restoring the same amounts of habitat. The existing population should increase, and previously unknown populations may reappear under appropriate management. New populations may be established through introduction into suitable, restored habitat. Demographic monitoring, when used with management history, should allow for identifying and adjusting management actions. Detection of threats is also necessary to prevent adverse impacts from browsing animals and illegal, off-trail use.

3.8.3.3.15. Henslow's Sparrow

Henslow's sparrow would be expected to increase under all action alternatives. The population will probably expand as suitable habitat becomes available through restoration. Alternatives 5 and 6 are expected to provide the greatest amount of unfragmented habitat; Alternative 2 the lowest. Alternatives 3 and 4 provide intermediate amounts, but because of reduced amounts of potential disturbance (trails and facilities), would probably support a larger population. Because this species is sensitive to fire management, it will not occupy all restored prairie and/or tall-stature grassland habitat; thus, larger amounts of habitat (Alternatives 4, 5, and 6) will result in a greater likelihood of a stable breeding population.

3.8.3.3.16. White-tailed Deer

White-tailed deer use most of the plant community types on Midewin. Conversion of croplands and successional woody vegetation to prairies, wetlands, and grasslands, plus restoration of existing natural communities will have impacts on white-tailed deer. The gradual reduction and elimination of row crops will remove one potential food source (young crop plants and waste grain), while concurrent restoration activities will provide increased browse for deer in existing and restored native vegetation. There will be removal of fencerow, successional woodland, and shrubland vegetation (approximately 1200 acres); these habitats provide some cover and browse, but many shrublands and successional woodlands are largely devoid of browse. This removal will be offset by concurrent restoration of native woody communities, including savanna, woodland, and forest habitats (at least 900 acres).

There will be differences between action alternatives because the amounts of natural community restoration and grassland habitat vary by alternative. Agricultural grassland habitat, by having fewer woody and forb species, provides

less browse for white-tailed deer than restored prairie. However, many deer forage heavy in agricultural grassland habitats during spring and fall, often grazing on young growth of grasses and clovers. Alternatives with the most natural community restoration and reconstruction (5 and 6) would be able to support more white-tailed deer and the population may increase.

Many actions not covered in this plan will also affect white-tailed deer. If the area available for hunting increases, then there will be effects on deer population and movements. Location and intensity of recreation use may also have affects on deer, both directly (disturbance) and indirectly (conflicts between uses may reduce areas available for hunting). Off-site actions, such as land use changes, will also have impacts on the deer population.

Because white-tailed deer can have a negative impact on prairie vegetation, specific native plant species, and the seed production beds, it is desirable to reduce deer populations when they threaten ecological sustainability.

Monitoring deer populations, hunter success, user conflicts, and adverse impacts (threats) to other resources should allow balanced management.

3.8.3.4. Summary of Effects

All action alternatives (Alternatives 2 through 6) provide for improvement over the current condition for all species and conditions associated with these Management Indicators. The only possible exception may be white-tailed deer, which may decline slightly under some or all action alternatives (based on habitat changes). Alternatives 2 and 3 may have the greatest decline. However, declines in the deer population may have positive effects on other Indicators and their associated species groups. More likely, there will no effect, because deer are relatively common around Midewin.

These benefits for the indicators and their associated species groups would not occur under Alternative 1, or would be small and probably temporary. Among the serious adverse effects to management indicators would be the eventual loss of many populations associated with prairie and grassland ecosystems. Alternative 1 might result in a temporary increase in White-tailed deer on Midewin.

All action alternatives provide a significant increase for species associated with dolomite prairie habitat, including the leafy prairie-clover.

There will be similar positive effects under all action alternatives for species associated with savannas, woodlands and forests, seeps, and intolerant benthic macro-invertebrates. Some of these positive effects, however, will not be realized for decades.

Alternatives 5 and 6 will provide the greatest benefits for species associated with typic prairie and associated wetlands, tall-stature grassland bird habitat, and Henslow's sparrow. Under these conditions, these associated species can increase, and there will be increased populations and individuals for interaction. Additional species associated with these groups can colonize or be re-established at Midewin. Species associated with short-stature and medium-stature grassland habitat will be able to increase, but there is probably insufficient habitat for long-term viability of some grassland bird species. Some species in this last group may become extirpated from Midewin.

Alternative 2 provides the greatest benefit for species associated with short-stature and medium-stature grasslands. Under these conditions, these associated species can increase and maintain viable populations. Additional species associated with these groups can colonize or be re-established at Midewin. Species associated with typic prairie and associated wetlands, tall-stature grassland bird habitat, and Henslow's sparrow will be able to increase, but there is probably insufficient habitat for long-term viability of other species. More mobile species, such as Henslow's sparrow, will be able to interact with populations on nearby prairie preserves as a meta-population, but less mobile species may not have sufficient habitat to maintain viability.

Alternatives 3 and 4 both provide a more even balance between the two groups of species (short-stature and medium-stature grasslands versus. typic prairie and associated wetlands, tall-stature grassland bird habitat, and Henslow's sparrow). Additional species associated with both groups will have increased potential for colonizing or being re-introduced at Midewin. Alternative 4 provides better conditions for both species groups at Midewin, in part because reduced impacts from facilities and trails. Because short-stature and medium-stature grassland habitat can be established fairly rapidly, the associated species can be brought up to viable levels well within the planning period.

3.8.3.5. Cumulative Effects

Cumulative effects for these indicators have been discussed in detail in other sections of this document. In general, all action alternatives provide for improved conditions for all species and conditions associated with these Management Indicators in the Central Till Plain Section (CTPS) over the current condition. The only possible exception may be white-tailed deer, for which Midewin may not have any significant impact, since this species is common throughout the CTPS.

These benefits for the CTPS would not occur under Alternative 1 (no action). Among the serious adverse effects would be the eventual loss of one of only five extant populations of leafy prairie clover in Illinois, and the associated species of the rare dolomite prairie community. Alternative 1 would not have significant impacts on White-tailed deer in the CTPS.

All action alternatives provide a significant increase for species associated with dolomite prairie habitat, including the leafy prairie-clover.

The positive effects that Midewin will provide for species associated with savannas, woodlands and forests, seeps, and intolerant benthic macroinvertebrates, will be similar under all action alternatives, and will be small, but significant within the CTPS.

Alternatives 5 and 6 will provide the greatest benefits for species associated with typic prairie and associated wetlands, tall-stature grassland bird habitat, and Henslow's sparrow. Under these conditions, these associated species can increase, and perhaps interact with populations on adjacent and nearby public and private land. Species associated with short-stature and medium-stature grassland habitat will be able to increase, but there is probably insufficient habitat for long-term viability; there may not be sufficient adjacent habitat for these species to maintain meta-populations.

Alternative 2 provides the greatest benefit for species associated with short-stature and medium-stature grasslands. Under these conditions, these associated species can increase and maintain viable populations. Some of these species may be able to colonize nearby habitat if it becomes available, and establish larger meta-populations in the CTPS. Species associated with typic prairie and associated wetlands, tall-stature grassland bird habitat, and Henslow's sparrow will be able to increase, but there is probably insufficient habitat for long-term viability of some species. More mobile species, such as Henslow's sparrow, will be able to interact with populations on nearby prairie preserves as a meta-population, but less mobile species may not have sufficient habitat to maintain viability.

Alternatives 3 and 4 both provide a more even balance between the two groups of species (short-stature and medium-stature grasslands vs. typic prairie and associated wetlands, tall-stature grassland bird habitat, and Henslow's sparrow). Alternative 4 provides better conditions for both species groups at Midewin, in part because reduced impacts from facilities and trails, it should have slightly higher benefit for the CTPS.

3.8.4. MITIGATION

The mitigation measures stated in the Prairie Plan standards and guidelines are sufficient to reach the goals and objectives of the desired conditions (restoration of the tallgrass prairie ecosystem, including the important disturbance factors of fire and grazing; protection, management, and enhancement of existing native vegetation; protection, restoration, and management of aquatic and wetland resources; establishment and management of sufficient grassland bird habitat; and restoration and management of ecologically accurate natural vegetation on

appropriate sites). These standards and guidelines are presented in the Prairie Plan under the headings for Ecological Sustainability (especially under Threatened and Endangered species, Sensitive Species, Species Restoration, Seed Provenance, Noxious Weeds and Invasive Plant Species, Native Vegetation Remnants, Aquatic and Wetland Resources, Habitat Restoration, and Wildlife) and Recreation and Interpretation (General Standards and Guidelines, Trails). Reaching the desired conditions will also require that sufficient monitoring and law enforcement be used in concert to detect and prevent actions counter to the goals and objectives.

3.8.5. MONITORING

The trends and amounts of management indicators provide the basis to evaluate the results of plan implementation (Committee of Scientists report, USDA 1999). Table 3.23 shows the Management Indicators and selected elements/conditions to be monitored. In addition, trends for sensitive species, native vegetation remnants, and invasive species will be monitored using a variety of techniques including: population sampling/counting, spatial parameters, using trend indicators, and studies to develop better population-habitat inferences.

The most useful monitoring information provides insights into relations between management actions and selected species or their habitats (Noon et al. 1999b). However, collecting information on cause and effect is often impractical due to our lack of knowledge about a species, the difficulty in monitoring it, its rarity, or the long lag time between activities and biological responses (Montgomery 1995). The primary purpose of monitoring species-at-risk and their habitats is to determine whether management actions need to be modified. Threshold values of each indicator should be established that would trigger a review of management (Committee of Scientists 1999). For most indicators, a precise threshold value is not realistic, and it may be more meaningful to specify a range of expected values that reflects the dynamic nature of ecosystems (Noon et al. 1999b).

Evaluation of viability, which has been the primary focus of many former efforts, then becomes a check on how well the objective for viability has been met. Many options are available for conducting these evaluations, but the choice of technique for most species will be severely constrained by limited availability of data. As a consequence, high levels of uncertainty will be associated with findings about species viability. This necessitates substantial focus on the collection of information through monitoring programs, and on the potential need for frequent changes in management direction to respond to that new information.

Table 3.23. Management Indicators/Ecological Conditions and selected elements to be monitored.

Management Indicators of Concern/Interest	Condition Indicator/Feature to be monitored											
	Native Plant Species Diversity	Seasonal Flowering Diversity	Relative cover of Native Herbs	Total Area of Habitat on MNTP	Size of Unfrag-mented Tract	Number of Shrubs >1.5m tall / ha	Tree Canopy Closure (%)	Graminoid height (cm) taken in June	Litter depth (cm) taken in Apr-May	RiverWatch Stream Quality Protocol	Demo-graphic Monito ring	Threats
Dolomite Prairie	+	+	+	+		+						+
Upland Typic Prairie	+	+	+	+		+						+
Wet Typic Prairie	+	+	+	+		+						+
Sedge Meadow	+		+	+		+						+
Marsh	+		+	+								+
Seep	+		+	+		+						+
Savanna	+	+	+	+		+	+					+
Woodland/Forest	+	+	+	+	+	+	+					+
Short-stature Grassland Habitat				+	+	+		+	+			+
Medium-stature Grassland Habitat				+	+	+		+	+			+
Tall-stature Grassland Habitat				+	+	+		+	+			+
Benthic Macro-Invertebrates										+		+
Leafy prairie-clover				+							+	+
Henslow's sparrow				+							+	+
White-tailed Deer											+	+

3.9. *NOXIOUS WEEDS AND INVASIVE SPECIES*

3.9.1. INTRODUCTION

Invasive species can be defined as organisms that are present in an environment in which they were not naturally present, and threaten biodiversity, habitat quality and ecosystem functions (Westbrooks 1998). Although often used in reference to non-native or exotic species, this definition can also be expanded to include native organisms that have colonized or increased in certain habitats or natural communities following human-related perturbations. Specifically, for Midewin, we are considering "invasive species" to be native and non-native organisms that threaten resource management, viability of native species, pose a threat to human health and safety, or damage investments.

Within this broad definition, we can recognize four subgroups based on their regulatory status and impacts: Noxious Weeds and Exotic Weeds; Exotic, Non-native, Alien, or Non-indigenous Species; Invasive Species; and Pests.

3.9.1.1. ***Noxious Weeds and Exotic Weeds*** are legally defined. Federal noxious weeds are designated by the USDA Animal and Plant Health Inspection Service (APHIS), which is empowered by the Plant Protection Act to prevent the spread of non-indigenous weeds into and through the United States. Other non-indigenous organisms of concern to APHIS include insects, plant diseases, animal diseases, mollusks, nematodes, and weeds. None of the plants species on the APHIS list occur in Illinois; most are tropical species that are not present (yet) within the conterminous USA.

The state of Illinois have statutes dealing with noxious weeds and exotic weeds. The Illinois Noxious Weed Law (505 ILCS 100/) requires landowners to control the spread of and eradicate noxious weeds. "Noxious weeds" are defined as "any plant which is determined by Director of the Illinois Department of Agriculture, the Dean of the College of Agriculture of the University of Illinois, and the Director of the Agricultural Experiment Station at the University of Illinois, to be injurious to public health, crops, livestock, land or other property". These species are listed below in Table 3.24:

Table 3.24 - Noxious weeds of Illinois

Common Name	*Scientific Name*	Present on Midewin?
Common Ragweed[1]	*Ambrosia artemisiifolia*	Yes
Giant Ragweed[1]	*Ambrosia trifida*	Yes
Marijuana, Hemp	*Cannabis sativa*	No
Musk Thistle, Nodding Thistle	*Carduus nutans*	Yes
Canada Thistle, Field Thistle	*Cirsium arvense*	Yes
Perennial Sowthistle	*Sonchus arvensis* (includes *Sonchus uliginosus*)	Yes
Sorghum-almum	*Sorghum almum*	No
Johnson Grass	*Sorghum halapense*	Yes

[1] Both ragweeds are considered noxious only within the corporate limits of cities, villages, and incorporated towns; Midewin does not lie within any corporate limits.

The Illinois Exotic Weed Act (525 ILCS 10/) makes it "unlawful for any person, corporation, political subdivision, agency or department of the State to buy, sell, offer for sale, distribute or plant seeds, plants, or plant parts of exotic weeds without a permit issued by the Department of Natural Resources". Exotic weeds are defined as "plants not native North America, which, when planted either spread vegetatively or naturalize and degrade natural communities, reduce the value of fish and wildlife habitat, or threaten an Illinois endangered or threatened species". Three species are designated exotic weeds under this act, Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), and purple loosestrife (*Lythrum salicaria*). Multiflora rose and purple loosestrife both occur on Midewin, although purple loosestrife is very rare and several small infestations have been manually removed. Multiflora rose is locally common in pastures, fencerows, and shrublands throughout Midewin.

3.9.1.2. ***Exotic, Non-native, Alien, or Non-indigenous Species*** are non-native organisms that now exist as wild, self-sustaining populations outside of their natural ranges. This includes species that were introduced for a specific purpose (*e.g.*, game animals, biological control of pest species, ornamental shrubs) or organisms that arrived as stowaways with imported soil, livestock, seeds, or ballast water. If these organisms are able to adapt to a new conditions, they may thrive in the absence of predators or pathogens. These exotics often species have life-history characteristics that allow for fast growth and high reproductive potential (Westbrooks 1999). Not all exotic species become management problems, but some cause billions of dollars in economic and resource damage on an annual basis (National Invasive Species Council 2001).

3.9.1.3. ***Invasive Species*** threaten natural resources and biodiversity. These are species, which, because of human actions, are freed from predation, pathogens, competition, or other limiting factors. An obvious example consists of any species introduced outside of its natural habitat, which may include pathogens, predators or other factors keeping populations in check. Less obvious are native species that may undergo population increases because of predator

extirpation or fire suppression. For example, certain native woodland shrubs become abundant invaders of prairie vegetation as a consequence of long-term fire suppression. In both cases however, the invaders often initiate further changes to habitats, by changing vegetation structure, species composition, and altering other ecosystem functions, such as fire frequency (Westbrooks 1999).

3.9.1.4. ***Pests*** cause damage to investments and may also threaten human health and safety. Examples include rodents infesting buildings, insects and rodents damaging stored seed, disease-carrying ticks, and dermatitis-causing plants hanging over a trail.

3.9.2. AFFECTED ENVIRONMENT

3.9.2.1. Non-native (Exotic) Plants

This category includes plants that are not likely to be indigenous to Midewin, based on past knowledge of the vegetation of northeastern Illinois. For the most part, these are species introduced from outside of North America, primarily from Europe and eastern Asia. Many of these plants were imported as minor crops, ornamental plantings, medicinal or dye plants, livestock forage, erosion control, or as food or cover for game species. Not all non-native plants are management problems; of the estimated 600 vascular plant species on Midewin, approximately 160 species (25%) are non-native; only 67 species are considered threats to vegetation and habitat restoration and management (Appendix C, Table 1).

Non-native plants often dominate the modern landscape of Midewin. All agricultural crops grown on site originated elsewhere, either in Europe (oats, wheat), eastern Asia (soybeans), or elsewhere in the Americas (maize, garden sunflower). The predominant plants in agricultural grasslands are cool-season grasses native to temperate Europe and western Asia, including “Kentucky” bluegrass (*Poa pratensis*), redtop (*Agrostis alba*), smooth brome (*Bromus inermis*), tall fescue (*Festuca aruninacea*), and clovers (*Trifolium* spp.). The common shrubs and forbs in these grasslands are often not native to Midewin and environs, including multiflora rose, Osage orange, autumn-olive, teasel, dandelion, Canada thistle, chicory, and wild carrot.

The existing native vegetation on Midewin is often heavily infested with non-native plant species. Remnants of dolomite prairie often contain Canada bluegrass, common St. John’s-wort, common mullein, and sweet clover. Natural wetlands are being invaded by reed canary grass, although another serious invader, purple loosestrife, is not yet well established. Nearly all native woodlands and forests on Midewin contain large stands of Amur honeysuckle, white mulberry, and garlic mustard.

Roadsides, abandoned fields, and other successional lands on Midewin are often dominated by non-native plant species. Exotic shrubs are especially abundant at

some localities, where there are impenetrable thickets of autumn-olive, Amur honeysuckle, white mulberry, Osage-orange, and multiflora rose.

Not all non-native plant species at Midewin are abundant and widespread; some are extremely localized, perhaps because of recent colonization (e.g., leafy spurge, purple loosestrife). Other species are unable to spread far beyond their original introduction, and are restricted largely to abandoned home sites, such as orange daylily, white poplar, lilacs, and fruit trees.

These categories also include some species native in North America or even Illinois, but not at Midewin; deliberate introductions or unintentional movement of seeds or other propagules has extended their ranges. Osage orange is native to the southern Great Plains. A few non-native species on Midewin are slightly outside of their natural range, with natural populations occurring within 25-250 miles. These species include western catalpa (*Catalpa speciosa*), black locust (*Robinia pseudo-acacia*), eastern gama-grass (*Tripsacum dactyloides*), and rough-leaved dogwood (*Cornus drummondii*). Common reed (*Phragmites australis*) is problematic in this regard; there are native populations in northern and central Illinois, but the aggressive strains posing management problems in wetlands appear to be of European origin (Marks, Lapin, and Randall 1994).

3.9.2.2. Native Plants

Native invasive plants are species that, although indigenous to Midewin and immediate vicinity, pose threats to management and restoration of native vegetation and grassland habitat (Appendix C, Table 2). Where fire suppression or other disturbance of ecological processes has occurred, these plants can aggressively invade other types of native vegetation. The best examples are the woody plants that invade prairie communities, specifically green ash, gray dogwood, hawthorns, smooth sumac, and sandbar willow. Where natural wetlands receive runoff from agricultural lands, cattails or other invasive natives may replace a diverse assemblage of sedges and other graminoids.

Some native species present on Midewin have become management problems in restoration projects in northern and central Illinois. Tall goldenrod can become dominant in prairie restorations and suppress both grass and forb species diversity. Similarly, early dominance by certain warm-season grasses (big bluestem, Indian grass, switchgrass) may lead to a decline in numbers of forbs.

A few native plants on Midewin may cause localized human health and safety problems. These are plants that may cause allergic reactions or dermatitis, such as poison ivy, ragweeds, and nettles.

3.9.2.3. Non-native Animals

A small but important component of the fauna of Midewin and environs consists of species that are not native to the region. Although many of these animals were imported to provide benefits, such as certain game species, biological control organisms, and domestic animals, others were imported unintentionally, arriving in shipped goods, ballast water, and through casual releases. Although most of these animals were released at several places, others originate from one importation, and have since spread throughout the continent.

Some of these non-native animals that are now present at Midewin include house sparrow (*Passer domesticus*), European starling (*Sturnus vulgaris*), ring-necked pheasant (*Phasianus colchicus*), feral pigeon (*Columba livia*), European honeybee (*Apis mellifera*), Japanese beetle (*Popillia japonica*), multicolored ladybird beetle (*Harmonia axyridis*), cabbage butterfly (*Pieris rapae*), European skipper (*Thymelicus lineola*), Chinese praying mantis (*Tenodera aridifolia sinensis*), common carp (*Cyprinus carpio*), Asiatic clam (*Corbicula* sp.), Eurasian earthworms (Lumbricidae), brown rat (*Rattus norvegicus*), and house mouse (*Mus musculus*) and free-roaming domestic cats (*Felis cattus*).

A few non-native animals originate elsewhere in North America, but are now present on Midewin, such as rusty crayfish (*Orconectes rusticus*), and house finch (*Carpodacus mexicanus*). The rusty crayfish is currently spreading through the streams on Midewin; it was restricted to the Jackson Creek in 1993, but had reached the Grant Creek watershed by 1998 (M. Redmer, pers. comm.).

3.9.2.4. Native Animals

This category includes native animals have greatly increased in abundance because of human activities; in certain cases, this increase has had far-reaching consequences on ecosystem processes or on populations of other native organisms, sometimes affecting their viability. This includes certain generalist predators and scavengers, including crows (*Corvus brachyrhynchus*), ring-billed gulls (*Larus delawarensis*), grackles (*Quiscalus quiscalus*), and raccoons (*Procyon lotor*). The brown-headed cowbird (*Molothrus ater*) is another native species in which recent increases have had a deleterious impact on certain songbirds, because the cowbird is a brood parasite.

Other native animals, however, can be pests under specific circumstances. Native rodents and insects may occasionally infest buildings or damage plants. Few native animals on Midewin pose direct threats to human health and safety; certain insects (wasps, bees, flies, mosquitoes) and ticks are the fauna most likely to have adverse impacts on humans.

3.9.2.5. CAUSE AND EFFECT RELATIONSHIPS/RESOURCE PRESSURES AND RESPONSES

3.9.2.5.1. *The following actions have the strongest impacts on all invasive species:*

1. Destruction of existing habitats and vegetation creates new opportunities for range expansion and population for many invasive species.
2. Long-distance transportation of materials, livestock, seeds, and other commodities creates opportunities for long distance dispersal and colonization by invasive species.
3. Disturbance of vegetation and soils creates opportunities for colonization by certain invasive plants.
4. Transportation corridors create dispersal routes for invasive species.
5. Conscious management and introduction of invasive species by humans for perceived or real benefits may lead to range expansions or population increases in invasive species.
6. Control or eradication of certain species (large herbivores, large predators) may lead to expansion or increases in invasive species.
7. Human disruption of suppression of ecological processes may lead to expansion by invasive species into new habitats. For example, long term fire suppression in prairie and savanna vegetation usually leads to an increase in woody plants, including hawthorns, autumn-olive, common buckthorn, and Asiatic bush-honeysuckles (*Lonicera* spp.). This invasion can change the character of vegetation (shading out of important fuel species), increasing the difficulty of resuming the process (periodic fires). Drainage of graminoid-dominated wetlands may lead to invasion by woody species, which alter conditions through shading, allelopathy, or water uptake. These changes may allow further invasions by additional species.
8. Some species may not become invasive until other interacting organisms are also present. For example, the spread of non-native buckthorns (*Rhamnus* spp.) in northeastern Illinois begins around the arrival of the European starling. The starling feeds heavily on fruits during the fall, and is likely to be a major dispersal agent for the seeds of non-native shrubs (Taft and Solecki 1990).
9. Humans may attempt to directly control populations of invasive plants and animals through a variety of techniques (chemical, cultural, biological, mechanical). Because most invasive organisms are fast growing, have high reproductive rates, and are good at long-distance dispersal, permanent control or eradication is often difficult or impossible.
10. Humans may attempt to control invasive species through other management activities, such as ecosystem restoration and management. This includes the replanting of appropriate vegetation, re-introduction of ecological processes (fire frequency, ungulate grazing, hydrological functions) that may give less invasive organisms a “competitive edge”.

11. Large scale changes, such as climatic warming or atmospheric pollution, may lead to ecological changes that benefit certain invasive species.

3.9.2.5.2. *Invasive species may impact their environment in many ways. Some of these are positive, others adverse; a few species may have both types of effects, depending on the ecological context.*

1. Some invasive species can have direct economic or other benefits to humans, such as introduced game animals and ornamental plants; however, these species can also have adverse impacts on indigenous fish, wildlife, and plants.
2. Some invasive species may provide alternative food or habitat for wildlife when natural habitats are lost. For example, grasslands dominated by non-native grasses and legumes provide suitable breeding and foraging habitat for grassland birds. However, these same non-native grasses and legumes are considered undesirable in native prairie remnants.
3. Biological control organisms can provide a cost-effective means of controlling pest or weed species. However, some biological control organisms can have unanticipated side effects. For example, the parasitic fly *Comspilura concinnata* was introduced to the USA to control another non-native insect, the gypsy moth (*Lymantria dispar*). However, this fly is not host-specific and has had a tremendous adverse impact on native silkworm moths. (Saturniidae), leading to local declines and extirpation (Boettner et.al. 2000).
4. Many invasive species can cause economic losses, such as weeds infesting croplands, unpalatable plants infesting pastures, or zebra mussels clogging intakes for water treatment and power generation plants.
5. As invasive species increase, they can change habitat and vegetation structure, leading to:
   a. changes in fire frequency and intensity;
   b. lowered native species diversity;
   c. population declines in desired species because of loss of food plants or habitat change;
   d. changes in hydrology and nutrient cycling; and
   e. increased erosion.
6. Certain invasive species directly compete with desired species, for food, nutrients, water, and habitat.
7. Invasive species may disrupt interactions between species, such as between co-adapted pollinators and flowers.
8. Certain invasive species may disrupt important life stages of desired species; for example, brood parasites (cowbirds) may have an adverse impact on the nesting success of certain forest-interior passerines.
9. Invasive species may cause declines or extirpation in populations of desired organisms through increased predation or herbivory.
10. Invasive organisms may cause declines or extirpation in populations of desired organisms because they act as reservoirs or vectors for pathogens and parasites. Some pathogens and parasites also act as invasive species, especially when introduced to new regions. For example, the Asian tiger lily

(*Lilium lancifolium*) serves as a reservoir for lily-mosaic virus; native lilies are highly susceptible to this non-native pathogen (Liberty Hyde Bailey Hortorium 1976).
11. Invasive species may threaten human health and safety.
12. The presence of invasive species may complicate or prevent certain resource management actions, such as prescribed burning, livestock grazing, or hay cutting.
13. Attempts to control invasive species may require increased investments in labor and capital, and may detract from other projects.

In many cases, the adverse impacts from any invasive species is often a combination of one or more of the effects listed above, and the interactions between these effects may lead to more severe impacts than anticipated.

3.9.2.6. Midewin National Tallgrass Prairie – Historical Context

3.9.2.6.1. Definition of area

Midewin National Tallgrass Prairie occurs near the northern boundary of the Central Till Plains Section, approximately 12 miles (19.5 km) south of the southern margin of the Southwestern Great Lakes Morainal Section. For the Prairie Plan, this area includes approximately 16,840 acres (6,850 ha).

3.9.2.6.2. Past Actions – Historical Context, Range of Variability, and Trends

Historically, the landscape of Midewin was 86% prairie, with the remainder being "timber" (probably savannas, woodlands, and forests), and "swamps" (perhaps deep marshes, seeps, or floodplain forests). The predominant vegetation consisted of herbaceous, perennial plants (grasses, forbs, sedges); woody plants were restricted to sloping areas along streams and other sites where topography and natural firebreaks allowed the development of woodlands, forests, and savannas. The distribution of animal life followed similar patterns; species able to adapt to the open prairie were widespread, while those depend on woody cover were localized.

Competition, predation, herbivory, and pathogens regulated populations of all organisms. Stochastic events, such as fire or severe weather, could lead to short-term declines or increases in some species. Long-term trends, such as climatic change, would cause changes in vegetative cover and individual species' abundance and distribution. New species (both plants and animals) would arrive gradually through migration and range expansion, in some cases leading to changes in ecosystem functions. However, the local establishment of "new" species might be dependent on natural disturbance or climatic fluctuation. Some native plants, often annuals or biennials, were dependent on naturally disturbed sites, such as eroding bluffs, windthrown trees, animal burrow mounds, and gravel bars for habitat. A few plant species were dependent on soil disturbance

created by Native Americans on around village sites. Native Americans may have brought some of these plants to the area.

By the middle 1800's, Euro-American settlement of the area near the confluence of the Des Plaines and Kankakee rivers had begun. Farmsteads were established on the area that is now Midewin. Prairie vegetation was plowed for conversion to crop fields, and native prairie was used for livestock pasture and as a source of hay. Timber was cut in prairie groves and savannas for buildings, fences, tools, and firewood. Groves were also used as pastures and as sources of maple syrup. Most large animals (bison, elk, black bear, cougar, wolf) were hunted to local extinction, either for as a source of food, or because they threatened livestock or crops. Roads were built, and served to enhance suppression of prairie fires. The Euro-American settlers brought some non-native plants and animals, primarily crop plants (for food, medicines, and dyes) and livestock. However, they were also accompanied by other organisms that had impacts on the native biota, including pets, ornamental plants, honeybees, European earthworms, and agricultural weeds. Invasive plants, including many non-native species, which arrived in soil or straw with imported plants and livestock, quickly colonized the soils disturbed by settlement. Other invasive species followed roads westward.

The human population grew over the next century, and so did the number of non-native organisms. Over ninety percent of all native vegetation was gone by 1900; the most common native plants became those species pre-adapted to highly disturbed conditions, such as ragweeds, horseweed, and evening-primrose. Non-native grasses and legumes were introduced to improve pastures and hayfields, including bluegrasses, redtop, timothy, reed canary grass, alfalfa, and clovers. Prairie fires were halted effectively by roads, railroads, ditches, and plowed fields that acted as firebreaks. Trees (both native and non-native species) were widely planted for shade, hedgerows, ornament, and windbreaks. Osage-orange was widely planted as a living fence during the middle 1800's, but these hedgerows were abandoned with the arrival of barbed wire (McClain *et.al.* 1999). Most of the woody plants introduced for ornamental plantings were from Europe, but with increasing numbers from eastern Asia.

By the 1950's, non-native plants were the dominant species in roadsides, hayfields, and pastures; even the weeds in crop fields were predominantly non-native species. The intensity of management in right-of-ways increased, with widespread use of heavy machinery and herbicides. Abandoned land was colonized by forbs and shrubs, including many non-native species.

Drainage of wetlands and increased runoff had adverse impacts on streams. Increased turbidity, nutrients, sediment deposition, and flow fluctuations caused the decline of intolerant fishes, mussels, and invertebrates; tolerant species, including the introduced carp, increased. Reed canary grass and other exotics colonized the stream banks and gravel bars. Down-cutting of streams lowered

the water table in adjacent floodplains and riparian areas, allowing colonization by woody plants, creating extensive successional woodlands along the banks of Prairie Creek and other streams; these woodlands were dominated by invasive non-native and native shrubs and trees.

When the site came under the administration of the Department of the Army (*c.* 1940), there were a number of rapid changes that affected the vegetation. Extensive areas were converted to ordnance production, with construction of buildings, parking lots, pipelines, roads, and utilities. Large amounts of soil were moved to create bunkers, bridge crossings, and railroad berms; the source areas were left unclaimed. By-products of ordnance manufacturing process were disposed of in landfills, wetlands, and streams. Private homesteads were removed, although some planted ornamentals were allowed to remain. Agricultural uses (cropland, hayland, and pasture) continued on land not converted to ordnance production. Livestock were allowed access to streams and wetlands for water. Mowing, haying, cropping, and grazing were used to keep grasses short, for security and to reduce potential for hazardous fires. Existing streams were diverted into channels, and new channels were created for portions of Jackson, Prairie, and Grant creeks. A few tracts were planted with non-native shrubs and trees to benefit game species. Disturbance and livestock use of the remaining savannas, forests, and woodlands declined, and the understory was invaded by a dense growth of saplings and shrubs, especially non-native Amur honeysuckle. The few small tracts of native vegetation survived unless converted to industrial uses. Finally, raw materials, personnel, vehicles, and equipment were brought to the site by the army, some from abroad; seeds and other propagules arrived with this material.

Over the last 12-15 years, ordnance manufacturing has declined, and finally ended in 1999. Maintenance of open land has declined, and many areas formerly mowed or used for pasture, hayfields, or croplands are now becoming invaded with dense stands of shrubs and young trees. Among the most abundant invaders of these lands are autumn-olive, Amur honeysuckle, Osage orange, teasel, and Canada thistle. Although some native vegetation has recovered because of reduced impacts from agricultural and industrial activities, there has been an increase in invasive plants, especially non-native species. Some non-native species have colonized the site because of natural dispersal and spread from external areas (common buckthorn, garlic mustard, purple loosestrife), but others may have arrived with livestock, vehicles, or construction equipment (leafy spurge, cut-leaved teasel, spotted knapweed).

Since the land was transferred to the Forest Service, there have been further changes. Certain croplands have been converted into agricultural grasslands, for the purpose of providing grassland bird habitat; these grasslands were planted with non-native grasses and legumes. Several tracts have been taken out of pasture to reduce impacts on wetlands, native vegetation remnants, and sensitive plant species. Fences have been installed to exclude cattle from

streams and wetlands. Certain croplands were converted to seed production beds and fields. Other croplands were taken out of production for eventual restoration to native vegetation. Alfalfa hayfields have been planted temporarily in row crops, in preparation for conversion to grassland habitat or prairie restoration. Spot mowing, livestock grazing, and manual removal (hand pruning or pulling) have been used to prevent seed production and spread in certain non-native plant populations, specifically those of garlic mustard, purple loosestrife, Amur honeysuckle, Canada thistle, blue globe thistle, musk thistle, white sweet-clover, yellow sweet-clover, cut-leaved teasel, common teasel, and autumn-olive.

3.9.2.6.3. Cumulative Effects Area – Historical Context

3.9.2.6.3.1. Definition of area

The geographic area considered in this analysis is the Central Till Plains Section, Prairie Parkland Province, Prairie Division (Keys Jr. et al. 1995). This Ecological Unit encompasses the Grand Prairie Natural Division of Illinois (Schwegman et al. 1973) and Grand Prairie Natural Division of Indiana (Homoya et al. 1985). Ecological Units represent an attempt to develop geographic units and characterizations which integrate, in an ecologically meaningful way, information from geomorphology, geology, hydrology, climate, soils, potential vegetation, flora, and fauna (Keys Jr. et al. 1995). This program consolidates similar geographic systems developed by individual state Natural Heritage programs across the eastern United States.

The Central Till Plains Section (CTPS) consists of a large portion of northern and central Illinois and a smaller area in northwestern Indiana. The area being considered for analysis of cumulative effects also includes a small portion of the Southwestern Great Lakes Morainal Section (Keys Jr. et al. 1995). This consists of approximately 21 square miles of land in western Will, southeastern DuPage, and southwestern Cook counties, Illinois, and conforms to that portion of the lower Des Plaines River valley within the Southwestern Great Lakes Morainal Section.

The natural vegetation of the CTPS was primarily tallgrass prairie with savannas, woodlands, and forests primarily in dissected regions along major. Some isolated groves were present on the more rolling terrain associated with end moraines or on elevated terraces present within floodplains. Many wetlands in this region were associated with major stream drainages, but there were also wetlands in upland depressions and swales. Within the lower Des Plaines River valley (and some other river valleys), there were local concentrations of dolomite prairie and associated wetlands.

3.9.2.6.3.2. Past Actions – Historical Context, Range of Variability, and Trends

Past activities that have affected invasive species within historical times on the CTPS and the relevant portion of the Southwestern Great Lakes Morainal

Section are similar to those of those occurring on the land now included within Midewin. However, there are some important differences.

As on Midewin, the largest single impact within the CTPS was the widespread conversion of native vegetation (especially prairies and wetlands) to agricultural land, and associated fire suppression; there was also extensive drainage of wetlands by tiling and ditching operations. Most (>98%) natural vegetation was destroyed (Illinois Natural Heritage Database 2001). During the middle 1900's, however, there were many land changes throughout the CTPS that did not occur on Midewin (or occurred to a lesser degree). Most large, permanent pastures and agricultural grasslands were converted to row crop production. Smaller, temporary grass fields were established to fill local needs for hay or pasture. Most fencerows and hedgerows were removed to enlarge fields under production and to accommodate larger farm equipment. Throughout the CTPS, there was increased use of agricultural chemicals for crop production. Herbicides replaced fire and hay-cutting as the preferred tool for controlling brush and noxious weeds in right-of-ways, and many surviving stands of native prairie and prairie plants were eradicated.

Throughout the CTPS, urbanization and intensity of land use increased with the human population. An extensive transportation and energy delivery infrastructure was developed; the corridors and right-of-ways became important dispersal routes for invasive species. The rapid transportation of construction materials, agricultural and horticultural goods (including seeds), soil, humans, and animals aided the dispersal of invasive species. Additional non-native, invasive species have continued to arrive in the CTPS. Some were consciously released to establish wild populations, such as ring-necked pheasants and carp. Other species, especially certain plants, escaped and spread from plantings done for ornament (buckthorns, Asiatic shrub-honeysuckles), erosion control (crownvetch), or to benefit wildlife (multiflora rose, Autumn-olive, Amur honeysuckle). An increasing number of species spread into the region from other release points, such as European starling, garlic mustard, and zebra mussel. A few species were unintentionally imported into the region, such as the deer tick. Since 1830, there has been a gradual acceleration in the establishment and spread of new exotic organisms, and they have come to dominate much of the landscape and remaining non-agricultural, non-urbanized habitats of the CTPS.

Many native species have continued to decline within the CTPS, largely because of habitat loss; however, some of these losses are directly the result of interactions with invasive species. In some cases, invasive plants have altered the structure and composition of vegetation. Other invasive species have caused declines because of increased predation, herbivory, brood parasitism, or other interactions.

Although there have been limited attempts to control and prevent the spread or establishment of new invasive species, additional species have continued to gain

foothold in the CTPS. There are several species now increasing and spreading which have not been recorded from Midewin, but are likely to reach Midewin in the near future (Appendix C, Table 3).

Invasive species have declined in some portions of the CTPS. Some of these declines include land managed for protection and restoration of native vegetation and wildlife. On these conservation lands, invasive species (mostly plants) have been controlled or eradicated with prescribed burning, removal of woody vegetation, and selective herbicide use. Control of invasive animal species has only been achieved through habitat manipulation, such as reducing habitat edge.

3.9.3. ENVIRONMENTAL CONSEQUENCES

3.9.3.1. Direct and Indirect Effects

3.9.3.1.1. Relevant Actions – Actions common to all alternatives

The following actions that will affect invasive species will occur under all six alternatives:

1. Control of noxious weeds.
2. Completion of at least 1,077 acres of restoration projects, primarily consisting of prairie and associated wetlands.
3. Protection and management of existing native vegetation remnants (400 acres).
4. Continuing row crops on at least 3000 acres, for the next five years, or more depending on alternative.
5. Management of at least 2800 acres of agricultural grasslands with livestock grazing, mowing, and hay cutting.
6. Deer hunting.
7. Cleanup of obsolete, unsafe, or unneeded structures.
8. Appearance of additional invasive plant and animal species on Midewin. The species most likely to appear within the next 5-10 years include deer tick (*Ixodes scapularis*), glossy buckthorn (*Rhamnus frangula*), dame's rocket (*Hesperis matronalis*), sericea lespedeza (*Lespedeza cuneata*), and European black alder (*Alnus glutinosa*), based on proximity to Midewin. A more complete list of plant species is included in Appendix C – Table 3.

3.9.3.1.2. Relevant Actions - Alternative 1

1. Under this alternative, the only specific management against invasive species will be management activities to control noxious weeds. The species controlled will include Canada thistle, perennial sow thistle, musk thistle, and Johnson grass. If any new species designated as Noxious by the USDA or the State of Illinois, and is present on Midewin, it will be controlled.

2. Other species that are determined to pose a threat outside of Midewin will be evaluated for control on a case-by-case basis. This may include such species as gypsy moth or Asian long-horned beetle.
3. Existing seed production beds and fields will be maintained until projects underway are completed. Until then, mechanical and cultural methods (mowing, hand-weeding, mulching) will be used to control noxious weeds and other invasive species in seed production beds and fields. Harvested seed will be protected from infestation with mice or insects.
4. Under Alternative 1, approximately 2800 acres of Midewin will be managed as agricultural grasslands. Management will consist of livestock grazing, mowing, and hay cutting.
5. Approximately 8400 acres will continue to exist as or develop into successional vegetation.
6. There will be 3000 acres of crop fields maintained on Midewin in Alternative 1. Established farming techniques will be used to control invasive species and pests; these techniques include crop rotation, selection of pest-resistant crop varieties, and application of appropriate pesticides. Prior to pesticide application, there will be site specific analysis as required by NEPA and NFMA.
7. The existing 400 acres of native vegetation remnants will be protected and managed in a limited manner. Spot-mowing and hand-pulling will be used to control invasive herbaceous plants; other mechanical methods will be used to remove invasive woody plants (both native and non-native), where appropriate.
8. At least 1700 acres will continue to be restored to native prairie and wetlands under Alternative 1. Spot-mowing and other techniques will be used to control noxious weeds.
9. There will limited visitor access, primarily through escorted tours. A limited area will be open for deer hunting and interim trails.

3.9.3.1.3. Relevant actions common to all action alternatives

The following actions will occur under Alternatives 2, 3, 4, 5, and 6.

1. Control of noxious weeds, and eradication, where possible.
2. Control of all invasive species that pose threats to:
   a. ecosystem restoration and management;
   b. threatened, endangered, and sensitive species and their habitats; and
   c. human health and safety.
3. Identification and eradication, if possible, of new infestations of noxious weeds and invasive species.
4. Use of Integrated Pest Management (IPM) or Integrated Weed Management (IWM) for determining best techniques to control invasive species and noxious weeds. Such management techniques will include cultural (mowing, livestock grazing, prescribed burning, crop rotation), biological (specific parasites or pathogens), mechanical (mowing, brush cutting), and chemical

(herbicides, insecticides) methods. All appropriate environmental analysis will be completed before actions will be taken.

5. Row cropping will continue under all action alternatives to keep land free of noxious weeds and invasive species until ready for habitat restoration. As the row crops are gradually phased out, cropland will be converted either to restored native vegetation or agricultural grasslands to be managed as grassland bird habitat.
6. Reduction of fragmentation in grassland habitats, through removal of fencerows, hedgerows, shrublands, successional woodlands, and similar features.
7. Management of agricultural grasslands with livestock grazing, hay cutting, prescribed burning, and mowing to provide habitat for certain suites of grassland birds.
8. Management of existing and restored native vegetation with prescribed fire, grazing, and mowing to restore vegetation structure, composition, and diversity.
9. Protection, management, and enhancement of existing native vegetation remnants (400 acres).
10. Research, environmental education, volunteer, and interpretive programs.
11. Recreation use, including nature observation, hunting, hiking, on-trail bicycling, on-trail equestrian riding (note that there is no equestrian use in Alternative 2), and camping (not in Alternative 6).
12. Development of infrastructure, including administrative site, access points, visitor center, trails, roads, other amenities, picnic areas, campgrounds (not in all alternatives), and seed production fields and beds.
13. Additional lands may be received through purchase, donation, or exchange.
14. Tiles and other drainage features will be removed within native vegetation restoration areas, and original landscape contours will be restored.
15. Existing native vegetation remnants will be restored to a close approximation of pre-1830 conditions (see Appendix B, Existing Vegetation), where possible, and management of surrounding areas will be conducted so as to encourage expansion of native vegetation.
16. Maintaining populations of threatened, endangered, and sensitive species.
17. Restoration of native vegetation and other important habitats on lands highly altered by agricultural or other uses. Native vegetation will be restored to a minimum of 6060 acres (Alternative 2), and agricultural grasslands will be restored to a minimum of 3810 acres (Alternative 5).

3.9.3.1.4. Relevant Actions - Differences between action alternatives

The five action alternatives differ primarily by: the amount of land restored to different habitat types; the amount of land developed for visitor facilities, administrative purposes, and seed production; the number of access points; amounts of roads and trails; and the types of recreation uses.

Table 3.25 - Comparison of Action Alternatives

Habitat or Other Feature	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Native Vegetation[1] (acres)	6061	7123	9578	12506	12587
Grassland Habitat[2] (acres)	10106	9146	6690	3809	3923
Developed/Administrative (acres)	671	569	570	523	328
Public Access Points (number)	7	9	9	9	6
Roads and Transportation[3] (miles)	21	10	28	18	9
Trails – bicycle and hiking (miles)	35	19	7	0	0
Trails – equestrian and hiking (miles)	0[4]	11	5	0	0
Trails – hiking only (miles)	37	40	20	29	12
Trails – multi-use (hiking, bicycle and equestrian) (miles)	0[4]	18	17	23	15
Total Trails	**72**	**87**	**48**	**52**	**27**

[1]Native vegetation is existing and restored native vegetation, including dolomite prairie, upland typic prairie, wet typic prairie, sedge meadow, marsh, seep, savanna, woodland, and forest types.
[2]Grassland habitat includes 64-400 acres of existing wetlands.
[3]This category includes administrative roads, public access roads, and internal transportation.
[4]There is no equestrian use in Alternative 2.

3.9.3.2. Cumulative Effects Area

There are numerous uncontrollable actions that may impact invasive species within and outside of Midewin and the CTPS. At both scales, such actions include long-term climatic change, increased international trade, air pollution, unusual or severe weather conditions (tornadoes, droughts), and wildfires. At the regional (CTPS) level, relevant actions that impact invasive species include the following:

1. Continued conversion of open land (including cropland, grassland, and native vegetation remnants) to residential, commercial, or industrial uses.
2. Adjacent lands to Midewin are being or will be developed as a veteran's cemetery, industrial parks, and landfill. Some land east of Midewin (but not contiguous) may be developed as a third airport for the Chicago metropolitan region.
3. Increased development of transportation, energy-delivery, and communication infrastructure associated with conversion of open land to developed uses.
4. Increased long-distance travel for recreation purposes.
5. Continued alteration of wetlands, streams, and riparian forests by agricultural runoff, stream channelization, and sediment deposition.
6. Continued introduction and spread of non-native species, either purposefully or unintentionally.
7. Restrictions placed on activities required for vegetation management, because of real or perceived conflicts with adjacent land use (e.g., prescribed burning and residential areas).

8. Increased human population and demand for open land available for recreation.
9. Increased amounts of open land (including native vegetation remnants) becoming protected, managed, and restored by federal, state, county, and municipal agencies, and private organizations.

3.9.3.3. Effects Analysis - Comparison of Alternatives

3.9.3.3.1. Midewin National Tallgrass Area

Alternative 1 will result in the lowest degree of control of invasive species, and will result in extensive areas where invasive species are the predominant flora and fauna. Succession on 8400 acres will result in extensive stands of invasive shrubs, trees, and herbs, many of them non-native species. Because of these extensive infestations, there will be constant seed rain of these species into native vegetation remnants, agricultural grasslands, and crop fields. Maintenance of these lands will become increasingly difficult. Some native vegetation remnants are likely to disappear, despite limited management, because of persistent spreading by reed canary grass or other herbaceous invasives not easily controlled by mechanical means. Any new non-native species that colonizes Midewin will be able to spread without interference, unless it is designated as a noxious weed by federal or state authorities.

Under alternative 1, only noxious weeds will be controlled, and because of succession, at least 8400 acres of Midewin will become increasingly unsuitable for those species currently designated as Illinois Noxious Weeds (Appendix C-Table 1). These species all require unshaded habitats, and cannot compete with taller woody species. Invasive animal species will continue to be widespread.

Under all action alternatives, there will a decline in infestations and coverage of invasive plants species. The aggressive management of native vegetation remnants will reduce or eliminate most populations of invasive plants within these areas. Gradual conversion of cropland and successional vegetation to restored native vegetation and agricultural grasslands will reduce habitat for all invasive species, especially when combined with appropriate management. Removal of fencerows, hedgerows, shrublands, and other successional vegetation will remove internal sources of infestation of invasive plants.

Aggressive management of invasives will also be required in developed areas. Access points, trailheads, visitor facilities, and administrative sites are all potential sites of new infestations, and frequent monitoring is required. Alternative 3, with the greatest number of access points (9) and a high amount of land devoted to facilities, will probably present the greatest challenge; Alternative 6, with only four access points and the lowest amount of facilities, will present the lowest challenge. Invasive plants must be managed in seed production beds and fields. The presence of invasive plants may lead to reduced seed production, but

the greatest threat is contamination of seed lots, and spread of invasive plants or noxious weeds elsewhere on Midewin.

Under all alternatives, there will be varying amounts of agricultural grasslands. Well-managed pastures, hayfields, and other grasslands should be relatively free of invasive plant species. The cool-season grasses planted in agricultural grasslands, however, are often considered non-native invasives when present in native vegetation. Appropriate management, including properly timed prescribed burning, should reduce their presence in native vegetation remnants and prevent invasion of restored vegetation. At present, these grasses are nearly ubiquitous on site, and it will require full conversion of all land destined for restoration and decades of management before agricultural grasslands will become the only source of these non-native grasses on Midewin. At that point, appropriate vegetation management should successfully keep these species in check in restored native vegetation. The management techniques described in the Prairie Plan standards and guidelines will be sufficient to keep cool-season grasses from being a threat to native vegetation remnants and restorations on Midewin.

The continuation of agricultural special uses, specifically the planting and harvest of row crops, will have similar effects under all action alternatives. The management of row crops will control noxious weeds and invasive plants in these fields until conversion to native restoration and grassland habitat. Crop fields will be managed to control noxious weeds and invasive species, also reducing the seed bank of these species before conversion and restoration activities begin.

The potential effects of livestock will be similar, as they are used as a management tool under the action alternatives. Livestock grazing can have strong effects on invasive plant species. Livestock can be used as a management tool to reduce or eliminate palatable, invasive plants. However, poor livestock management can cause disturbance, which creates habitat for colonization by invasive plants. Improper management can also favor unpalatable plants (hawthorns) over pasture grasses, leading to habitat change. Livestock can disperse seeds of certain invasive plants, such as Osage-orange. Movement of livestock, straw, and vehicles may lead to introduction of new species.

Certain invasive and pest animal species are likely to decline under all action alternatives, largely because of reduction of fragmenting features, such as roads, fencerows, and shrublands. Burning and reduction in populations of non-native food plants may reduce populations of some non-native insects, such as Chinese praying mantis and cabbage butterfly. Removal of structures may lead to declines in house sparrows and Asian multicolored ladybird beetle. However, some invasive organisms are not expected to decline, despite habitat and vegetation restoration. For example, Chinese clams, European earthworms, and rusty crayfish are expected to remain widespread, and are probably impossible to control or eradicate without causing adverse impacts on native species.

The largest factors influencing invasive plant species will be public access and use. This will be a minor factor under Alternative 1, because of the highly restricted nature of public use. All five action alternatives propose extensive public access, with varying amounts of types and intensities.

Because trails, roadsides, and campgrounds provide both habitat and dispersal corridors for invasive plants (Benninger 1991; Benninger-Traux et al. 1992; McLendon 1996; Shelby 1991; Soehn 2002; USGS 2001), the amount of trails and developed recreation sites are likely to effect the amount of management needed to control invasive plant species. Alternative 3 provides the greatest amount of these features, and would require the greatest area to monitor for new infestations. In descending order, there will be less potential habitat, monitoring, and management required for invasive plant species along trails and roads under Alternatives 2, 5, 4, and 6.

The types and intensity of recreation uses will also affect the severity of invasive problems on site. The elimination of certain recreational activities from consideration, such as dog field-trails, off-trail equestrian use, off-trail bicycle use, and off-road vehicles will reduce or prevent soil and vegetation disturbance that will create colonizing sites for invasive plants. Off-road vehicles and sporting dogs may also serve as vectors for invasives, by dispersing seeds and deer ticks.

Of the remaining uses, equestrian use will have the greatest affect on invasives; equestrian use is proposed in alternatives 3, 4, 5, and 6, with the greatest amount of trails available in Alternative 3 (30 miles), with decreasing amounts in Alternatives 4 (23 miles), Alternative 5 (23 miles), and Alternative 6 (15 miles). The distance and location of equestrian trails is important, as horses can be dispersal agents for the seeds of certain invasive species (Benninger 1991; Campbell 1996; Guthrie 1984; Janis 1975; Shelby 1991; Soehn 2002). The ability of invasive plants to become established relies, at least in part, on soil disturbance, damage to existing vegetation, and changed nutrient levels, all potentially resulting from equestrian use (Benninger-Traux et al. 1992; McLendon 1996; Soehn 2001). If equestrian use is effectively limited to designated trails the potential for establishment of invasive plants associated with this use will be reduced. Alternative 3, with its highest length and most extensive distribution of trails available for equestrian use, has the highest potential for spread of invasive plants associated with this use. Alternative 2 has the lowest potential (no equestrian use), followed by Alternative 6, with equestrian use limited to the periphery of the east side of Midewin. Alternatives 4 and 5 are intermediate with similar trail lengths and distribution of equestrian use, including approximately seven miles of multi-use trail west of Illinois Route 53.

If equestrian use is not restricted to maintained, designated trails, then there will be increased soil and vegetation disturbance, with increased habitat and sites of infestation for invasive plants (Adkison and Jackson 1996, Benninger-Traux et al. 1992; DeLuca et al. 1998; Shimp 1999; Weaver and Dale 1978; Wilson and Seney 1994). Similarly, ineffective prevention of prohibited recreation activities (off-road vehicle use) may also lead to greater invasive species problems than can be predicted from the actions proposed in the alternatives (Liddle 1975, Weaver and Dale 1978; Wilson and Seney 1994).

Regardless of the alternative chosen, there may be certain changes that affect invasive species populations on Midewin. Additional non-native plant species are likely to colonize Midewin from surrounding areas; some of these may be new introductions not yet present in northeastern Illinois. As land use around Midewin changes, there are likely be changes in the types of invasive species entering the site. The development of adjacent landfills and industrial parks may benefit certain species, such as ring-billed gulls, crows, and rats. The increase in these species will likely have adverse effects on non-invasive, native wildlife species, especially ground-nesting grassland birds. Finally, climatic change may result in additional invasive species spreading north, reaching Midewin. Climatic changes may also affect restoration efforts on Midewin, leading to increased opportunities for infestation by certain invasive plants.

3.9.3.3.2. Central Till Plains Section

Because of the extensive amount of land in the CTPS already infested with or supporting populations of noxious weeds and invasive species, the selection of alternative may not have a significant impact on the overall situation within the CTPS.

Under Alternative 1, vegetation types supporting many invasive species would dominate approximately half of Midewin. Most of these species are abundant already on adjacent and nearby private, corporate, and public lands that are not actively managed. Midewin would likely become a source of seed that would increase the difficult of management on nearby lands, and could be an active nuisance to certain neighbors.

Under the action alternatives, the above scenario would not occur. Invasives would be actively managed, and are expected to decline. Midewin would not be a source of invasives for adjacent and nearby lands. This is dependent, however, on Midewin's ability to manage the land and prevent illegal or inappropriate activities, such as intensive, off-trail equestrian use. Otherwise, Midewin could become a focal point for infestation and spread of invasive species and noxious weeds in the CTPS, as is currently occurring at several localities in southern Illinois.

3.9.4. MITIGATION MEASURES

The mitigation measures stated under Prairie Plan standards and guidelines are sufficient to reach the goals and objectives of the desired future conditions (control, reduction, and eradication of invasive species and noxious weeds). These Plan standards and guidelines are presented under the headings for Ecological Sustainability (especially under Noxious Weeds and Invasive Plant Species, Native Vegetation Remnants, Habitat Restoration, and Wildlife) and Recreation and Interpretation (General Standards and Guidelines, Trails). Reaching the desired future condition will also require that sufficient monitoring and law enforcement is used to detect and prevent actions counter to the goals and objectives.

3.9.5. MONITORING

Species identified as noxious weeds or invasive plant species will be monitored using appropriate techniques to determine the number of infestations, size of infestation (acres), and population levels. A higher intensity of monitoring may be required along trails and at access points.

The success of all treatments, including prevention and control measures, will be monitored. In some cases, this monitoring may be very direct, as in answering the questions, “is invasive species XX present on site as of this date?” or “did treatment Y prevent seed production in noxious weed Z?”

Trail corridors and sensitive habitats will be regularly monitored for evidence of inappropriate use that may lead to new infestations by invasive species or noxious weeds.

3.10. *General Wildlife Habitat Types and Associated Animal Species*

3.10.1. INTRODUCTION

Midewin National Tallgrass Prairie provides habitat for at least 275 species of vertebrate organisms, and well over 300 species of invertebrates, including 9 species of native fresh-water mussels, and 103 species of conservative prairie insects (Glass 1994; USDA 1999). These animals occupy a variety of habitats across Midewin; some have specialized habitat requirements and others utilize several habitats over the course of their life history. General wildlife habitat types and comparison of alternative actions upon these habitats are discussed briefly in this section.

3.10.2. AFFECTED ENVIRONMENT

3.10.2.1. RESOURCE DESCRIPTIONS

Following are brief descriptions of four general wildlife habitat types and associated wildlife: Grasslands (prairie and agricultural grasslands); Wetlands; Forest, Woodland and Savanna; Successional Non-native Vegetation Habitats (shrublands, hedgerows, fencerows, and edges). Several animal species mentioned here may also be discussed in other sections on Threatened, Endangered, and Sensitive Species or Management Indicator Species.

3.10.2.1.1. Grasslands

Grasslands considered here include native prairie remnants and agricultural grasslands such as pasture and hayfields that are open grown with less than 5% shrub cover. Native prairie dominated by native grasses and forbs and different prairie types are described in the Appendix A of the Plan. Agricultural grasslands are short-stature grasslands dominated by mostly non-native grasses and forbs, and managed with agricultural techniques. For wildlife that occupy these habitat types, the vegetative structure of habitat is often more important than the vegetative composition.

Animal species characteristic of the grassland habitats at Midewin include grasshopper sparrow, savannah sparrow, vesper sparrow, dickcissel, Eastern and Western meadowlarks, monarch butterfly, European skipper, meadow and prairie voles, Northern short-tailed shrew, thirteen-lined ground squirrel, fox snake, smooth green snake, and Plains garter snake. Grassland wildlife includes generalist species such as the deer mouse or red-tailed hawk and a number of more specialized species that require differing habitat characteristics. Some species are dependent on certain plant species such as the silphium root borer; others require specific vegetative structure such as the sedge wren; or edaphic characteristics such as the Plains pocket gopher; or have habitat area (size) requirements such as the savannah sparrow.

3.10.2.1.2. Wetlands

Wetlands include streams, marshes, sedge meadows, seeps, and open water ponds. These habitats range from vegetation dominated communities such as sedge meadows, to the open water communities of ponds, to mixed water/vegetation communities such as hemi-marshes. Vegetation is often dominated by a single species such as bulrushes, sedges, or cattails. Water levels or delivery may be relatively constant as in seeps or may be more seasonally variable as in shallow marshes or intermittent streams.

Wetland wildlife includes some generalist species such as mallard or beaver and a number of more specialized species that require differing habitat characteristics. Some species require wetlands for one or more portions of their life cycle, such as the mud minnow, greater yellowlegs and northern leopard frog; others are dependent on certain plants, such as the *Hellenium* root borer; others require certain vegetative composition or structure, such as the common moorhen or muskrat; and others use wetlands intermittently with other habitats, such as the red-winged blackbird and great blue heron.

3.10.2.1.3. Forest, Woodland, and Savanna

Native forested habitats include upland and floodplain forest, woodland, and savanna. These habitat types include mature and successional conditions of closed canopy forest (80-100% tree canopy cover), woodland (50-80% tree canopy cover), and savanna or grove (10-50% tree canopy cover). The mature conditions of these habitats are considered relatively stable with regard to structure, and successional stages often are more structurally variable and will eventually grow into mature and more stable conditions.

Forest wildlife associated with mature forest and woodland includes species such as American redstart, veery, scarlet tanager, eastern wood pewee, American woodcock, eastern chipmunk, white-footed mouse, and gray fox. Species that utilize successional forest habitat include blue-winged warbler, red-eyed vireo, and woodthrush. Other species intermittently utilize these habitats such as breeding great blue herons that nest in a rookery in successional forest on Midewin. Savanna species include indigo bunting, red-headed woodpecker, northern flicker, and blue grosbeak. Some area sensitive forest birds include the red-eyed vireo, least flycatcher, ovenbird, and woodthrush. Animals associated with other woody habitats such as successional non-native vegetation habitats are discussed below.

3.10.2.1.4. Successional Non-native Vegetation Habitats

Successional non-native vegetation habitats include those that are mostly dominated by non-native woody vegetation such as shrublands, old fields, hedgerows, fencerows, early successional forest (often native species dominant), and includes non-native grasslands (that are not managed with agricultural techniques) containing scattered shrubs, ecotones, and other corridor

communities such as riparian corridor habitats. These habitats have a woody component that varies in dominance between types. The structure of successional non-native vegetation habitat types ranges from fairly open conditions with scattered or patchily distributed shrubs and trees to dense conditions with thick cover of shrubs and other woody understory vegetation. The vegetative structure of these habitats can be more important than the vegetative composition.

A number of animals make use of or require successional non-native vegetation habitat types. Included in this group are least flycatcher, blue-winged warbler, white-eyed vireo, orchard oriole, indigo bunting, American goldfinch, chipping sparrow, woodthrush, fox squirrel, raccoon, woodchuck, Eastern cottontail, Northern short-tailed shrew, red fox, blue racer, fox snake. Edges also tend to be heavily used as travel lanes for many predators such as snakes, blue jay, striped skunk, opossum, and red fox. Some animals associated with these habitats are widespread and common species (gray catbird, brown thrasher, Northern cardinal, American goldfinch, bluejay, raccoon, fox squirrel, red fox, Eastern cottontail, common garter snake), while others are much less abundant and more patchily distributed (Northern bobwhite, willow flycatcher, yellow warbler, yellow-breasted chat, orchard oriole, striped skunk, and woodchuck). Robinson, et al. (1998) and Herkert (pers. comm.) identified the following edge and shrubland birds as species of management concern in Illinois: Northern bobwhite, willow flycatcher, white-eyed vireo, yellow warbler, yellow-breasted chat, blue-winged warbler, prairie warbler, blue grosbeak, and loggerhead shrike.

3.10.2.2. Cause and Effect Relationships/Resource Pressures and Responses

The general cause and effect relationships and resources pressures and responses that apply to all wildlife groups and their habitats are the same as those listed for species of concern. (Refer to the discussion titled Direct and Indirect Effects Common to all species of concern in the Threatened, endangered and sensitive species section of the FEIS).

3.10.2.3. Occurrence and Trends

The status and distribution of habitat across the local and regional landscape has changed significantly since the early 1800s. Occurrence and trends of general wildlife habitats at local (Midewin) and regional (Central Till Plains Section) scales are described below.

3.10.2.4. MIDEWIN NATIONAL TALLGRASS PRAIRIE – LOCAL SCALE

3.10.2.4.1. Grasslands

Approximately 16,247 acres (96.5%) of the Midewin landscape was described as prairie (including wet prairie and shallow marsh) by the Land Survey Office in 1821 and 1834 (USDA 1999). Nearly all of this was later converted to agricultural and other uses and cool season grasslands replaced much of the prairie over

time. Currently approximately 1,865 acres (11%) of the site is covered by dry and mesic prairie and agricultural grassland.

In an analysis of large grassland ecosystems in Illinois, McKinney, et al. (1998) identified the grassland at Midewin as the single largest tract of this habitat type in the state. Additionally, in a county-by-county analysis, Will County was identified as containing the largest total area of >40 hectare and >100 hectares grasslands, and among the top three counties for the number of >40 hectare tracts and among the top four counties for the number of >100 hectare tracts. (One hectare equals 2.47 acres). These larger grassland tracts have particular significance for area sensitive species such as upland sandpiper, bobolink, Henslow's sparrow, northern harrier, and short-eared owl, discussed in Sections on Threatened, Endangered, and Sensitive Species and Management Indicator Species.

3.10.2.4.2. Wetlands

Based on soils considered to be hydric, approximately 6,948 acres (41%) of the Midewin landscape was wetland prior to 1830 (USDA 1999). Much of this habitat was later drained and converted to agricultural and other uses. Approximately 1,078 acres of wetland are present (including restoration projects at Blodgett and South Patrol Roads), representing 6.4% of the site.

3.10.2.4.3. Forest, Woodland, and Savanna

Approximately 590 acres (3.5%) of the Midewin landscape was described as forest by the Land Survey Office in 1821 and 1834 (USDA 1999). Approximately 233 acres of forest, woodland, and savanna are now present, representing about 1.4% of the site.

3.10.2.4.4. Successional Non-native Vegetation Habitats

No information is available about the historic distribution of successional non-native vegetation habitats at Midewin. Historic distribution was probably much less than current acreage because many features of these habitats are human in origin; hedgerows, fencerows, and oldfields are the results of human activities. Other important factors, such as periodic fires, have been eliminated or altered by human intervention. Also, it is likely that most wildlife now using successional habitats used other habitat in the past, such as savannas, woodland edges, riparian areas, or shrubby prairies. Successional fields and shrubland habitat types together currently total approximately 2,100 acres at Midewin, representing about 12% of the site (USDA 1999).

3.10.2.5. CENTRAL TILL PLAINS SECTION - CUMULATIVE EFFECTS AREA SCALE

Historic habitat distribution for the Central Till Plains Section is estimated from data for the Grand Prairie Natural Division of Illinois, which approximates the Illinois portion of the CTPS. Percentage estimates for primary habitat groups

come from different sources and include crossover for specific habitat types; for example, grassland and wetland estimates both includes wet prairie and shallow marsh, and wetland and forest estimates both include forested wetlands. Due to inherent limitations of the data, it was not possible to separate these crossovers for the current analysis, and consequently percentage totals exceed 100%.

3.10.2.5.1. Grasslands

Significant destruction of prairie throughout the United States has occurred since the early 1800s. Prairie (including wet prairie and shallow marsh) occupied approximately 84% of the CTPS in the early 1800s (*after* Iverson 1989). Prairie has been reduced to less than 1% of its original 21 million acres in Illinois (Schwegman 1983). By the mid 1970s, high-quality native prairie was reduced to about 381acres, or 0.0035% of its original extent in the Grand Prairie Natural Division (White 1978). Prairie was replaced predominantly by agricultural applications and agricultural grasslands became increasingly important for many grassland wildlife species. These habitat types currently total 2,084,692 acres, or 12.7% of the Central Till Plains Section. Some protection, conservation, and restoration of prairie and grasslands is expected from increasing private, public, corporate, and government interest and activity in natural area and habitat conservation. However, recent regional trends also suggest that, increasingly, management practices of agricultural grasslands (earlier timing and more frequent mowing) are not compatible with management for nesting success of many bird species (Herkert, et al. 1993; Vickery, et al. 2000), and that habitat fragmentation and degradation and the conversion of agricultural grasslands to other uses will also continue (Chicago Region Biodiversity Council 1999).

3.10.2.5.2. Wetlands

Significant destruction of wetlands throughout the United States has occurred since the early 1800s. Wetlands (including wet prairie, shallow marsh, and forested wetlands) occupied approximately 30% of the CTPS in the early 1800s (*after* Suloway and Hubbell 1994). Wetlands have been reduced to less than 10% of an estimated original 9.4 million acres in Illinois (Suloway and Hubbell 1994). Wetland habitat currently totals 318,462 acres, or about 1.9% of the area, of the Central Till Plains Section. Some protection, conservation, and restoration of wetlands is expected. However, based on recent local and regional trends for wetland draining and filling and forecasts for continued urban and suburban expansion, loss and degradation of wetland habitat is expected to continue within the CTPS (Chicago Region Biodiversity Council 1999).

3.10.2.5.3. Forest, Woodland, and Savanna

Significant destruction of forestlands throughout the United States has occurred since the early 1800s. Forests (including forested wetlands) covered approximately 15.5% of the CTPS in the early 1800s (*after* Iverson 1989). Forests have been reduced to about 4,278,000 acres (31%) of an estimated original 13.8 million acres in Illinois and to about 580,000 acres (29%) of an estimated original 2.0 million acres within the Grand Prairie Natural Division of

Illinois (Iverson et al. 1989). Forested habitats currently occupy an estimated 805,235 acres, or 4.9% of the area, of the CTPS. In Illinois, forest area was drastically reduced from the early 1800s through the early –mid 1900s; trend data then shows that forest area increased slightly from about 1962 through about 1985 (Iverson, et al. 1989). Forecasts for continued urban and suburban expansion show an ongoing threat of destruction, degradation, and fragmentation of forested habitats within the CTPS (Chicago Region Biodiversity Council 1999).

3.10.2.5.4. Successional Non-native Vegetation Habitats

No information is available about the historic distribution of successional non-native vegetation habitats within the Central Till Plains Section. These habitat types are currently fairly common across the region. Historic distribution of successional non-native vegetation habitats across the CTPS was probably much less than current acreage, because many features of these habitats are human in origin; hedgerows, fencerows, and old fields are human created, and conditions, such as frequent landscape fires, that allow for succession to woody species, have also been altered or eliminated by human intervention. These habitats are frequently established as wildlife habitat and often their presence is a result of lack of management. Although it is expected that some of these types of habitats will continue to be cleared for other land uses (urban and suburban development or conversion to agricultural uses), no significant change in status or distribution within CTPS is expected.

Table 3.26 - Midewin National Tallgrass Prairie and Central Till Plain Section – Historic and Current Distribution of General Habitat Types

Habitat	Midewin Historic in acres (% area)	Midewin Current in acres (% area)	CTPS Historic in acres (% area)	CTPS Current in acres (% area)
Prairie and Agricultural Grasslands[1]	16,247 (96.5%)	1,865 (11.1%)	13,761,864 (84.0%)	2,084,692 (12.7%)
Wetlands[1]	6,948 (41.3%)	1,078 (6.4%)	4,914,952 (30.0%)	318,462 (1.9%)
Forest, Woodland, and Savanna[1]	590 (3.5%)	233 (1.4%)	2,539,392 (15.5%)	805,235 (4.9%)
Successional Non-native Vegetation[1]	N/A	2,100 (12%)	N/A	N/A

[1]Percentage estimates for primary habitat groups come from different sources and include crossover for specific habitat types; for example, grassland and wetland estimates both includes wet prairie and shallow marsh, and wetland and forest estimates both include forested wetlands. Due to inherent limitations of the data, it was not possible to separate these crossovers for the current analysis, and consequently percentage totals exceed 100%.

3.10.3. ENVIRONMENTAL CONSEQUENCES

3.10.3.1. Direct and Indirect Effects

3.10.3.1.1. Relevant Actions Common to all Action Alternatives

The primary focus of habitat restoration will to benefit grassland birds, but will also benefit many other wildlife species. Existing prairie and grassland bird habitat, wetland, forest, woodland, savanna, and certain types of successional non-native vegetation habitats would be protected and managed in all alternatives, except the no action alternative. Establishment of additional habitat, predominantly grassland, is also provided for in all alternatives, except the no action alternative. The Prairie Plan contains standards and guidelines for restoring and managing the different habitats.

Many uncontrollable actions may negatively impact wildlife habitats within and outside of Midewin and the CTPS. At both scales, impacting events include:

- Climatic changes and stochastic events such as drought, tornadoes, wildfires, or chemical spills.
- Continued conversion of habitat to alternate land uses - hayfields and pastures converted to cash crops such as corn and soybeans.
- Continued draining and conversion of wetlands or forested habitats to development or agriculture.
- Timing and frequency of mowing agricultural grasslands for management purposes during periods that are critical to nesting success.
- Changes in hydrology and water levels because of alternate water uses.
- More subtle forms of habitat degradation such as overgrazing, succession of grassland to shrubland, invasion by exotic species, habitat fragmentation, pollution, and predation.
- Additional actions include those that may take place outside of the region impacting migratory species in their wintering grounds. These actions include: habitat destruction and degradation; use of pesticides known to be harmful wildlife; killing as pest species due to impacts upon agricultural resources; and hunting.

3.10.3.1.2. Comparison of Alternatives

Each alternative provides for a mix of restored, reconstructed, and improved prairie, grassland, wetland, stream, forest, woodland, savanna, and successional non-native vegetation habitats. Refer to Table 3.27 for a comparison of general habitat acreages and developed features by alternative.

Under Alternative 1 the quality of grassland, wetland, and forest habitats on site would degrade due to encroachment of invasive, exotic, and woody species (for grasslands and wetlands). Lack of vegetative management may alter vegetative composition and structure. A shift to more woody vegetation could also alter local moisture regimes by decreasing available soil moisture due to increased losses

to evapotranspiration. The net impact on wildlife would be negative for many animal species associated with these habitats and especially for those that have specific habitat (structure, species, and area) requirements. Under Alternative 1, the amount of successional non-native vegetation habitats would increase significantly as woody species encroach into other habitats. Those wildlife species that use successional non-native vegetation and especially those that are specialized for such habitats would benefit from the habitat conditions created by Alternative 1.

Alternatives 2 – 6 would benefit grassland wildlife by providing increased amounts of grassland habitat. Grassland restoration may be dominated by the use of cool season grasses where necessary, until methods for managing grassland bird habitat with native prairie grasses and forbs are known to be successful. Wildlife species that require native prairie plant species (especially some of the insects discussed in the TES section) may not benefit from the cool season grasslands, but should not be negatively impacted by establishment of this habitat since it would not replace existing prairie. Alternatives 2 and 3 provide the largest acreage of grassland bird habitat and the largest acreage of combined prairie and grassland bird habitat. Alternatives 5 and 6 provide the largest acreage of prairie habitat. Alternative 6 provides the largest areas of unfragmented habitat, which would also benefit many species including area sensitive grassland birds and some of the obligate species that require certain prairie plants.

Alternatives 2 – 6 should benefit wetland wildlife by providing increased amounts of wetland habitat. In general, wetland acreage increases from Alternatives 2 - 6, with Alternatives 5 and 6 being equal and providing the largest acreage. Stream miles would not increase by alternative. However, management practices stipulated in the Prairie Plan Standards and Guidelines for all habitats and features should provide for overall improved stream habitat under Alternatives 2 - 6.

Alternatives 2 – 6 would have mixed benefits for forest, woodland, and savanna habitat and wildlife. Forested habitat acreage, representing forest, woodland, and savanna, would increase equally from Alternatives 2 through 6, but much of the successional woodland on site would be removed to restore other habitat types. Many mature and interior forest species would benefit, but those that primarily utilize early successional woodland habitats may be impacted negatively.

Alternatives 2 – 6 would decrease the overall amount of successional non-native vegetation habitat on site as other habitats are restored. Alternatives 2 - 6 allow for considerable restoration and large areas of unfragmented condition that would significantly reduce edge habitat currently present in features such as old hedgerows, fencerows, and oldfields. Alternative 2 provides for the least reduction of successional non-native vegetation habitats, and then habitat reduction increases from Alternative 5, to Alternative 3, to Alternative 4, with Alternative 6 providing for the largest amount of habitat reduction. It is expected that this overall reduction of successional non-native vegetation habitats would negatively impact certain wildlife species and especially those that are specialized for these habitat types.

Development of a visitor center or campgrounds may impact or reduce the size of habitats due to their placement or proximity to habitats. Trails and new roads constructed may impact habitats due to their potential for introducing human disturbances. In general, Alternative 6 provides for the fewest features and the lowest impact to all four wildlife habitats. Alternative 5 provides somewhat greater impact, with greater impacts respectively, under Alternatives 4, 2, and 3.

3.10.3.2. Cumulative Effects

Under Alternative 1 there may be negative impact on prairie restricted and general grassland wildlife within the Central Till Plains Section. If the large, open grasslands of Midewin degrade or succeed to woody habitats this would result in a regionally significant loss of habitat because of the regional importance of the Midewin grasslands. Under Alternative 1 there may be slight negative impact or no effect regionally, on wildlife species that use wetlands. The existing amount of wetlands at Midewin may have no regional importance for wetland wildlife species. Alternative 1 will have no regional impact on wildlife species associated with forest, woodland, and savanna, as the forest acreage at Midewin is small enough that it should not influence habitat trends in the CTPS. Under Alternative 1, the amount of successional non-native vegetation habitats would increase significantly as woody species expand their distribution by encroaching into other habitats. The regional impact would be positive for most wildlife species that use successional non-native vegetation, and especially for those that are specialized for these habitats.

Alternatives 2 – 6 would likely benefit many grassland wildlife species within the Central Till Plains Section. The grasslands at Midewin alone represent the largest grassland habitat in Illinois. Combined with several other large grassland areas managed for wildlife in the Prairie Parklands area of Illinois (Goose Lake Prairie Nature Preserve and Des Plaines Conservation Area), Midewin would provide regionally significant grassland for both prairie restricted and general grassland animal species. Each alternative provides for different large amounts of combined prairie and grassland bird habitat restoration: Alternative 2 provides the largest acreage, then acreages decrease from Alternative 3 to Alternative 4,

and the smallest acreage is provided in Alternatives 5 and 6, which both provide equal acreage.

Alternatives 2 – 6 would also likely benefit many wetland wildlife species within the Central Till Plains Section. Acreage of wetlands increases from Alternatives 2 through 6. The amount of wetland acreages provided in these alternatives, especially in Alternatives 4, 5, and 6, may provide regionally significant wetlands for wildlife, and especially for specialized species and those that require large habitat blocks.

Alternatives 2 – 6 would have no regional effect on wildlife associated with forest, woodland, and savanna habitats. These habitat acreages at Midewin are small enough that actions here should not influence habitat trends in the CTPS. It is expected that changes in forest habitat on Midewin resulting from any action alternative will not have significant impact on wildlife species that utilize mature forest habitats within the Central Till Plains Section.

Alternatives 2 – 6 would decrease the amount of successional non-native vegetation habitats on Midewin as other habitat types are restored. These habitat types are currently fairly common across the region and any decrease in distribution at Midewin is not expected to impact associated wildlife species within the CTPS.

Table 3.27 - Restored acreage estimates of general habitat type and developed features (including acreage of habitat reduction) by alternative.

		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Habitat Restored and Area Reduced by Developed Features							
Grassland Bird Habitat	**Restored**	**1303**	**10106**	**9146**	**6690**	**3809**	**3923**
	Developed	0	222	132	22	114	0
Mesic and Dry Prairie	**Restored**	**562**	**2124**	**2671**	**4021**	**6132**	**6197**
	Developed	0	109	109	206	110	45
Wetland/ Wet Prairie	**Restored**	**1674**	**3031**	**3535**	**4640**	**5453**	**5469**
	Developed	0	318	317	331	292	276
Forest/Woodland	**Restored**	**194**	**420**	**427**	**427**	**429**	**429**
	Developed	0	9	2	2	0	0
Savanna	**Restored**	**39**	**486**	**490**	**490**	**492**	**492**
	Developed	0	13	9	9	7	7
Totals	**Restored**	**3772**	**16167**	**16269**	**16268**	**16315**	**16510**
	Developed	**0**	**671**	**569**	**570**	**523**	**328**
Successional Non-native Vegetation		8400	100	100	100	100	100
Unfragmented Habitats Area		0	9536	9781	9989	9755	11766

		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Features							
Visitor Center (habitat types impacted or reduced in area)		0	X (upland prairie, wet prairie/sedge meadow, savanna)	X (upland prairie, wet prairie/sedge meadow, savanna)	X (upland prairie, wet prairie/sedge meadow, savanna)	X (upland prairie, wet prairie/sedge meadow)	0
Campground Units and Sites (habitat types impacted or reduced in area)		0	X (grassland bird habitat)	X (upland prairie, wet prairie/sedge meadow, grassland bird habitat)	X (upland prairie, wet prairie/sedge meadow)	0	0
Picnic Area (habitat types impacted or reduced in area)		0	X (grassland bird habitat)	X (grassland bird habitat)	X	X (grassland bird habitat)	0
Public Access/ Parking		0	X	X	X	X	X
Trails (miles)		0	72	90	48	53	27
Administrative Roads (miles)		115	4	5	4	7	8

Habitat: Acreages are listed for habitat types and for area reduced by developed features. Features: X=present, 0=not present, and a note is included about habitat types impacted; Miles are indicated where applicable.

3.10.4. MITIGATION

Mitigation measures are included in the Prairie Plan Standards and Guidelines. These include protecting existing and restored prairie and grasslands, wetlands, and forests, woodlands, savannas, and some existing types of successional non-native vegetation habitats, such as those associated with savanna, woodland, forest edges, shrubby prairie, riparian and other ecotones, when existing fencerows, overgrown hedgerows, and successional thickets are cleared and removed for restoration of other habitat types. The Prairie Plan also includes guidance for managing and developing habitats, features, and facilities in proximity to the habitat types listed above.

3.10.5. MONITORING

No specific monitoring will be required for wildlife associated with grassland, wetland, forest, woodland, savanna, and shrubland and edge habitats, other than species and conditions identified and highlighted as Endangered, Threatened, and Sensitive Species, or Management Indicators. Monitoring of Grassland Birds is described in the Section on Threatened, Endangered, and Sensitive Species.

Monitoring of the effects of any action alternative on habitat will be conducted at a basic level, continuing to inventory the number of acres of specific habitat types as habitat establishment and restoration take place.

3.10.6. Game and Harvest Wildlife Species

3.10.6.1. AFFECTED ENVIRONMENT

Midewin provides habitat for a number of game species including; blue-winged teal, northern shoveler, wood duck, hooded merganser, mallard, Canada goose, American woodcock, common snipe, mourning dove, wild turkey, ring-necked pheasant, beaver, mink, muskrat, raccoon, fox squirrel, eastern cottontail, coyote, gray fox, red fox, white-tailed deer, bullfrog, spiny softshell turtle, common snapping turtle, smallmouth bass, largemouth bass, rock bass, black bullhead, yellow bullhead, and carp (Illinois Wildlife Code 520 ILCS 5/1.1 et seq.). Current hunting programs are administered in cooperation with the Illinois Department of Natural Resources. White-tailed deer is the only game species for which a hunting program is currently administered on site. These game and harvest species utilize a variety of habitats within Midewin. Some species have specialized habitat requirements, many species make use of more than one habitat type, and several species are habitat generalists that use numerous habitat types. Table 3.28 below provides information about general breeding habitat requirements for game and harvest species.

Table 3.28 - General Breeding Habitats for Game and Harvest Wildlife Species at Midewin.
Sources: Birds= Ehrlich, et al. 1988; Mammals = Hoffmeister 1989; Amphibians and Reptiles = Phillips, et al. 1999; Fishes = Page and Burr 1991.

Common Name	Habitat Notes
Birds	
Blue-winged teal	Prairie potholes, marsh, pond, slough, lake, sluggish stream.
Northern shoveler	Freshwater shallow, especially muddy, sluggish habitats and surrounding marsh, and wet prairie meadows.
Mallard	Shallow pond, lake, marsh, flooded field.
Wood duck	Pond, marsh, flooded forest, bottomland slough, wooded swamp.
Hooded merganser	Forested habitats near water, lakes, swamps, and marshes.
Canada goose	Freshwater and brackish marshes, meadows.
American woodcock	Moist woodland, mixed forest, thickets along boggy streams, wet meadow, occasionally abandoned fields.
Common snipe	Wet grass habitat, marshes.
Mourning dove	Open woodland, agricultural areas with scattered trees.
wild turkey	Mature deciduous and deciduous-coniferous forests and open woodlands.
Ring-necked pheasant	Open country, cultivated areas, marsh, woodland, forest edge.
Mammals	
Beaver	Large and small streams, ponds, lakes, drainage ditches, and canals with

Common Name	Habitat Notes
	food plants and trees nearby.
Mink	Permanent water of streams, rivers, lakes, marshes, and ponds with ample supply of food source; water-dwelling animals.
Muskrat	Rivers, streams, lakes, and ponds. Require stable water levels for some house building, and fluctuating water levels for availability of many food plants.
Raccoon	A variety of habitats with a permanent supply of water, places to den, and available food.
Fox squirrel	Forest edge, oak openings, shrublands, woodlots, and along hedgerows.
Eastern cottontail	Habitats which combine a variety of cover types; forest-edge, shrublands, briar, brush piles, old fields.
Coyote	Prairie, grassland, brushy areas, and wood edges.
Gray fox	Deciduous forest, woodlands, occasionally into wooded pastures.
Red fox	Open grasslands, unmowed field edges, shrubland, and woodland edges.
White-tailed deer	Wooded areas adjacent to streams, fields, and pastures. Forage considerable distances from forest.
Amphibians and Reptiles	
Bullfrog	Permanent water bodies of lakes, ponds, rivers, and streams in forest, prairie, or disturbed habitats.
Spiny softshell turtle	Rivers, backwaters, lakes, and ponds.
Common snapping turtle	Almost any body of water with aquatic vegetation - especially shallow backwaters and ponds.
Fishes	
Smallmouth bass	Clear, gravel-bottom runs and flowing pools of small to large rivers; shallow, rocky areas of lakes.
Largemouth bass	Clear, vegetated lakes, ponds, swamps, and backwaters and pools of creeks and small to large rivers; usually over mud or sand.
Rock bass	Vegetated and brushy stream margins and pools of creeks and small to medium rivers; rocky and vegetated margins of lakes, most common in clear, silt-free rocky streams.
Black bullhead	Pools, backwaters, and sluggish current over soft substrates in creeks and small to large rivers; impoundments, oxbows, and ponds.
Yellow bullhead	Pools, backwaters, and sluggish current over soft substrate in creeks and small to large rivers; oxbows, ponds, and impoundments.
Common carp	Muddy pools of small to large rivers; lakes and ponds. Most common in manmade lakes and in turbid, sluggish streams containing large amounts of organic matter.

3.10.6.1.1. Cause and Effect Relationships/Resource Pressures and Responses

The cause and effect relationships and resources pressures and responses are the same as those that apply to all wildlife groups and are referenced elsewhere in the FEIS.

3.10.6.1.2. Occurrence and Trends

The status and distribution of habitat across the local and regional landscape has changed significantly since the early 1800s, or pre-European settlement. Occurrence and trends of general wildlife habitats at a local (Midewin) and regional (Central Till Plains Section) scale are described in the previous section General Wildlife Habitat Types and Associated Animal Species.

3.10.6.1.3. Midewin National Tallgrass Prairie – Local Scale

Specific data are not available about the historic status and distribution of the game species listed. Essentially all wildlife habitat types have declined in distribution on Midewin since the early 1800s; however, shrubland and edge habitats have probably increased on site. Historic and current acreages for general habitat types are as provided in the table previously listed in this section.

3.10.6.1.4. Central Till Plains Section – Cumulative Effects Area Scale

Essentially all wildlife habitat types have declined in distribution within CTPS since the early 1800s. Historic and current occurrence and trends for general habitat types are described in the previous section.

3.10.6.2. ENVIRONMENTAL CONSEQUENCES

3.10.6.2.1. Direct and Indirect Effects

Each action alternative provides for a mix of restored, reconstructed, and improved prairie, grassland, wetland, stream, forest, woodland, savanna, and successional non-native vegetation habitats. Refer to Table 3.27 for a comparison of general habitat acreages and developed features by alternative.

Under Alternative 1 (no action), grassland, wetland and mature forest, woodland, and savanna habitats would decrease in quality, and then eventually in area also, as habitats degrade due to lack of management and the resulting habitat degradation. The effect on game and harvest wildlife species that utilize these habitat types would be generally negative, especially for those specialized for any of these habitats or have area requirements. Successional non-native vegetation habitats will increase in area as woody species expand their distribution by encroaching into other habitats. The impact on game and harvest wildlife that use successional non-native vegetation habitats would be positive, especially for those that are specialized for this habitat or have area (habitat size) requirements.

In general, Alternatives 2 – 6 would provide habitat benefit for game and harvest wildlife species associated with grasslands, wetlands, and forested habitats. Alternative 2, followed closely by Alternative 3, would provide the most habitat benefit for game and harvest animals generally associated with agricultural grassland. Alternatives 5 and 6 would provide the most habitat benefit for game

and harvest species associated with prairie. Alternatives 5, and 6 would most likely benefit animals generally associated with wetlands. Alternatives 2 – 6 are equally beneficial to game and harvest wildlife generally associated with forest, woodland, and savanna. Benefits for game and harvest wildlife associated with successional non-native vegetation habitats decrease from Alternative 2 through Alternative 6.

Development of visitor center or campground may impact or reduce the size of habitats due to their placement or proximity to habitats. Trails and road construction may impact habitats due to their potential for introducing human disturbances. Alternative 6 provides for the fewest features and the least impact to and reduction in size of habitats. Alternative 5 provides the next least impact to and reduction in size of habitats, followed by Alternative 4.

3.10.6.2.2. Cumulative Effects

Under Alternative 1 (no action) there may be negative impact on prairie restricted and general grassland game and harvest wildlife. If the large, open grasslands here degrade or succeed to woody habitats this would result in a regionally significant loss of habitat due to the size and regional importance of the Midewin grasslands. Alternative 1 is not expected to have a regionally significant negative impact on wetland, forest, woodland, and savanna habitats as their current acreages are not regionally significant. Alternative 1 may be regionally beneficial for game and harvest wildlife using successional non-native vegetation habitats as these acreages would increase over time.

Alternatives 2 - 6 will likely benefit many game and harvest wildlife species associated with grasslands within the Central Till Plains Section. The grasslands at Midewin alone represent the largest grassland habitat in Illinois. Combined with several other large grassland areas managed for wildlife in the Prairie Parklands area of Illinois (Goose Lake Prairie Nature Preserve and Des Plaines Conservation Area), Midewin would provide regionally significant grassland for both prairie restricted and general game and harvest grassland animal species. Alternatives 5, and 6 would most benefit game and harvest animals generally associated with grassland. Alternatives 2, 3, and 4 would most benefit area sensitive game and harvest wildlife associated with grassland. No alternative would have an impact on the other habitats in the region that support game and harvest species. (Refer to Table 3.27 for restored acreage estimates of general habitat types by alternative).

3.10.6.3. MITIGATION

Mitigation measures are included in Prairie Plan Standards and Guidelines. This includes protecting existing and restored grassland, wetland, forest, woodland, savanna, and some existing types of successional non-native vegetation habitats associated with these other habitat types. Also included is guidance for

managing and developing habitats, features, and facilities in proximity to one another.

3.10.6.4. MONITORING

Monitoring of specific game and harvest animals will continue to be conducted through hunter harvest records. Some habitat components will be monitored; water quality of streams and wetlands; and continued inventory the number of acres of specific habitat types as habitat establishment and restoration take place.

3.11. *RECREATION AND INTERPRETIVE PROGRAMS*

3.11.1. INTRODUCTION

No public recreational use has existed on site since the early 1940s, aside from hunting. Historical accounts indicate that recreational facilities were provided for Joliet Arsenal on-site personnel and that hunting was available to hunting club members. Public hunting began in the early 1990's and has continued on site up until the present.

3.11.2. AFFECTED ENVIRONMENT

3.11.2.1. Existing Recreational Opportunities at Midewin

Public access to Midewin has been minimal because of the hazards remaining from the Army arsenal operations as well as current cleanup activities. Hunting has continued to be the only unsupervised recreational activity, although limited to a specific area. Other public access has been allowed for restoration activiites, guided tours, and limited interim trails.

3.11.2.1.1. *Deer Hunting*

The Forest Service continues to allow deer hunting in the southwest portion of Midewin. In 1997, this activity was limited to hunters holding a hunting permit for the adjacent Des Plaines Conservation Area. In 1998, the opportunity to hunt deer at Midewin was opened to all holders of an Illinois deer hunting license if they also purchased a Midewin Pass. Two accessible hunting blinds were available by reservation for hunters with disabilities. In 1999, to improve the hunting experience and accomplish deer management objectives, the boundaries of the deer hunting area were expanded and hunters were required to sign up for designated sites. In the future, other types of game hunting may become available at Midewin, depending on the results of site-specific studies.

3.11.2.1.2. *Tours*

Because of the Army's cleanup activities, the Forest Service has not been able to offer unsupervised public access. The public is eager to view the Midewin lands, especially because the property was closed for so many years. The tour program, originally designed to familiarize and prepare the public to participate in the land use planning process, has been expanded to include more specialized interpretive activities. Guided tours travel by car or van, using existing roads and stopping for interpretive talks. Midewin hosted 600 people on guided tours in 1999 and 400 during the 2000 season.

3.11.2.1.3. *Educational Programs*

School groups guided by staff and volunteers visit the site to participate in the Mighty Acorns Youth Stewardship Program. Over 1,000 elementary and middle school students in Will County visit Midewin three times during the school year to perform stewardship activities – such as harvesting native plant seed or pulling invasive weeds – and to participate in environmental education programs.

3.11.2.1.4. *Volunteer Programs*

Midewin benefits from the time and talents contributed by hundreds of dedicated volunteers. Most volunteer efforts focus on restoration activities, including collecting, and cleaning seed, and potting, planting, weeding, and watering in the native seed production gardens. Other volunteers lead tours and educational programs, build and remove fences, collect litter, and a variety of other activities. Volunteering is a growing activity as people are spending their leisure time at Midewin enjoying the camaraderie of other volunteers and the feeling that they are improving the environment. Staff or trained volunteer leaders are present to guide volunteer activities, provide interpretation, and control their access on the site.

3.11.2.2. The Unique Experience of Midewin

As the largest public open space in northeastern Illinois, Midewin will offer experiences of vastness and solitude unavailable elsewhere. The area will provide opportunities for long distance trails without interruption by public roads, and opportunities to experience prairie ecosystems and view grassland wildlife.

3.11.2.3. Existing and Proposed Recreational Opportunities in the Region

Many state and county parks, forests, and preserves are within a 50-mile radius of Midewin. Most of the sites are small (under 1,000 acres). Several private recreational clubs require membership fees and offer fishing, camping, golfing, etc.

Within 60 miles of Midewin, two sites are comparable in size to Midewin: the 15,000-acre Indiana Dunes State Park/National Lakeshore complex and the 12,000-acre Palos Forest Preserve. The Indiana Dunes State Park/National Lakeshore complex is known for its wide diversity of habitats ranging from upland forests to marshes to the fragile, open dunes of the lakeshore. It offers hiking, biking, and equestrian trails, camping, a swimming beach, nature center, and a historic farmstead. Palos Forest Preserve is predominantly forested habitat with several sloughs and ponds, and offers hiking trails, mountain bike trails, equestrian use, fishing, a Boy Scout camp, picnic areas, and a nature center. Both sites are transected by public roadways.

The 4,000-acre Kankakee River State Park is a forested area that offers trails for hiking, bicycling, equestrian, and snowmobile use. Opportunities for camping, hunting, fishing, and canoeing are also provided. The 5,000-acre Des Plaines Conservation Area, comprised mainly of fields and forested areas, is adjacent to the west boundary of Midewin and offers fishing, hunting, field trialing, camping, and equestrian trails.

The nearest prairies are Goose Lake Prairie (2,537 acres), Hoosier Prairie, Braidwood Dunes and Savanna Nature Preserve (259 acres), Lockport Prairie Nature Preserve (254 acres), Romeoville Prairie Nature Preserve (108 acres), Grant Creek Prairie Nature Preserve (78 acres), Hitts Siding Nature Preserve (260 acres), and Wilmington Shrub Prairie Nature Preserve (146 acres). Trail opportunities, if available, are for hiking only.

The Forest Preserve District of Will County proposes to develop the Wauponsee Glacial Trail on the abandoned railroad corridor adjacent to the east boundary of Midewin. This 24-mile multi-use trail will be available for hiking, biking, equestrian, and, possibly snowmobile use. The trail will serve to connect Midewin to the City of Joliet to the north and the Kankakee River within three miles of the Kankakee River State Park to the south. The Wauponsee Glacial Trail will also serve to connect Midewin to the 21-mile Old Plank Road Trail that extends east from Joliet to Chicago Heights.

Midewin is located within the Illinois and Michigan (I&M) Canal National Heritage Corridor. The proposed Wauponsee Trail could provide a trail connection from Midewin to Joliet within one mile of the I&M Canal State Trail. These trails are part of the State designated 454.5-mile Grand Illinois Trail and the Federally designated 6,356-mile American Discovery Trail.

3.11.2.4. *Camping*

Three public campgrounds, all managed by the Illinois DNR, are in the vicinity of Midewin: Des Plaines Conservation Area adjacent to Midewin's western boundary, Kankakee River State Park, 8 miles south of Midewin, and Channahon State Park, 14 miles northwest of Midewin. The Empress Casino and Martin Campgrounds are nearby privately-owned campgrounds. The Empress Casino is 12 miles north of Midewin and offers camping for recreational vehicles only. The Martin Campground is 8 miles north of Midewin.

Table 3.29 - Camping Opportunities in the Vicinity of Midewin

Location	Public Campground	Private Campground	Number of Campsites with Hookups	Number of Campsites without Hookups
Des Plaines Conservation Area	X			22
Kankakee River State Park	X		167	96
Channahon State Park	X			25
Empress Casino		X	88 (RV-only)	
Martin Campground		X	100	19

3.11.2.5. *Campground Use*

The following information refers to campgrounds managed by the Illinois Department of Natural Resources and was derived from the IDNR 's 1998 "Camping Plan."

- In general, campgrounds located in the Midwest experience their main camping season in the six-month period from May 1 through October 31 (26 weekends).
- Most campgrounds experience capacity crowds only on Memorial Day, Fourth of July, and Labor Day weekends. The rest of the campgrounds experience capacity crowds on up to nine weekends in the six-month period.
- In IDNR's Region 2, which includes the Chicago metropolitan area (and Midewin), half the sites are full to capacity on weekends for half of the six-month season.
- Estimated statewide occupancy rates for all non-holiday weekends are:
  - Class A campgrounds (69% occupancy), offer showers and electricity.
  - Class B campgrounds (55% occupancy) offer showers or electricity, but not both.
  - Class C campgrounds (33% occupancy) minimally developed but provide vehicular access to campsites and water hydrants.
  - Class D campsites (34%) offer primitive, walk-in camping with limited facilities
- In IDNR's Region 2, general occupancy estimate on weekends for Classes A through D is 60%. Of the campsites available in Region 2, 86% are either Class A or B and have a 93% occupancy rate.

The Des Plaines Conservation Area adjacent to Midewin has 22 primitive sites (no utilities or showers).

Kankakee River State Park offers the closest campground to Midewin (8 miles) and provides electricity and showers. In 1998, 8,000 permits were issued for its 263 sites. Personal communication with the Site Superintendent confirmed that the campground is full most weekends with regular weekday use during the six-month season. Recreational Vehicle sites receive more use than tent sites.

Channahon State Park is 14 miles north of Midewin and offers 25 tent sites with no utilities or showers. In 1998, 251 permits were issued.

The I & M Canal State Trail offers a few remote campsites accessible by hiking or bicycling. It appears these sites are not used frequently; many campers visiting the I & M Canal use the campgrounds at Gebhart Woods or Channahon State Park.

3.11.2.6. Summary of Recreation Demand

Information from national, state, and local surveys as well as input during the Prairie Plan public involvement process indicates a demand for a variety of recreational opportunities and facilities, primarily those involving an appreciation of the natural and scenic environment. The need for opportunities close to home will grow as populations increase, roadways become more congested, leisure time is limited, and populations age. The increasing population of older adults may have more leisure time and will desire more moderate activities, closer to home, and suiting their physical abilities and preferences.

Midewin has the opportunity to serve both local and regional needs. Will County, immediately surrounding Midewin, is the fastest growing county in Illinois and the population is expected to double by the year 2020. Approximately 10 million people live within 50 miles of Midewin, which includes the City of Chicago, suburbs, and parts of Indiana.

3.11.2.7. ASSUMPTIONS COMMON TO ALTERNATIVES

3.11.2.7.1. Recreational Facilities are Conceptual

Developed areas, such as a visitor center, campground and picnic area are represented as Management Area 2. The intent is to locate the facilities in the best area within the Management Area and conduct restoration activities surrounding and up to the facilities. The exact location and details of facilities will be identified during site-specific planning.

3.11.2.7.2. Trails

Trail locations identified in the alternatives are conceptual. Trails are classified as four types based on the most impacting type of activity -- hiking, bicycle, equestrian and multiple-use (all three activities). Hiking and cross-country skiing are allowed on all types of trails. Trail construction requirements, width, and surfacing will vary depending on the location, and anticipated use (see Table below). These details, in addition to the exact location of trails, will be determined during the site-specific level of planning. Since Army cleanup activities are scattered around the site, development of new trails may be restricted until the cleanup is completed. Interim/temporary trails may be necessary to bypass those areas.

3.11.2.7.2.1. *Hiking Trails*

- All action alternatives provide trails for hiking use only.
- Hiking trails do not fragment grassland habitat and are thus identified in areas considered "unfragmented."
- Hikers may go off designated trails in some areas; however, certain restrictions may apply, depending on the habitat.
- More hikers are expected than bicyclists or equestrians.

3.11.2.7.2.2. *Bicycle and/or Equestrian Trails*

- Bicycle, equestrian, and multi-use trails are located on the perimeter of designated unfragmented grasslands, because the width and/or type of activity on these trails is assumed to fragment habitat.
- Bicycles and/or equestrians are limited to designated trails. Education, enforcement and design will be used to deter off-trail use.

Table 3.30 - Guidelines for Trail Development

Trail Type	R.O.S Class*	Width	Surface
Hiking	Semi-Primitive	32- 42"	Mowed turf, dirt, wood decking, or natural appearing reinforced surface
Hiking	Roaded Natural	4-6'	Mowed turf, limestone screenings, or other firm surface
Hiking	Rural	4-6'	Asphalt, concrete, brick, wood decking, limestone screenings, or mowed turf
Equestrian (and hiking)	Roaded Natural and Rural	8-10'	Limestone screenings
Bicycle (and hiking)	Roaded Natural and Rural	8-12'	Limestone screenings, asphalt, or concrete
Multi-use (hiking, bicycling, and equestrian)	Roaded Natural and Rural	10-14'	Limestone screenings

* ROS = Recreation Opportunity Spectrum.

3.11.2.7.3. Facilities

Recreational facilities are proposed in the alternatives based on the following descriptions. Actual development will depend on the market analysis, interpretive plan, recreational opportunity spectrum, architectural and thematic guidelines, and site-specific planning to further define goals, needs, size, locations, costs, impacts, etc.

3.11.2.7.3.1. *Visitor Center – Proposed in Alternatives 2, 3, 4 and 5*

- A visitor center is envisioned as a complex of both indoor and outdoor facilities with the ability to serve large and small groups. A visitor center would

function as a focal point to provide services and information, and introduce Midewin's interpretive themes. A large acreage is proposed to allow flexibility in locating the various elements. Restoration would occur between constructed features. A visitor center is anticipated to have the highest concentration of visitors and largest parking area

- The development would include one major building, a few support structures, outdoor exhibits, and a group interpretive area such as an amphitheater.
- An Environmental Learning Center (ELC) could serve groups in a variety of educational programs. It may be in the main building or a separate structure with connecting paths. Alternative 2 has a separate site for the ELC. Alternative 1 and 6 have no ELC.
- The visitor center complex would also have a 1/2- to 2-mile interpretive trail and a trailhead for longer trails.
- The auto loop or shuttle proposals in Alternatives 2, 4, and 5 would also access the visitor center complex.
- Visitor center locations were selected based on an expansive view of future restored prairie, access to public roads, and proximity to a variety of habitats, a bunker field, and a cultural resource site to facilitate interpretation programs.

3.11.2.7.3.2. *Camping – Proposed in Alternatives 2, 3, 4 and 5*

Three types of camping are proposed to serve different needs and to provide different experiences. Public input varied on this issue thus the alternatives reflect a variety of camping opportunities and combinations. To some, camping is considered as part of the prairie experience, to others it is a service offered to allow an extended visit to the site. Details such a unit size, quantity, spacing, and level of support facilities will be determined at the site-specific level of planning.

- **Developed Campground – Proposed in Alternatives 2, and 3**

This type of facility is proposed to serve families and individuals desiring an overnight experience with easy access to their automobile. Facilities will, at a minimum, provide vehicular parking, restrooms, and tent pad. Utilities such as electricity and other amenities may be considered during site-specific planning. A group gathering area for interpretive programs may also be included.

- **Group Camping – Proposed in Alternatives 2, 3, and 4**

This type of camping offers opportunities for organized groups to have a camping experience. The site layout usually provides a central gathering area for meals with opportunities for interpretive and educational programs.

- **Dispersed Camping – Proposed in Alternatives 3, 4, and 5**

This type of camping area, proposed in Alternatives 3-5, is accessed only by trails with the intent of providing a back-country type of experience

away from the sights and sounds of human activity. Dispersed campsites have not been identified on the site map and will most likely be planned in conjunction with the trail system. Restroom facilities are rustic and primitive. Camping units may be clustered to share the minimal facilities provided; however, the units are spaced farther apart from each other than in a developed campground.

3.11.2.7.3.3. *Picnic Area – Proposed in Alternatives 2, 3, 4, & 5*

An area for families and groups to gather may offer several small shelters and/or a larger shelter with picnic tables and support facilities such as parking, restrooms, and water. This facility may also function as a trailhead and offer interpretive exhibits as well.

3.11.2.7.3.4. *Shuttle– Proposed in Alternatives 2, 4, & 5*

A shuttle is envisioned as a rubber-tired, quiet vehicle that can transport small and large groups of people through a portion of the site. It may allow a few on/off stops and may provide interpretation. In the absence of personal vehicles, the shuttle allows visitors to see areas of the site that may be difficult for them to access on their own. The shuttle is also intended to minimize traffic congestion.

3.11.2.7.3.5. *Auto Loop / Scenic Drive – Proposed in Alternatives 2 & 3*

The use of personal automobiles is limited in all alternatives. Alternatives 2 and 3 propose a five-mile auto route, a one-way route with a slow speed limit to facilitate viewing the landscape and wildlife. This route may have a few scenic turnouts to allow for photography, etc., and to minimize traffic congestion.

3.11.3. ENVIRONMENTAL CONSEQUENCES

3.11.3.1. Direct and Indirect Effects

3.11.3.1.1. Management Activities and Recreation

Management activities are discussed relative to their effects on recreation and interpretation. Refer to the individual sections for more detail on these management activities. The alternatives are evaluated based on the desired conditions even though cleanup activities and funding limitations will result in phased development over several years. Effects are common to all action alternatives, unless otherwise stated.

3.11.3.1.1.1. *Restoring and Maintaining Native Habitat* will provide nature-viewing opportunities for interpretation and volunteer stewardship activities. Restoring native vegetation may provide an appearance similar to what was seen by Eliza Steele in 1840.

3.11.3.1.1.2. ***Managing Grassland Habitat*** will provide opportunities for visitors to view sensitive grassland birds. It may include the use of cool season non-native grasses to provide the proper height and structure for the birds.

Alternatives 2 and 3 have the most area managed for short and medium grass heights by cattle grazing. Alternatives 1, 5 and 6 have the least amount of area to be managed for short and medium grass height and Alternative 4 is in the middle of this range.

3.11.3.1.1.3. ***Grazing and Mowing*** help maintain a desired grass height and structure for grassland bird habitat. Mowing is seasonal and would occur only on portions of the site. The machinery may create noise and dust and the area will appear less natural for a few weeks. Grazing will require extensive fencing to contain the animals. Whether to allow the visitor within the same area as the grazing animals will need to be determined at the site-specific level of planning. Grazing with livestock gives the landscape a pastoral appearance.

3.11.3.1.1.4. ***Prescribed burning*** may result in temporary closures to portions of trails. This activity would not occur on the entire site, however, it is conducted on a regular seasonal basis. Trails through burned areas will provide an opportunity for interpreting the role of fire.

3.11.3.1.1.5. ***Integrated Pest Management*** is an approach to controlling invasive species and ranges from pulling weeds by hand to using chemicals on specific species. This will provide for a more diverse ecosystem and may offer opportunity for public involvement/volunteerism.

3.11.3.1.1.6. ***Managing Watersheds*** will provide natural and stable waterways and a variety of habitats for the visitor to enjoy and study. While all alternatives provide for watershed management; Alternatives 5 and 6 restore the largest acreage.

3.11.3.1.1.7. ***Cleaning up the arsenal*** may restrict large areas from visitor access and temporarily limit recreational facility development. Completion of cleanup should provide a site safe for public use. Trail users may experience the sights and sounds of construction equipment at nearby sites or the view of fencing to restrict access to the areas. These activities will be temporary; but will continue for at least 10 years.

Mitigating measures:

- Construction equipment will be limited to designated routes.
- Interim/temporary trails may be provided to avoid areas not approved as safe for public use.

3.11.3.1.1.8. ***Managing Transportation and Access*** involves access for public and administrative purposes. Administrative access to cemeteries, dams, Army in-holdings/monitoring sites, and agricultural leases must be maintained in all alternatives.

3.11.3.1.1.9. ***Use of Adjacent Land*** activities may affect Midewin visitors, but this is beyond the control of the Forest Service. Existing activities include railroads, public roadways, agricultural use, and industrial parks. Future activities may include a landfill, an additional industrial park, and future residential and commercial development. Impacts may include views of structures and vehicles, sounds of horns and machinery, and smells of emissions or decomposing material.

All action alternatives have trails along a portion of the site's perimeter. Visitors along these trails may be able to see, hear, and/or smell activities on adjacent properties. All action alternatives provide interior trails for visitors wishing to minimize outside influences. The multi-use trail in Alternative 6 is entirely on the perimeter and subject to the greatest exterior influences.

3.11.3.1.2. Recreational Facilities and Trails-Comparison of the Alternatives

3.11.3.1.2.1. Recreation Opportunity Spectrum

The Forest Service plans and manages for recreational experiences through the application of the Recreation Opportunity Spectrum (ROS). ROS classes are defined by their combination of activity, setting, and experience. Because of Midewin's size and location, the spectrum has been limited to three classes and modified to reflect the unique experience Midewin has to offer. Because of the proximity to public roadways, all alternatives are similar in the ability of each to provide these ROS classes.

The ***Rural*** class represents Midewin's highest level of development. New facilities are in harmony with the natural environment, and automobile and road access are allowed in, these areas. Hunting is not allowed because of the high concentration of people. An area with a visitor center or developed campground is an example of the rural ROS class. Approximately 1,281 acres of Midewin would be managed under the Rural guidelines for Alternatives 2, 3, 4 and 5. Alternative 6 would have less, because there is no visitor center or campground, and all of Midewin is classified as rural under Alternative 1.

The ***Roaded Natural*** class represents a moderate level of development. New facilities are minimal, and the environment appears natural. Automobile and road access are acceptable. An area with bicycle or equestrian trails is an example of the roaded natural ROS class. Approximately 12,511 acres of Midewin will be managed under the Roaded Natural guidelines for Alternatives 2 through 6. Alternative 1 has no Roaded Natural areas.

The ***Semi- Primitive*** class represents an area with the lowest level of development, highest opportunity for solitude, and the greatest opportunity to avoid the sights and sounds of humans. Only foot traffic would be permitted in these areas. A hiking trail, or a natural area with no trails is an example of the semi-primitive ROS class. Approximately 3,140 acres will be managed under the Semi-Primitive guidelines for Alternatives 2, 3, 4, and 5. Alternative 6 would have more Semi-Primitive areas and Alternative 1 would have no Semi-Primitive areas.

3.11.3.1.2.2. Diversity of recreational opportunities

Visitors come to public lands with different interests, physical abilities, and amount of leisure time. The availability of choices will enhance the recreational experience.

Alternatives 3 and 4 offer the greatest variety of choices. Alternatives 1 and 6 offer the least variety.

Table 3.31– Diversity of Recreational Activities

Indicator: Recreation Activities Available	Alt. 1	Alt. 2	Alt. 3	Alt. 4 [1.]	Alt. 5	Alt. 6
Visitor Center/ Environmental Learning Center [3.]	no	yes	yes	yes	yes	no
Hiking only (miles) [3.]	3	37	40	20	30	12
Multi-use trail - bicycle, equestrian and hiking (miles) [3.]	0	0	18	17	23	15
Bicycling and Hiking (miles) [3.]	0	35	20	6	# [4.]	# [4.]
Horse back riding and Hiking (miles) [3.]	0	0	11	5	# [4.]	# [4.]
Shuttle (guided tour)	no	yes	no	yes	yes	no
Auto Loop (self guided tour) [2.]	no	yes	yes	no	no	no
Developed Camping (family) [2.]	no	yes	yes	no	no	no
Group Camping [3.]	no	yes	yes	yes	no	no
Dispersed Camping [3.]	no	no	yes	yes	yes	no
Picnic Area	no	yes	yes	yes	yes	no
Wildlife/ Nature Viewing	no	yes	yes	yes	yes	yes
Hunting (seasonal)	yes	yes	yes	yes	yes	yes
Total types of activities	2	10	12	11	8	4
Compatibility of activities	2	8	10	11	8	4

Note 1: Alternative 4 is the preferred alternative.
Note 2: The following recreational activities are considered not compatible with the ecological goals of Midewin: Auto Loop (self tour) and Developed Camping (family).
Note 3: The following recreational activities fill Midewin's niche by providing opportunities for interpretive and educational programs and backcountry experiences in a restored prairie setting: visitor center/environmental learning center, trail system, group camping site, and dispersed camping sites.
Note 4: Available on shared multi-use trails; but not included in diversity calculation.

3.11.3.1.2.3. Potential for User Conflict

The future patterns and intensities of visitor use at Midewin are unknown; however, too many activities in a limited area may result in conflict among users and limit the opportunity to experience solitude. A site with multiple access points and greater trail mileage will better disperse the users so that conflicts may be less severe.

Alternatives 2 through 6 provide single use and multi-use trails. Conflict on multi-use trails may be minimized through trail design and education; however, the

potential for conflict can be compared by alternative. Alternatives 2 and 3, offering the most single-use trails and the most access points, will have the least potential for user conflict because users are separated and dispersed. Alternative 2 provides only for hiking and bicycling use, providing fewer activities to conflict with each other. Alternatives 5 and 6 have the greatest potential for user conflict with primarily multiple-use trails, and Alternative 6 has the fewest access points. Alternative 4 has a mixture of trail types and access points. Alternative 1 has only hiking trails, thus minimizing conflict with other user types.

3.11.3.1.2.4. Trail Opportunities

The table below displays the estimated mileage, type, and mixture of trails. The top number is mileage for that type of activity only, and the lower number, in parentheses, is the mileage available for that activity when combined with multi-use trails.

Table 3.32 - Trail Opportunities

Activity	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Hiking (hiking is allowed on all trails)	3	37 (72)	40 (90)	20 (48)	30 (53)	12 (27)
Bicycling	0	35 (35)	20 (39)	6 (23)	0 (23)	0 (15)
Equestrian	0	0	11 (30)	5 (22)	0 (23)	0 (15)
Multi-use *(bicycle, equestrian and hiking)*	*0*	*0*	*19*	*17*	*23*	*15*
Total Miles (on the ground)	**3**	**72**	**90**	**48**	**53**	**27**
( ) Indicates miles of trail available for this activity when combined with multi-use trails.						

3.11.3.2. Cumulative Effects

3.11.3.2.1. How the Alternatives Contribute to Recreation in Northeastern Illinois

While other recreational opportunities exist in this area, few offer a comparable setting and experience to Midewin. As the largest public open space in northeastern Illinois, Midewin can offer experiences of vastness and solitude, long-distance trails, distance from automobile traffic, and opportunities to see unique prairie wildlife. These experiences are generally not available elsewhere. Midewin can provide opportunities to hike, bicycle, and possibly ride a horse through large expanses being transformed into a sea of grasses and flowers.

3.11.3.2.2. *Trails*

Alternative 1 will provide limited contribution to the recreational opportunities in the area. Alternatives 2-6 provide a variety of trail types, locations, and distances as well as connections to existing and proposed regional trails.

3.11.3.2.3. *Camping*

Existing trails and campgrounds surrounding Midewin are well used and will most likely experience an increase in use as the population of the area grows and tourism opportunities increase. Midewin will be considered a tourism opportunity, attracting visitors from greater distances, requiring overnight services. No nearby facilities offer camping in a prairie-like setting. Midewin has the potential to offer the unique experience of sunrise and sunset on the prairie.

Alternatives 5 and 6 do not propose a campground. Alternatives 2-4 propose a developed campground and group camping areas, Alternatives 3-5 offer dispersed camping, which would offer a unique opportunity in the area.

3.11.3.2.4. *Visitor Center*

A visitor center is proposed in Alternatives 2-5 and would provide services and information and introduce interpretive themes unique to Midewin. The visitor center at Goose Lake Prairie State Park is the only visitor center in the area that also focuses primarily on a prairie theme, but will not meet the needs of Midewin visitors nor express the themes unique to Midewin.

3.11.3.2.5. *Adjacent Land Uses*

The following adjacent activities are in various stages of planning and development. It is unknown how activities at Midewin will affect them or how their activities will affect Midewin. It is possible that employees and visitors to these areas may be curious and visit Midewin and vice versa. Environmental impacts, as well as sights, sounds and smells from these activities may be anticipated to some degree but are unknown at this time.

Table 3.33 Adjacent land uses and effects on recreation

Existing Adjacent Land Uses	Potential Effects on Recreation
Commercial Railroads	Sights and sound
Public roadways i.e. Illinois Route 53, River Road, Hoff Road, South Arsenal Road, Interstate I-55	Sights and sounds along the perimeter
Army land (in cleanup)	On going sights, sounds
Des Plaines Conservation Area	Attracts additional visitors
Abraham Lincoln National Cemetery	Attracts additional visitors
Agricultural land	Possibly odors
Residential	Sights
Industrial (refinery, grain services)	Sights, and odors
Chicagoland Speedway	Sounds, Attracts additional visitors

Potential and Proposed Adjacent Land Uses	Potential Effects on Recreation
County landfill (planned) (see also Scenery)	Sights, sounds, odors
Deer Run Industrial Park, west side (under construction)	Sights, sounds, possibly odors
Island City Industrial Park, east side (in planning)	Sights, sounds, possibly odors
Wauponsee Glacial Trail (planned)	Attract additional visitors
Commuter rail service (in planning)	Sights from the perimeter, sound
Potential housing developments (in planning)	Sights from the perimeter, increase visitors
Agricultural lands in conversion to other uses (in planning)	Sights
Other Proposed Nearby Land Uses	**Potential Effects on Recreation**
Third Chicagoland Airport in Peotone (in planning, pending)	Sights, sound

3.12. *SCENERY*

3.12.1. AFFECTED ENVIRONMENT

3.12.1.1. Historic Landscape Character

The historic scenery of Midewin was a graceful expansive landscape with a subtle mix of prairie, enclaves of oak savanna (a mix of open-grown woodland and prairie), and woodland. The prairie was drained by meandering streams.

The landscape was subtle, ranging from rolling hills to a level plain. Patches of savanna and woodland provided the primary vertical element on the prairie landscape, while flowering forbs provided color through much of the summer and fall. The land was covered with a mix of medium to tall grasses and forbs. Views would have varied from extremely close to extensive vistas depending on the position of the viewer.

Eliza Steele (a visitor to the area in the 1840's) wrote this account in her book "A Summer Journey in the West"

"...I started with surprise and delight. I was in the midst of a prairie! A world of grass and flowers stretched around me, rising and falling in gentle undulations, as if an enchanter had struck the ocean swell, and it was at rest forever... You will scarcely credit the profusion of flowers upon these prairies. We passed whole acres of blossoms all bearing one hue, as purple, perhaps, or masses of yellow or rose; and the again a carpet of every color intermixed, or narrow bands as if a rainbow had fallen upon the verdant slopes. When the sun flooded this Mosaic floor with light, and the summer breeze stirred among their leaves the iridescent glow was beautiful and wondrous beyond anything I had ever conceived..."

3.12.1.2. Existing Landscape Character

Midewin is an irregular quilt work made up of layers of cultural influences laid on the land over the past 200 years.

The terrain is gently rolling. Numerous creeks, ditches and channels drain this undulating landscape. Many stretches of the streams were straightened or channelized, resulting in steeper stream banks and no meanders. In some areas, riprap lines the streambank to control erosion. Portions of the riparian area along Jackson and Prairie Creek are wooded. In western segments of Prairie Creek and Jackson Creek, dolomite limestone is visible when the water level is low. Kemery, and Doyle Lakes are small impoundments; havens for waterfowl with cattails and arrowheads emerging from the surface of the water.

Little of the historic landscape remains today. Occasional prairie remnants exist where the land was not disturbed. The entire Prairie is cut into a grid pattern of roads at one-mile intervals, typical of the early midwestern agricultural landscape. Most of this early road system remained the primary transportation system for the Joliet Arsenal. Other roads were abandoned and allowed to grow over. The farmstead landscape is still evident today, with rows of Osage orange trees that were planted as living fences in the mid 1800's. Along the roads are the remnants of numerous farmsteads, primarily building foundations and vegetation including windbreaks, fruit, shade and walnut trees, and various perennials, along with invasive shrubs.

Evidence of the Joliet Arsenal remains an important landscape feature at Midewin. The largest bunker field contains over 130 bunkers on 800 acres. Five bunker fields are located on the east side; the largest contains 87 bunkers and covers approximately 450 acres; the smallest covers about 120 acres and contains 23 bunkers. The bunkers vary slightly in shape and size depending on their intended purpose. In general they are an arched concrete structure approximately 60 feet long and 30 feet wide. Viewed from the sides or rear they appear as grassy knolls that quickly fade into the background as the viewer moves away.

Four rectangular groups of warehouses (60' x 500') cover approximately 190 acres each; with the largest array containing 34 buildings. Buildings within each group of warehouses are consistent in design and size but vary in materials.

The former arsenal facilities are joined by a network of 115 miles of roads (varying from two-track to paved) and 118 miles of railroad beds.

The spaces between the former arsenal structures are made up of a quilt work of agricultural land uses (See Figure 1- Map of Midewin NTP and Prairie Parklands). Some land is crop production, other hay and pasture land. The quilt work of land uses is irregular in size and shape.

3.12.1.3. Scenery of Adjacent Lands

The lands adjacent to Midewin have a substantial influence on the character of Midewin.

Four large areas, still in Army ownership, cover approximately 150 acres each on the east side of Midewin. Although not located on lands managed by the Forest Service, these facilities have a major impact on the character of the east side of Midewin. These facilities are constructed of masonry, corrugated steel and wood frame, following long straight lines. Various support structures are located on the periphery including guard huts, personnel changing buildings and personnel evacuation bunkers.

Illinois Route 53, a four-lane divided highway, runs north and south through Midewin. Within the corridor are a high-speed train track, private and Army properties, farmhouses, an agricultural products supplier, and grain bins and silos. Hoff Road, a two lane county road, borders the east side of Midewin on the north. Smaller paved and gravel roads are adjacent to and dead end at Midewin around much of the site.

Deer Run Industrial Park at the west side of Midewin will include a rail car storage area, container storage, vehicle storage, a transfer yard, a light industrial complex and various smaller businesses. It will be visible in the middleground and background from much of the western unit of Midewin. The light industrial portion of the development will be prominent from Jackson Creek.

Midewin is buffered from the Abraham Lincoln National Cemetery by Hoff woods, a native woodland area.

Island City Industrial Park and the Will County Sanitary landfill along the south end of the east side of Midewin are in early planning and development stages. The type of facility that will be developed at Island City Industrial Park is not known at this time. A proposal for the landfill includes a mounded system that may reach 150 feet above adjacent lands. It is expected that the upper portion of the site, as the mound develops, will always be un-vegetated and heavy equipment (scrapers, end loaders, etc.) will be visible during working hours. The landfill will be visible from many parts of the prairie.

Other industries are located to the northwest of Midewin, including Exxon- Mobil refinery, a prominent feature. The refinery is a complex of tanks, pipes and other steel structures that extend several stories in the air.

Des Plaines Conservation Area lies along the south and west boundary of Midewin, with wooded and grassy recreation areas with occasional parking lots and support structures.

The remaining property that borders Midewin is privately owned agricultural land. This land is primarily tilled or pasture with scattered farmhouses and out buildings (barns, machine sheds, etc.), divided by local roads. The land north of Hoff Road may be developed for housing, most likely starting near the village of Elwood. The land south of Midewin may also be developed in the near future.

3.12.1.4. Desired Condition

The desired condition of Midewin is a more natural appearing landscape than exists today. However, restoring the historic landscape is not possible because many of the extensive modifications to the land are virtually irreversible or infeasible. Therefore, restoration efforts will focus on moving the landscape character to a more natural appearing condition.

The Scenic Integrity Objectives (SIO) are the result of the compilation of analysis and survey to classify the desired scenic quality of the land. The objectives are used to guide management practices to ensure the scenic and ecological integrity of the land is maintained or improved. The relative visibility of the landscape, the level of concern with the landscape and the scenic attractiveness of the land are combined to form the Proposed Scenic Integrity Objectives (See Map Figure 15).

3.12.2. ENVIRONMENTAL CONSEQUENCES

3.12.2.1. Direct and Indirect Effects

3.12.2.1.1. Alternative 1

Alternative 1 the “No Action” alternative would not enhance or improve scenic integrity at Midewin. Many human made features would remain on the landscape. The patch-work of fields, pastures, and arsenal development separated by roads, railroad beds, and fence and hedge rows would remain as the primary fabric of Midewin lands. There would be no opportunity for solitude and vastness. Travelers on Illinois Route 53, River Road and Hoff Road as well as all other adjacent roads would see essentially the same landscape that exists today.

Existing interim trails would remain open and guided tours would remain the primary access to the interior of the property. The land seen by the public would not progress in the direction of the scenic integrity objectives. Because no additional native habitat restoration will occur in this alternative, the land will not move toward the proposed scenic integrity objectives.

Grazing and mowing would have a short-term impact of the visual quality of the area. These effects are minimal in this alternative due to the limited access on the site.

Integrated pest management would be limited to treating noxious weeds. Other invasive plants and successional woodland would be allowed to grow in areas (approximately 8000 acres) that are not included in the grassland management area, agricultural land use areas and existing prairie, savanna and wetland habitat.

3.12.2.1.2. Effects Common to Alternatives 2 through 6

Restoring native habitat has the best likelihood of meeting high scenic integrity levels. Managing for grassland habitat will also be close to meeting this scenic integrity level. Restoring native habitat will result in an increase of species diversity that will contribute to a natural appearing landscape. The greatest abundance of wildflowers and the greatest variety of vegetation heights are likely in areas where native habitat is restored.

Both native habitat restoration and grassland bird habitat may be managed by grazing resulting in a variety of vegetation heights. Grazing will have a moderate to high impact on the visual quality as grassland habitat increases, depending on the viewpoint of the visitor.

Prescribed burning may have a negative short-term effect on the visual quality of the landscape in prairie and wetland areas, because of the effect of the blackened landscape. The longer-term effects will be positive because fire will assist in re-establishing and maintaining native prairie vegetation. A longer-term positive effect can be expected in woodland areas where the fire will burn the scrubby undergrowth, improving the scenic quality of the woodland. Considering the short-term impact, there is little difference between alternatives. In the long-term, removing invasive species will improve the expansive scenic vistas that were part of the historic landscape.

Arsenal clean up is crucial in meeting the Scenic Integrity Objectives.

All alternatives have at least one point where a visitor can experience a view that can be described as vast or expansive. Trails, especially those with higher levels of development, such as biking, hold the potential to impact the visual aspect of the prairie. The potential is greatest in low vegetative types because the trails can be seen from a greater distance. Alternative 6 has the least opportunity to effect scenery resources because trails are located along the edges of the Prairie. The hiking trail along the creek limits opportunity for expansive views.

Biking/hiking trails run adjacent to the future landfill development and Island City industrial park; the landfill will have a major impact on the experience of users of this trail. Views and sounds of the landfill will be prominent from this area of the prairie.

Locating recreational facilities on the periphery and grouping the campground and picnic areas together will help minimize impacts on the visual quality of the prairie. The visitor center also has the potential to change the Illinois Route 53 corridor viewshed.

Because restoring native habitat would most greatly enhance the scenic integrity level, Alternatives 5 and 6 are rated highest among the five action alternatives.

3.12.2.2. Cumulative Effects

The activities proposed in all the action alternatives will result in overall improvements to the scenic integrity at Midewin. Alternative 1 will generally result in little change from current visual patterns.

The vicinity of Midewin is expected to become more highly developed in the future. Industrial parks and the Will County landfill will be developed and housing

developments may encroach upon the lands surrounding Midewin. Several of the developments may result in negative impacts to the scenic integrity of Midewin. Since the activities in all alternatives either improve scenic integrity (alternatives 2-6) or maintain existing scenic integrity (alternative 1), none of the alternatives are additive to the negative visual cumulative affects that may result from developments outside, but within the viewshed of Midewin. Lands within Midewin will provide a visual respite within encroaching development.

3.13. *HERITAGE RESOURCES*

3.13.1. INTRODUCTION

The Forest Service protects and enhances heritage resource values. These efforts are based on concepts of conservation and Federal stewardship, and are guided by requirements mandated by Federal legislation, most notably the National Historic Preservation Act (NHPA) of 1966. Because heritage resources are non-renewable, the NHPA requires all federal agencies to consider the effects of their undertakings on cultural (heritage) resources.

Managing heritage resources involves carefully collecting and analyzing data. Because there are a wide range and sometimes-subtle expression of heritage resources and their values, federal legislation provides specific procedures, which must be followed to assure these values are considered in the decision-making process. Complying with these procedures requires inventorying, evaluating, determining effects, and mitigating adverse effects.

3.13.2. AFFECTED ENVIRONMENT

Archaeological surveys are not completed for all of Midewin. Project-related inventories have, and will continue to identify significant historic and prehistoric sites and other historic properties. Potential site locations will be based on analyses of sites located within Midewin, as well as those known to exist on adjacent state and private lands.

The historic and prehistoric heritage resources of Midewin are an important part of the local, regional and national cultural heritage. Identified historic sites consist of seven types:

1.) arsenal-related structures and features (n=445);
2.) farmsteads (n=174, a minimum of 43 impacted by arsenal construction);
3.) farmstead-related features (roads, fence and tree lines, and discard areas);
4.) rural domestic sites;
5.) schools (n=6, a minimum of 1 impacted by arsenal construction);
6.) churches (n=2);
7.) cemeteries (n=5).

Not all of these sites have been fully documented through archaeological inventory; these numbers have been gathered from archival resources. Early farmsteads (1830s-1850s) were located near the prairie-forest boundaries. In this way farmers were able to take advantage of both wooded and prairie environments: wood was necessary for housing, fuel and tool constructions. The

prairie did not have to be cleared—it was available for grain crops immediately. The invention of the steel plow and installation of drain tiles made the land highly productive. Areas too wet or too rocky to plough were used as pasture for livestock. Schools, churches, and stores were located near roads, especially crossroads, for easy access. Early cemeteries or those established between the 1830s and 1850s, were generally located on bluff crests or other elevated sites, whereas the later community cemeteries (post 1850s), similar to schools and churches, were located near roads.

Prehistoric sites at Midewin are likely to include:

1.) prehistoric isolated finds, consisting of a single artifact;
2.) limited activity camps (also called lithic scatters or camps);
3.) habitation sites which include evidence of multiple activities such as making stone tools, making and using pottery, gardening, storing or preparing food;
4.) mortuary sites consisting of burial mounds, although prehistoric burials were often made within villages as well. This last class of sites, as well as other traditional cultural properties, may have traditional or spiritual significance for contemporary Native Americans.

3.13.2.1. Archaeological evidence of the earliest peoples in Will County is sparse. Elsewhere in northeastern Illinois, Paleo-Indian projectile points tend to be found on slopes and edges of what were major bogs and sloughs.

3.13.2.2. Early Archaic (8,000-10,000 B.P.) peoples appear to have occupied uplands adjacent to bogs and marshes and wet prairies. Archaic people utilized two kinds of sites: large semi-permanent base camps and small, seasonally temporary extractive camps. Gathering seasonally available foods did not require entire relocation of large residential villages, but consisted of seasonal forays by only a segment of the village. Internments during the Early and **Middle Archaic** consisted of single individual graves in villages, camps and elsewhere. During the **Late Archaic**, prehistoric individuals began to be buried in small, low mounds by peoples of the “Red Ochre” culture.

3.13.2.3. Early Woodland sites (3,000-2,300 B.P.) are located on old sand ridges adjacent to swales within marshy bottomlands or sand islands in the marsh. These sites are characterized by the presence of extremely thick and poorly made pottery. **Middle Woodland** (2,300-1,700 B.P.) sites feature the frequent use of exotic raw materials and the frequent inclusion of obviously highly prized grave offerings in internments in large conical burial mounds, including whole ceramic vessels, tool kits, stone pipe, snake belts, mica, and elk teeth. Villages and mounds were largely located in the major river valleys. **Late Woodland** (1,700-1,100 B.P.) sites are more evenly spread across the landscape indicating these people were beginning to use the secondary river valleys and upland areas. As with the Middle Woodland, Late Woodland people continued to use mounds for burials, although they were smaller. They also

constructed another kind of mound called effigy mounds, which were representations of animals and other forms. The Late Woodland people also began to use corn or maize as part of their diet.

3.13.2.4. The **Mississippian** (900-1640 A.D.) cultural period in Illinois is characterized by permanent villages and towns featuring large truncated temple mounds surrounded by dispersed family-unit farmsteads. However, in northeastern Illinois, Mississippians were more mobile and often moved whole villages to seasonally available wild food resources. There are no temple mounds or elaborate burial rituals. During this time period, there appeared to be two major landscape choices for habitation: the northern edge of the Prairie Peninsula at the interface of the prairie and forest, and the riparian environments of the Kankakee Marsh and the Chicago Lake Plain. Because both prairie and marsh environments were present within Midewin boundaries, it is likely that late prehistoric Mississippian-era sites may be present within Midewin. Farming and corn were important to Mississippian culture. Although not a major part of their diet year-round, stored corn was critical during lean winter months. Sometime after 1400 A.D. prehistoric Native Americans began to hunt bison, although it did not become important as a wild food resource until the historic period (post 1640 A.D.).

3.13.2.5. Historic Native Americans in Illinois continued to hunt bison after 1640. The occurrence of bison, south of the rapids near Joliet, was mentioned by Pierre Deliette. In early summer (June) large numbers of Illinois people would leave their villages for communal bison hunts on the prairie. In the summer of 1688, the Illinois reportedly killed over 1,200 bison during a single hunting foray.

In the late 1600s, the Illinois were the most populous Native American ethnic group in Illinois. There may have been as many as twelve different Algonquin-speaking Illinois tribes, but by 1700 there appear to have been only five: the Cahokia, Kaskaskia, Michigamea, Peoria, and Tamaroa. Only the Peoria and Kaskaskia continued into the nineteenth century. The Illinois had a diverse economy based on agriculture (maize, pumpkins, beans, squash and watermelons), hunting, fishing and gathering wild foods.

An analysis of first hand accounts of historic-era Native Americans in northern Illinois suggest there may be three types of sites present, although none have been recorded to date: 1.) kill and primary processing sites, 2.) hunting camps or limited activity sites, and 3.) villages or base camps. This is consistent with our knowledge of the Illinois' settlement system. Summer villages located near large rivers were occupied during late spring planting (April and May) and again during late summer harvesting (late July through October). These large villages, which consisted of as many as 350 mat-covered longhouses, were reoccupied year after year. Summer hunting camps on the prairies were smaller and only occupied during the summer bison hunts. Winter villages were much smaller and often located in the river bottoms where good hunting was expected. These

winter homes consisted of smaller mat- or bark-covered oval lodges called wigwams.

During the eighteenth century other Indian tribes began to move into the Illinois country, including the Mesquakie (Fox), Iowa, Kickapoo, Mascouten, Piankashaw, Sauk and Potawatomi. The Ho-Chunk (Winnebego) moved into northern Illinois during the early nineteenth century. Native Americans continued to maintain a traditional lifestyle centered on farming, hunting, and fishing. As late as 1833, Chicago had only 300 American citizens. Almost all were engaged in the fur trade with an estimated 2,000 Native Americans who surrounded them. Archaeological investigations at a Potawatomi site in nearby Kankakee County and at a Kickapoo site in McLean County revealed that Native American groups engaged in the fur trade maintained many aspects of their traditional culture.

Cultural and environmental factors affected the selection of locations for Potawatomi sites. Potawatomi villages were generally located at the intersection of trails with significant natural features such as creeks or the prairie/forest margin. The Potawatomi often pastured their horses and planted cornfields on the prairie, while houses and wigwams were built along the prairie/forest margins, a setting that provided shade as well as wood for house construction and fires. There is archival evidence that Potawatomi or perhaps other Native American camps may have been present along the forest/prairie margins within the boundaries of Midewin, although no large villages are known to exist.

3.13.2.6. Euro-American settlement was restricted during the early years of the nineteenth century by lingering fear of the Potawatomi and other Native Americans after the Black Hawk War. However, by the mid-1830s a series of towns has been established along wooded sections of the river valleys. Prairie areas away from the rivers were initially avoided because of wet conditions, the belief that their soils were unproductive, and the lack of adequate farming equipment to break through the thick prairie sod. Except for a few early to mid-nineteenth century farms located adjacent to the “groves”, land sales and settlement in the areas away from the major river valleys remained stagnant during the 1840s. However, prairie land sales and settlement increased during the late 1840s after steel scouring plows were developed and improved, the Graduated Land Act of 1852 was passed, and the Illinois Central Railroad was built. The railroad served to tie the Kankakee River Valley into Chicago’s economic base. Land use and settlement patterns of the 1850s continued into the late nineteenth and early twentieth century. When the Elwood Ordinance Plant and the Kankakee Ordinance Works were built, all residence within the boundary of Midewin ended.

3.13.3. ENVIRONMENTAL CONSEQUENCES

3.13.3.1. Direct and Indirect Effects

Effects to heritage resources can stem from project-related management activities involving earth disturbance or land exchanges and public access. Natural forces such as erosion and other environmental processes may also cause serious adverse effects to archaeological sites. Stabilizing, maintaining, and rehabilitating sites or recovering data are ways to prevent the loss of significant resources and the information they contain. Standards and Guidelines for historic preservation are outlined in Chapter 4 of the Prairie Plan.

Public use may destroy heritage resources through inadvertent damage caused by compaction or other ground-disturbing activities. Vandalism, relic collecting, defacement and theft result in losing information and destroying the resource. Protecting significant heritage resources from public use includes establishing public education programs, maintaining confidentiality of site locations, monitoring, and directing public use away from vulnerable sites. Standards and Guidelines for protection and monitoring heritage resources are outlined in Chapter 4 of the Prairie Plan.

Educational and interpretative programs can create awareness of the importance of heritage resources and foster a sense of stewardship while enhancing the recreational experience. However, protective measures to control or eliminate intentional destruction of these areas by relic collecting, theft, and other forms of vandalism must be implemented. Standards and Guidelines for promoting heritage values are outlined in Chapter 4 of the Prairie Plan.

Management of other resources can provide opportunities for inventorying, evaluating and interpreting heritage sites. However, ground-disturbing activities have the highest potential to adversely affect these same heritage resources. Impacts are related to the location and nature of the activity, the characteristics of the soils, and the degree of use. Standards and Guidelines pertaining to heritage applications to natural resource management are outlined in Chapter 4 of the Prairie Plan.

Preservation of significant heritage resources includes those sites already listed on the National Register of Historic Places (NRHP) and sites nominated or determined to be eligible for inclusion on the NRHP. Protection of sites, which have not been evaluated against NRHP criteria, must be assured as well. Some areas may need to be avoided entirely to protect the resource. Preservation of both significant and unevaluated heritage resources may preclude some land management activities within designated areas. Compliance with Section 106 of the National Historic Preservation Act is required early in the planning process.

Preservation in-place through site avoidance is the preferred management of sites potentially eligible, eligible, nominated to or listed on the National Register of Historic Places. Potential effects from earth-disturbing activities may require mitigation measures in order to achieve a “finding of no adverse effect” in consultation with the State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation, and sometimes Native American tribal authorities. Potential effects are reduced or diminished when the physical settings around significant heritage resources are maintained in as natural or as undisturbed state as possible.

There is little risk of unforeseen impacts to heritage resources. All project areas in all alternatives are inventoried for heritage resources prior to project implementation and compliance with the NRHP and other applicable federal mandates completed. All heritage resources will have been identified as well as sites that may be eligible for inclusion on the National Register of Historic Places. Any potential adverse affects to these resources will have been mitigated through site avoidance or other approved site mitigation method.

Over time, the effects of erosion, decay, neglect and uncontrollable natural landscape changes may threaten the preservation of significant heritage resources. Increased project activity may result in accelerated loss of heritage resources, often through indirect effects caused by increased public access and the concomitant potential for looting and other acts of vandalism.

3.13.3.2. Cumulative Effects

Because preservation in place through site avoidance will be used for most sites, cumulative effects would be relatively minor or insignificant.

3.13.4. MITIGATION

All alternatives include requirements for identifying, evaluating, protecting, preserving, monitoring, and interpreting heritage resources. All alternatives also have requirements for consulting with the SHPO, Native American tribal authorities, and other interested parties as described in the heritage resource Standards and Guidelines (see Prairie Plan, Chapter 4), 36 C.F.R. §800 Protection of Historic and Cultural Properties, and other applicable mitigation direction found in related heritage authorities, including the Archaeological Resource Protection Act, Native American Graves Protection and Repatriation Act, Executive Order 11593 (Protection and Enhancement of the Cultural Environment, May 13, 1971), and Executive Order 13007 (Indian Sacred Sites, May 24, 1996).

Adverse effects are identified, avoided or mitigated through a variety of measures. Mitigation other than site avoidance may be accomplished through protective enclosures, systematic monitoring of project activities, or mandatory

restrictions on project design. When adverse impacts cannot be avoided, systematic recovery of resource information will be undertaken through archaeological excavation. An approved data recovery plan will be completed through consultation with the SHPO and the Advisory Council on Historic Preservation.

Protection of significant heritage resources from public use or over-use includes establishing public education programs, maintaining confidentiality in regard to site location information, and directing the public away from the most vulnerable sites.

3.13.5. MONITORING

Monitoring the effects of the Prairie Plan on heritage resources is required by law and Forest Service policy. On-site monitoring of archaeological sites and other historic properties will occur in order to ensure continued protection and preservation of known significant heritage resources. Chapter 6 of the Prairie Plan outlines monitoring requirements for heritage resources.

3.14. *SOCIO-ECONOMIC CONDITIONS*

3.14.1. INTRODUCTION

This section describes effects on the socio-economic environment including land use patterns, demographic trends, the general economy, local revenues, visitor services, present net value, and civil rights.

The Illinois Land Conservation Act determined the uses for lands of the former Joliet Arsenal, including the use of Midewin for habitat management. The social and economic effects of decommissioning Joliet Army Ammunition Plant are not considered here. This analysis compares the effects of the alternatives, and the analysis is limited because the alternatives differ little in their potential effects.

It is expected that the majority of visitors to Midewin will come from within a 100-mile area or the greater Chicago metropolitan area, home to almost 10 million people. However, the primary socio-economic effects will occur almost entirely within Will County, close to where Midewin.

The information presented below the affected socio-economic environment is from data compiled by the Northeastern Illinois Planning Commission (NIPC) and by the Illinois Department of Natural Resources, Prairie Parklands Assessment, Vol. 4, Socio-Economic Profile, 1999.

3.14.2. Land Use Patterns

3.14.2.1. AFFECTED ENVIRONMENT

Agriculture has been the primary land use in Will County, and farm employment is still important in southern Will County where Midewin is located. Agricultural land uses are dominated by production of corn, soybeans, and small grains. As of 1992, there were 1,057 farms in Will County comprising 61% of its total land base (US Census Bureau, 1996).

Eighteen percent of land uses in Will County are classified as urban. Industrial, commercial, and residential land uses occupy much of the remainder of the Will County land base. Residential land use is growing and farm acreage is decreasing, particularly in northern Will County. This trend is expected to continue, because Will County is one of the fastest growing counties in the region.

Future uses of the former Joliet arsenal are important components of the future land uses of Will County. In addition to Midewin, 3000 acres of the former arsenal will be used as two industrial parks, 455 acres will become a county landfill, and 900 acres became the Abraham Lincoln National Cemetery

Nature preserves and recreational land are important components of local land uses. The 16,000+ acres of Midewin constitute the largest piece of protected conservation lands in northeastern Illinois. The State of Illinois holds important tracts of preserved land, including the Des Plaines Conservation Area and the I & M Canal. The Will County Forest Preserve District has been increasing its holdings following a 1999 tax levy to fund county land acquisition.

3.14.2.2. ENVIRONMENTAL CONSEQUENCES

3.14.2.2.1. Direct and Indirect Effects

Alternatives 2-6 provide for the same basic land use, i.e. habitat management. Therefore, the alternatives are the same with regard to regional or local land uses. The direct effects of alternatives contribute to the regional land base for ecological preservation, recreation, enjoyment of the natural environment, and learning opportunities. The agricultural component would change as row crops are gradually phased out and converted to grasslands. Grazing will continue for habitat management.

Alternatives 2-6 may have indirect effects on nearby land uses. The visitor opportunities on Midewin may contribute to the development of service businesses in the immediate vicinity or nearby towns. (See “visitor services” below). Consequently, land uses in the vicinity of Midewin may become more commercial and less agricultural. The presence of Midewin as a local amenity may stimulate development of residential tracts on neighboring agricultural lands.

The potential for indirect effects varies by alternative. Alternatives that provide more visitor opportunities have more potential to encourage the growth of services near Midewin. Alternatives 2-6 have equal potential to attract residential developments to nearby lands. Both potential effects run parallel to regional trends that are tied to the economic development of the Chicago area, but the contribution of Midewin to the trends may be insignificant.

The No Action Alternative represents a continuation of the existing conditions, therefore few changes to associated social communities and lifestyles would be expected.

3.14.2.2.2. Cumulative Effects

However, the cumulative effects of the alternatives are minor or insignificant when compared to economic activities in Will County and the changes expected over the next 10 to 15 years.

3.14.3. Demographic Trends

3.14.3.1. AFFECTED ENVIRONMENT

In 1990 Will County's population was 357,313 and is expected to increase by 50% to 535,378 by 2005. Eighty-one percent of the population is urban, living in 7 cities and 34 villages. Joliet is the largest city with 77,000 residents. Wilmington's population in 1990 was 4,743. Will County is one of the fastest growing counties in the greater Chicago metropolitan area. The population of Will County is forecast to double by the year 2020. (The Herald News, August 22, 2000).

Joliet's population from the 1990 census shows a diversity of ethnic groups with 69% white, 19% African-American, and 12% Hispanic. By the year 2020, these percentages are expected to change significantly to 55%, 23%, and 22%, respectively. Wilmington is much less diverse with 99% white and 1% Hispanic origin.

The area's residents are fairly young, with 32.5% under the age of 19, compared to 29% statewide. The area is fairly affluent: Will County ranks 10th in per capita income statewide. The area's poverty rate is 6%, compared to the statewide rate of 12%. The education level of people 25 years and over is a little less than statewide with 18% with college education compared to 21% statewide.

3.14.3.2. ENVIRONMENTAL CONSEQUENCES

3.14.3.2.1. Direct and Indirect Effects

The No Action Alternative represents a continuation of the existing conditions, so few changes to associated social communities and lifestyles would be expected.

Alternatives will have no notable direct or indirect effects on demographic trends. No impacts are expected to the distributions of gender, ethnicity, urban/rural populations, or poverty levels among county residents. These alternatives would not result in adverse human health or environmental conditions for any persons living in the county. Thus, persons living below the poverty level would not be disproportionately affected by these alternatives.

3.14.3.2.2. Cumulative Effects

None of the alternatives will have notable cumulative effects on demographic trends or conditions of environmental justice.

3.14.4. General Economy

3.14.4.1. AFFECTED ENVIRONMENT

The general economy includes the different economic sectors, employment, and income levels.

In 1990, 99,393 people were employed in Will County. The service sector of the economy has grown while manufacturing jobs have decreased. The top three industries employing the largest number of people are services, retail trade, and manufacturing, employing 29%, 21%, and 20%, respectively. In 1995, the services sector employed more than one-quarter of the total workforce, with about $1 billion in earnings. Provena Hospital, with 2,300 employees, is the largest service sector employer, followed by Empress Casino, Caterpillar Inc., and Silver Cross Hospital.

The Deer Run Industrial Park is under construction, and expects to employ over 21,399 people while it is being developed, and employ about 8,760 people when fully operational. Estimated payroll for Deer Run for construction and permanent jobs during the first seven years totals $3,425,904,000. Permanent annual payroll after seven years is estimated at $508,080,000. (Deer Run Industrial Park Development Briefing Book, 1999).

The Island City Industrial Park is yet to be developed and its contribution to the local economy is still unknown. Overall, earnings in Will County increased by 64.8% from 1970 to 1994, indicating a healthy rate of economic growth despite the closure of the Joliet Arsenal, which resulted in the loss of 8,000 jobs in 1976.

3.14.4.2. ENVIRONMENTAL CONSEQUENCES

3.14.4.2.1. Direct and Indirect Effects

The No Action Alternative represents a continuation of the existing conditions, so few changes to associated social communities and lifestyles would be expected.

Alternatives 2-6 will provide a source of income for several farmers from Will County or other areas from permitted agriculture activities. Total government receipts and personal income from agriculture would decline under any alternative as row crops are eliminated.

Restoration and maintenance work on Midewin will create some short-term or seasonal employment opportunities, periodic service or maintenance work, and the purchase of supplies from local businesses. Restoration projects will result on potential contract awards to businesses or organizations that operate in northeastern Illinois and these projects will promote the development of the ecological services sector.

Development of recreation and interpretative services and facilities will result in contract awards to businesses from Will County or a wider geographical area. Maintenance needs on Midewin will benefit local companies. General operations would benefit a variety of local suppliers or service businesses.

3.14.4.2.2. Cumulative Effects

The cumulative effects of the alternatives are relatively minor or insignificant when compared to economic activities in Will County and the changes expected over the next 10 to 15 years.

3.14.5. Visitor Services

3.14.5.1. AFFECTED ENVIRONMENT

Most visitors to Midewin will come from within a 100-mile radius, which encompasses much of the greater Chicago metropolitan area. Midewin lies in close proximity to other recreation areas of the Prairie Parklands and will contribute to the tourism-based economic activity associated with the parks. The seven state-owned parks within the Prairie Parklands combine to become one of Illinois' popular outdoor recreation destinations, due to the close proximity to Chicago and the diversity of available activities.

Popular sites within the Prairie Parklands include the Illinois and Michigan Canal State Trail, a 61-mile park that had 560,000 visitors in 1997. Attendance at Goose Lake State Prairie and Heidecke Lake was greater than 300,000 in 1997. Several state fish and wildlife areas nearby also have high visitor use. Kankakee River State Park lies nearby. Mazonia/Braidwood, Des Plaines and La Salle State Fish and Wildlife areas accounted for 1.1 millions visitors annually from 1994-1996.

Most of the Prairie Parkland sites provide fishing or hunting opportunities and boat access, with campgrounds, picnic facilities and trails on a limited basis. Some sites provide for use of recreational and motorized vehicles. Recreational activities on Midewin will not include boat access, recreational vehicles, or motorized vehicles, and other activities may be more limited than on other Prairie

Parkland sites, so visitor activities will probably produce fewer demands for services.

The Illinois DNR determined that the Prairie Parklands sites contribute to the local economy through increased local tourism. IDNR used IMPLAN, an input-output model built on county data, to estimate the impacts. Their analysis determined that visitors generated approximately $30.6 million in total economic output, $8.9 million in personal income, and 415 jobs, based on average combined attendance of almost 2.7 million annual visits to the seven most-visited sites from 1993 to 1997.

3.14.5.2. ENVIRONMENTAL CONSEQUENCES

3.14.5.2.1. Direct and Indirect Effects

All action alternatives will have beneficial effects on the general economy by stimulating increased services for visitors to Midewin. It is expected that visitor opportunities on Midewin will increase the total number of visitors in the Prairie Parklands rather than displacing visitors from other nearby sites.

3.14.5.2.2. Outputs

Outputs relating to visitors are based on the gradual addition of approximately 5 miles of trail per year. Visitors participating in tours and educational programs as well as hunters are included as trail users for estimation purposes. An average of four nearby state park visitor counts indicates approximately 30,000 visitors per mile of trail. A more conservative estimate of 15,000 visitors per mile is used to project visitors to Midewin. Upon completion of a visitor center, anticipated around 2007, the visitor count is anticipated to rise an additional 20% and then gradually taper off.

Table 3.34 – Estimated Visitors per Year

Year	# Visitors	Trail Miles	Method of calculation
2000	2,000	0	Existing counts
2001	4,000	3 interim	Estimated from previous year
2002	75,000	5 interim	15,000 visitors /mile
2003	150,000	10 interim	15,000 visitors /mile
2004	225,000	15 interim/ permanent	15,000 visitors /mile
2005	300,000	20 interim/ permanent	15,000 visitors /mile
2006	375,000	25 interim/ permanent	15,000 visitors /mile
2007	540,000	30 interim/ permanent and a visitor center	15,000 visitors/mile + 20%

Table 3.35 –Visitor count from area parks

	Acres	1996/1997 Visitors Average	Trail Miles	Visitors per Mile
Des Plaines Conservation District	5,000	332,407	12	27,701
Goose Lake Prairie State Park	2,537	341,994	10.5	32,571
Kankakee River State Park	4,000	1,499,465	47	31,904
Morton Arboretum	1,700	350,000	12	29,167
Average				**30,335**

Visitors to Midewin will request services principally from nearby businesses, particularly in Elwood, Wilmington, and Manhattan but also in Joliet, Kankakee, Morris, or other cities nearby. Services will include purchases of gasoline, food, beverages, and lodging. Visitors may make occasional retail purchases of clothing, hiking or biking equipment, photographic equipment, Midewin memorabilia, outdoor guide books, maps or other information.

Using the results of IDNR's analysis as a rough gauge, 540,000 visitors per year are estimated to generate approximately 6 million dollars in total annual economic output, less than 1.8 million dollars in annual personal income, and sustain approximately 80 jobs through their demands for services. These figures include both direct and indirect increases in final demand. Overall, very little or no impact to the county's overall socioeconomic condition would occur, given the relatively small size of the area and the relatively minor contribution to employment of county residents.

The alternatives provide for different amounts of visitor recreational opportunities, and the effect of each alternative on the local economy would slightly vary with the number of visitors that arrive.

3.14.5.2.3. Cumulative Effects

The cumulative effects of the alternatives on visitor services would be relatively minor or insignificant when compared to existing economic activities in Will County and the changes expected over the next 10 to 15 years.

3.14.5.3. MONITORING

Monitoring effects of the Prairie Plan on the general economy is not required beyond the basic level of verifying the increased presence of visitors on Midewin and their increased demands on the local economy. Visitation and recreational uses of Midewin will be monitored.

3.14.6. Local Revenues

3.14.6.1. AFFECTED ENVIRONMENT

Midewin may generate government revenue through the agricultural permit program, deer or other hunting and fishing permit programs, and recreational fees. Twenty-five percent of the revenues collected by the Forest Service for the use of National Forest System lands and resources will be returned to the state of Illinois (the 25% Fund), and the state in turn redistributes the funds to the county. Federal law requires that these funds be used for county roads and schools.

For Fiscal Years 1997 and 1998, receipts for agricultural leasing at Midewin totaled $1,503,080.98. Payments made to the State of Illinois totaled $375,770. Collections in 1999 and 2000 totaled $1,413,200 with $353,300 made in payments to the State of Illinois. The remainder of these fees is administered under the Illinois Land Conservation Act 1995, whereby the Forest Service is authorized to collect user fees for the admission, occupancy, and use of Midewin. This law provides for a special fund “Midewin National Tallgrass Prairie Restoration Fund”, and monies collected may be used for restoration and administer Midewin.

User fees collected from deer hunters and visitors on guided tours in 1999 and 2000 totaled $21, 290. Visitor use and collection of user fees is expected to increase as facilities are developed and restoration progresses.

Property tax rates in Will County have risen 55% since 1966. Property tax revenues in 1996 were more than twice the 1971 revenues. Most of the tax base is from residential property, though a large percentage is from industrial property. Since 1981, the tax base from farm property fell from 6% to 3%, while residential property tax base increased from 60% to 67%. Most (61%) of the area’s property tax revenue goes to schools, with the remainder going to municipalities, county and township governments, and other local services.

Since 1978, farm acreage in Will County has decreased by 10%. Livestock in Will County account for less than 1% of the statewide livestock inventory, and the number of cattle has declined since the early 1980’s. The value of area farms is greater than the average statewide, but, as in the rest of the state, the number of farms is declining. In 1995, farm earnings accounted for less than 1% of total earnings in Will County. Less than 2% of Illinois’ farm receipts are produced in Will County, mostly from corn and soybeans.

3.14.6.2. ENVIRONMENTAL CONSEQUENCES

3.14.6.2.1. Direct and Indirect Effects

The no action alternative represents a continuation of existing conditions.

In Alternatives 2 to 6 the principal source of revenue will be agricultural permits. These will decrease annually as croplands are converted to pasture or restored prairie. Revenues from hunting permits will be essentially equal under all alternatives. Estimated revenues from recreational programs may vary slightly by alternative due to differences in the amount of available visitor access but may increase by 5% per year as trails and other visitor services are developed.

3.14.6.2.2. Cumulative Effects

The cumulative effects of the alternatives would be relatively minor or insignificant when compared to economic activities in Will County and the changes expected over the next 10 to 15 years.

3.14.7. Present Net Value

3.14.7.1. AFFECTED ENVIRONMENT

Present Net Value is an assessment of the present value of Midewin based upon future depreciation, revenues, and needs for investment under each alternative. The analysis of Present Net Value is a mandatory component of the FEIS. However, given the nature and purpose of Midewin, it is recognized that the Present Net Value is not a critical factor for comparing the alternatives.

3.14.7.2. ENVIRONMENTAL CONSEQUENCES

3.14.7.2.1. Direct and Indirect Effects

Table 3.36 - Present Net Value by alternative (in thousands of dollars)

ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6
11,359	-236,429	-260,395	-291,814	-326,439	-313,898

3.14.8. Civil Rights

3.14.8.1. AFFECTED ENVIRONMENT

Civil Rights are defined as the “legal rights of United States citizens to guaranteed equal protection under the law”, (USDA Forest Service manual 1730). An analysis of civil rights impacts is a mandatory component of the FEIS.

The Forest Service is committed to equal treatment of all individuals and social groups. The nature and purposes of Midewin present no extraordinary concerns for protection of civil rights. Public use, employment practices, and contracting practices on Midewin will follow all applicable Forest Service policy and procedures to protect civil rights.

3.14.8.2. ENVIRONMENTAL CONSEQUENCES

3.14.8.2.1. Direct and Indirect Effects

All alternatives include administration of public use, employment, and contracts as well as interpretive services and environmental education activities. None of the alternatives include foreseeable or intentional violations of legal rights to equal protection under the law for any individual or category of people.

3.14.8.2.2. Cumulative Effects

None of the alternatives include any foreseeable adverse effects on civil rights for any individual or category of people.

3.14.8.3. MITIGATION

Mitigation of the effects on civil rights is not required.

3.14.8.4. MONITORING

Monitoring of the effects of the Prairie Plan on civil rights is not required beyond existing administrative procedures to ensure fairness in public use, employment, contracting, and other areas of operation.

3.14.9. Environmental Justice

3.14.9.1. AFFECTED ENVIRONMENT

Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” requires that Federal agencies aim to achieve environmental justice by identifying and addressing disproportionately high and adverse human health and environmental effects of their programs, policies, and activities on minority and low-income populations.

Other sections summarize socio-economic conditions of Will County and describe the projected environmental effects of land management activities on fish, wildlife, habitat, and socio-economic conditions. The Prairie Plan activities projected over the planning period are not foreseen to have disproportionately high or adverse human health and environmental effects on minority and low-income populations within Will County.

3.14.9.2. ENVIRONMENTAL CONSEQUENCES

3.14.9.2.1. Direct and Indirect Effects

The following considerations of environmental justice reflect the lack of notable adverse effects:

1. In the U.S. low-income groups and some ethnic groups are more likely to consume higher quantities of fish from local waters. Activities on Midewin will improve water quality and the health of aquatic systems.
2. In the U.S. projects with undesirable environmental effects tend to occur more frequently near low-income neighborhoods or communities. Midewin is not located near communities that are disproportionately low-income, and activities will not have adverse effects on the health of the surrounding environment.

3.15. *OTHER DISCLOSURES*

3.15.1. SHORT-TERM EFFECTS AND LONG-TERM PRODUCTIVITY

Restoration and development of Midewin will involve many ground-disturbing activities that can affect the short-term and long-term conditions of soils. The following activities will result in short-term ground disturbance with long-term loss of soil quality or productivity: construction of camping areas, permanent trails, roads, a visitor center, and other facilities. Other ground-disturbing activities will result in short-term soil dislocation and potential for erosion but will enable long-term recovery of soil properties and productivity: demolition and removal of former arsenal buildings, removal of roads and rail beds, removal of drain tiles and ditches, removal of fencerows, tilling or planting vegetation. Mitigation through implementation procedures, e.g. Best Management Practices, will eliminate or reduce short-term impacts of ground-disturbance. Guidance on the location and design of roads, trails, and facilities will reduce the potential long-term effects. Overall, the alternatives will result in long-term improvements in soil quality and productivity.

3.15.2. IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Expenditure of funds to implement activities in any alternative would be an irreversible commitment of monetary resources. An irreversible commitment of resources is one that results from action altering an area such that it is prevented from returning to its natural condition for an extended period of time, or one that utilizes nonrenewable resources, such as mineral extraction. The only irreversible commitment of resources anticipated under any alternative would be the use of fossil fuels for energy in the administration and management of the Prairie, and any inadvertent loss of cultural resources. No mineral extraction is anticipated at Midewin during the 10-year planning period.

Irretrievable commitments of resources occur when we forego the opportunity to use or produce a specific resource for a period of time while favoring the production of another resource. The commitments are irretrievable rather than irreversible because the reversal of management decisions would allow uses of these resources to occur once again. Only the loss sustained during the period of unavailability would be irretrievable (benefits foregone). Management decisions that could result in irretrievable commitments include:

a) Any inadvertent damage and subsequent loss of threatened, endangered or sensitive wildlife and plant species habitat, wetlands, soils, air quality or water quality. These losses could occur if mitigation measures are unsuccessful.

b) The reduction of habitat potential on sites dedicated to recreation facilities, seed production areas and roads.
c) Removal of Army facilities. Removal of roads, rail beds, drain tiles, ditches, fencerows and shrubby vegetation.

3.15.3. UNAVOIDABLE ADVERSE EFFECTS

This section describes those adverse effects that cannot be avoided as a result of probable management activities on Midewin National Tallgrass Prairie. Implementation of any of the alternatives will generally move the landscape and ecosystem towards greater productivity and improved condition, but adverse environmental effects will occur even with mitigation measures to control the effects. Most notably, the unavoidable effects include:

Air Quality - Prescribed burning will cause nuisance smoke. Plowing and tilling in dry weather conditions may increase dust levels.

Plant and Animal Species-- The public use of land may result in unavoidable disturbance of native plants, birds, or other species near travel routes, trails, or facilities. For example, the presence of a trail and activity on the trail may result in trampling of bordering vegetation, loss of nesting habitat along the trail corridor, or local elimination of predators. Such effects would be avoidable only by complete elimination of all travel routes and facilities. Also, visitor presence may contribute to dispersal or increased populations of non-native or invasive plant species, undesirable insect species, rodents, or other species.

Woodland and Shrubland Species – The restoration of the tallgrass prairie will benefit native species, particularly sensitive species that lack existing habitat. Populations of some common species that use existing habitat will decline. In particular, these include tree and shrub species in fencerows and riparian areas, such as Osage orange, silver maple, autumn olive, and honeysuckle, as well as the animal species that use the trees and shrubs, including raccoons, opossums, skunks, squirrels, and some bird species. The losses of exotic woodland or shrub environments will be similar under all alternatives as unavoidable effects of creating unfragmented habitat and prairie or grassland communities.

Soil Productivity – Development and restoration activities such as parking lot construction or visitor center development will adversely affect soil productivity on the occupied site (See Short-term Effects and Long-term Productivity above).

3.15.4. RELATIONSHIPS TO PLANS OF OTHER AGENCIES

The Midewin Land and Resource Management Plan and this Final EIS are the result of extensive public involvement and cooperation with other federal, state, and local agencies, and extensive analysis.

Principal cooperating agencies involved in this planning process are the Forest Service and Illinois Department of Natural Resources and Illinois Natural History Survey, (IDNR) and Will County Forest Preserve District. Other agencies and organizations have provided information for preparation of this Draft Environmental Impact Statement. Will County Planners provided information on transportation needs. The US Fish and Wildlife Service provided information on threatened and endangered species.

No apparent conflicts with other agency plans have surfaced during development of the Land and Resource Management Plan and the Final EIS. However, the possibility of conflict with other agency missions and objectives could arise. Resolution of these conflicts can occur by amending the Midewin Prairie Plan, amending other agency plans, or a combination of both.

Other plans that helped shape management direction at Midewin include:

- USDA Forest Service Strategic Plan (2000 Revision)
- 1999 Biodiversity Recovery Plan for the Chicago Wilderness
- 1999 Wetland Restoration Plan for Midewin prepared by The Wetlands Initiative
- 1998 Strategic Plan for the Prairie Parklands
- 1997 Streams and Watersheds of the Midewin National Tallgrass Prairie, Openlands Project
- 1997 Midewin Trails Report on their Conceptual Design prepared by Midewin Trails Working Group and Openlands Project
- 1997 Metra Southwest Corridor Study
- 1995 Arsenal Land Use Concept Plan prepared by the Joliet Arsenal Citizens Planning Commission

The 1997 Interim Record of Decision ROD prepared by the Department of Defense (DOD) for the Joliet Army Ammunition Plant. Projects at Midewin will tier to the final ROD to be prepared by DOD within the next year that determines acceptable standards for soil and sediment contaminants.

3.15.5. HAZARDOUS MATERIALS CONCERNS

The term “hazardous material” has a specific meaning under the Resource Conservation and Recovery Act (RCRA). The determination of whether a material is hazardous may depend on the form or concentration of the material and whether the material may be used for a suitable purpose. Sites on Midewin include hazardous materials, as defined under RCRA, and other materials that are undesirable but do not qualify as hazardous materials. Materials of concern include:

1. Telephone poles and railroad ties, most of which contain creosote preservative.
2. Electrical wires, transformers, and other appurtenances.
3. Railroad ballast that may contain arsenic.
4. Soil with arsenic contamination under security fences.
5. Glass objects or shards, such as jars, bottles, insulators.
6. Metal objects and scraps, such as implements, poles, drums, fence wire, rails.
7. Buildings with transite roofing or siding (transite contains asbestos)
8. Bunker doors with asbestos interior linings.
9. Soil and sediment contamination in drainages and wetlands connected to former arsenal facilities, including polyaromatic hydrocarbons (PAH), polychlorinated biphenyls (PCBs), lead, mercury, zinc.