Environmental Assessment
Of
Herbicide Use for Invasive Plant Species and Noxious Weeds Control

MIDEWIN NATIONAL TALLGRASS PRAIRIE
Will County, Illinois

April 2002

EXECUTIVE SUMMARY

The Forest Service at Midewin National Tallgrass Prairie (Midewin) proposes to implement management activities on the prairie. This Environmental Assessment (EA) documents the potential environmental effects of limited herbicide application to control invasive species and noxious weeds at Midewin. This EA was prepared in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA discloses the direct, indirect, and cumulative environmental impacts and any irreversible or irretrievable commitment of resources that would result from the proposed action and alternatives. An interdisciplinary team (ID Team) of resource specialists used a systematic approach for analyzing the proposed project and alternatives to it, estimating the environmental effects, and preparing this EA. Based on this EA, the Forest Service Prairie Supervisor will decide whether or not to include limited herbicide use with other Integrated Pest Management (IPM) strategies to control invasive species and noxious weeds at Midewin.

Proposed Action

The Forest Service at Midewin proposes to control invasive plant species and noxious weeds through limited use of herbicides in order comply with the laws and policies for control of invasive species, to comply with the responsibilities and obligations outlined in the Illinois Land Conservation Act (PL 104-106, Midewin establishing legislation), and to comply with the Prairie Plan for Midewin. Included with selected prescription areas are localities where invasive species have recently colonized Midewin, or areas for which spot treatment may be needed as new, small infestations of invasive plant species become known. Invasive species occurring in these areas are a threat to restoration efforts in progress, and a threat to future restoration efforts. Because of the high potential for many invasive species and noxious weeds to spread rapidly, it is critical that these species be controlled now. These management activities would occur principally over the next ten years as restoration activities in accordance with the Prairie Plan.

Purpose and Need

The purpose of controlling invasive plant species and noxious weeds through use of herbicides on Midewin is to facilitate the restoration of the tallgrass prairie ecosystem. Herbicide use will occur in conjunction with other methods, including seeding, cultivation, hand pulling, mowing, cutting, and burning as part of Midewin's IPM strategy. Invasive species and noxious weeds are a common sight on the Midewin landscape and are a threat to management and restoration.

Direction in Executive Order 13112 and the National Invasive Species Management Plan provides the basis for the purpose and need to control invasive plant species and noxious

weeds. As directed by FS policy (Forest Service Manual [FSM] 2080), Midewin is responsible for preventing, controlling, and eradicating noxious weeds on lands under its jurisdiction. Noxious weeds are defined by the Forest Service as aggressive and difficult-to-manage, non-indigenous plant species. The Federal Noxious Weed Act of 1974 requires Forest Service cooperation with state, local, and other Federal agencies in the application and enforcement of all laws and regulations relating to management and control of noxious weeds. Additionally, Illinois law requires control of certain plant species declared to be noxious weeds by the State of Illinois (IL Noxious Weed Law).

Issues

The public was invited to participate in this analysis in October 2001. The Forest Service contacted approximately 500 interested parties on October 31, 2001, requesting comments by December 3, 2001. Comments received from the public, other agencies, and Forest Service resource specialists helped define the issues relevant to the project. These issues directly influenced the development of alternatives for this EA.

Issue 1: Herbicide use is a reasonable tool to control native and nonnative invasive species and noxious weeds.
Issue 2: Herbicides may impact threatened and endangered species.
Issue 3: Herbicides may pose a potential threat to human health.
Issue 4: Herbicides may have adverse effects on soil, water, non-target vegetation, and wildlife.

Alternatives

Based upon the written comments the Interdisciplinary (ID) Team formulated four project alternatives.

<u>Alternative 1 – Proposed Action</u>

Alternative 1 is the Proposed Action as defined in the public scoping notice. Under this alternative, the following six herbicides will be considered, and their use as safe and appropriate tools will be analyzed in this EA: 2, 4-D, glyphosate, pelargonic acid, sethoxydim, triclopyr, and clopyralid. Each herbicide is registered with the Environmental Protection Agency for weed control.

The proposed action includes limited treatment within 10 designated areas at Midewin. Not more than 500 total acres would be treated annually. None of the spot treatment areas are expected to exceed one acre in size, and most will be less than 1,000 square feet. The identified sites are listed below, within which the selected smaller areas would

be treated to control invasive species and noxious weeds. In no case would entire tracts be treated with herbicides.

1. Drummond Dolomite Prairie Area (580 acres)
2. Grant Creek Prairie Annex Area (240 acres)
3. Doyle Creek Wetlands (410 acres)
4. Seed Production Areas (260 acres)
5. Foxglove Prairie (50 acres)
6. Blodgett Road (290 acres)
7. South Patrol Road (420 acres)
8. Prairie Creek Woods (230 acres)
9. Pastures and other agriculture grasslands (5,520 acres)
10. Spot treatment areas for new invasives (3,780 acres)

These areas are indicated in Figure 2. Midewin lands currently leased for row crops (3,950 acres) have not been included in areas designated for herbicide use. They may be analyzed at a later time for spot treating new invasives as agricultural uses are phased out.

Alternative 2 (Preferred Action) - Addition of Fosamine Ammonium Salt and Imazapic to List of Herbicides

Alternative 2 is a modification of Alternative 1. Alternative 2 increases the tools available to the Forest Service by adding two herbicides to the Forest Service list of six herbicides. This change is the result of comments received during the scoping period suggesting that the Forest Service not be limited to six herbicides. The two additional herbicides, fosamine ammonium salt (FAS) and imazapic, were selected based on suggestions from the public, and by research indicating that both have minimal environmental impacts and will be useful tools for the Forest Service. Alternative 2 is the Preferred Alternative of the Forest Service.

The areas to receive limited herbicide treatment are the same under Alternative 1 and Alternative 2 (Figure 2).

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Alternative 3 follows the Preferred Action as described in Alternative 2. However, the proposed area to receive limited herbicide treatment is smaller under Alternative 3. Alternative 3 excludes the Drummond Dolomite Prairie (580 acres) from herbicide treatment because of the following endangered, threatened, or sensitive plant species that are restricted to this habitat:

Leafy Prairie Clover (*Dalea foliosa*, FE, SE) [1],
Glade Quillwort (*Isoetes butlerii*, SE, RFSS),
False Mallow (*Malvastrum hispidum*, SE, RFSS),
Pitcher's Sandwort (*Minuartia patula*, ST, RFSS),
Crawe's Sedge (*Carex crawei*, RFSS),
Glade mallow (*Napaea dioica*, RFSS), and
Sullivant's coneflower (*Rudbeckia fulgida sullivantii*, RFSS).

In addition to the listed sensitive plant species, there are several sensitive wildlife species that are associated with the Drummond Dolomite Prairie that may be affected by herbicide treatment. These species are: king rail, *Rallus elegans* (RFSS, ST), Blanding's turtle, *Emydoidea blandingi* (RFSS, ST), red-veined prairie leafhopper, *Aflexia rubranura* (RFSS, ST), upland sandpiper, *Batramia longicauda* (RFSS, SE), bobolink, *Dolichonyx oryzivorus* (RFSS), Henslow's sparrow, *Ammodramus henslowi* (RFSS, SE), and migrant loggerhead shrike, *Lanius ludovicianus migrans* (RFSS, ST).

Under Alternative 3, the Forest Service would continue other IPM practices such as brush-cutting, mowing, and hand-pulling to control invasive species and noxious weeds on the Drummond Dolomite Prairie (note: livestock grazing, while a viable IPM practice for other parts of Midewin, is not currently proposed on the Drummond Dolomite Prairie).

Alternative 4 – No-action

Alternative 4 is the No-action Alternative. Under this alternative, herbicides would not be used on Midewin to control invasive species and noxious weeds. However, the Forest Service would continue using other IPM practices including seeding, cultivation, hand-pulling, mowing, cutting, prescribed burning, and livestock grazing to control undesirable plant species.

Affected Environment and Environmental Consequences

This Environmental Assessment (EA) was completed to identify significant environmental and social issues that may be affected from limited herbicide treatment to control noxious weeds and invasive species. This EA identifies potential adverse and beneficial consequences of limited herbicide treatment on Midewin for the following areas of social and environmental concern:

[1] FE = Federal Endangered species
FT = Federal Threatened species
RFSS = Regional Forester's Sensitive Species
SE = Endangered by Illinois Endangered Species Protection Board (1988)
ST = Threatened by Illinois Endangered Species Protection Board (1988)

- Noxious weeds and invasive species
- Land use
- Human environment
- Water quality and aquatic ecology
- Air quality
- Soil quality
- Threatened, endangered and sensitive plant and animal populations
- Management Indicator Species
- Recreation
- Visual quality
- Environmental Justice
- Irreversible and irretrievable commitment of resources

Based on this EA, the Prairie Supervisor must determine if the selected alternative would or would not be a major federal action significantly affecting the quality of the human environment. If the Prairie Supervisor determines that it would not significantly affect the quality of the human environment, then he can prepare and sign a Finding of No Significant Impact (FONSI) and the project can proceed.

If the Prairie Supervisor determines that the selected alternative would significantly affect the quality of the human environment, then an Environmental Impact Statement (EIS) and a Record of Decision (ROD) must be prepared and signed before this project can proceed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1.0 PURPOSE AND NEED

1.1 INTRODUCTION

The Forest Service at Midewin National Tallgrass Prairie (Midewin) proposes to implement management activities on the prairie. This Environmental Assessment (EA) documents the potential environmental effects of limited herbicide application to control invasive species and noxious weeds at Midewin. This EA was prepared in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA discloses the direct, indirect, and cumulative environmental impacts and any irreversible or irretrievable commitment of resources that would result from the proposed action and alternatives. Based on this EA, the Forest Service Prairie Supervisor will decide whether or not to include limited herbicide use with other Integrated Pest Management strategies to control invasive species and noxious weeds at Midewin.

An interdisciplinary team (ID Team) of resource specialists (identified in Section 5.0) used a systematic approach for analyzing the proposed project and alternatives to it, estimating the environmental effects, and preparing this EA. The planning process complies with NEPA and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1500-1508). An EA is "a concise public document…that serves to briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact" (40CFR 1508.9).

1.2 PROJECT AREA

Midewin is located in Will County, Illinois, about 45 miles southwest of Chicago, 15 miles south of Joliet, and 3 miles north of Wilmington, Illinois. Midewin is part of the Prairie Parklands, an area of approximately 40,000 acres of lands important for habitat conservation (Figure 1). These public, private and corporation lands in Will and Grundy counties include the Illinois Department of Natural Resources' Des Plaines State Fish and Wildlife Area, Goose Lake Prairie State Park, Heidecke Lake Fish and Wildlife Area, several Forest Preserves, and portions of corporation lands owned by Commonwealth Edison, General Electric, Exxon-Mobil, BPAmoco, Stepan and Dow Chemical. In all, there are 22 nearby areas owned by state, county and local governments, corporations, and interested private landowners.

The enactment of the Illinois Land Conservation Act of 1995, established Midewin. Midewin presently includes 15,189 acres of land that was part of the former Joliet Army

Ammunition Plant (Joliet Arsenal). Three additional parcels on the perimeter have been acquired either through land exchange or purchase. Approximately 3,000 additional acres are legislated to be transferred to the Forest Service pending cleanup, but currently remain under administration of the Department of Defense.

Midewin provides habitat for a rich assemblage of plants and animals, including three species on the federal list for threatened and endangered species, over twenty species listed by the State of Illinois as threatened or endangered, and twenty-six species recognized as Regional Forester Sensitive Species (RFSS) in the US Forest Service Eastern Region (R-9). The extent and diversity of habitats within Midewin provide some of the most significant wildlife habitat in northeastern Illinois.

1.3 PURPOSE AND NEED FOR ACTION

The purpose of controlling invasive plant species and noxious weeds through use of herbicides on Midewin is to facilitate the restoration of the tallgrass prairie ecosystem. Herbicide use will occur in conjunction with other methods, including seeding, cultivation, hand pulling, mowing, cutting, and burning as part of Midewin's Integrated Pest Management (IPM) strategy.[2] Invasive species and noxious weeds are a common sight on the Midewin landscape and are a threat to management and restoration. Fire suppression and lack of management have allowed noxious weeds and invasive species to invade Midewin's grassland and prairie communities. Management of open land declined as U.S Army activities ceased, and many areas became invaded with invasive herbaceous vegetation and dense stands of shrubs and young trees. In many areas, the existing native vegetation is heavily infested with non-native plant species. For example, exotic species such as Canada bluegrass, common teasel, common mullein, and sweet clover are invading rare dolomite prairie habitat. Reed canary-grass and common reed are aggressive invaders present in Midewin's marshes, sedge meadows, moist grasslands, and wet dolomite prairie. These invasive species can form dense monotypic stands that can choke a wetland and displace desirable plant and animal species. Native invasive plants also pose a threat to management and restoration of native vegetation and grassland habitat. Native woody plants such as green ash, gray dogwood, hawthorns, smooth sumac, and sandbar willow are invading grassland and prairie communities, displacing desirable species and fragmenting grassland bird habitat.

The success of ecosystem restoration on Midewin will be compromised as long as invasive plant species and noxious weeds persist and continue to invade grassland and prairie communities. Invasive species and noxious weeds pose an increasing threat to native ecosystems and reduce the effectiveness of ecosystem restoration by competing

[2] Treatment methods will be determined by life history of target species, size of infestation, level of infestation, and compatibility with habitat objectives (Prairie Plan, p. 4-6).

with desired species for light, nutrients, and water. They alter habitat structure, contaminate native seed production, and alter hydrologic regimes in certain wetlands. Management of invasives will prevent Midewin from becoming an additional source of infestation for surrounding lands.

1.4 PROPOSED ACTION

The Forest Service at Midewin proposes to control invasive plant species and noxious weeds through limited use of herbicides in order to comply with the laws and policies for control of invasive species, to comply with the responsibilities and obligations outlined in the Illinois Land Conservation Act (PL 104-106, Midewin establishing legislation), and to comply with the Prairie Plan for Midewin. Included with selected prescription areas are localities where invasive species have recently colonized Midewin, or areas for which spot treatment may be needed as new, small infestations of invasive plant species become known. Invasive species occurring in these areas are a threat to restoration efforts in progress, and a threat to future restoration efforts. Because of the high potential for many invasive species and noxious weeds to spread rapidly, it is critical that these species be controlled now. These management activities would occur principally over the next ten years as restoration activities in accordance with the Prairie Plan. Some mitigation and monitoring would extend into the future to ensure effectiveness of the mitigation and monitoring activities.

One goal outlined in the Prairie Plan is to reduce noxious and exotic, invasive plant infestations and prevent new invader species from becoming established (Prairie Plan p. 2-6). The Desired Condition for the ecological sustainability of the prairie includes reducing or eradicating populations of noxious weeds and invasive plant species (Prairie Plan p. 2-3). The objectives of the Prairie Plan include within three years of the Prairie Plan implementation, to begin an Integrated Pest Management program for noxious weed and invasive species prevention and control, and within 10 years to reduce or limit expansion of areas affected by noxious weeds and invasive species, with emphasis on areas where these species have a high potential for establishment and spread (Prairie Plan p. 2-6). Application of approved herbicides is one tool identified in the Prairie Plan for effective Integrated Pest Management (Prairie Plan pp. 3-5, 3-7). The objectives of this proposal to control invasive plant species and noxious weeds through limited herbicide use are to effectively reduce the current infestations at the 10 sites identified at Midewin for priority treatment and to quickly prevent new infestations from becoming established. The goal is to improve Forest Service capabilities to manage land and water resources to conserve and enhance native populations of fish, wildlife, and plants in accordance with the Illinois Land and Conservation Act of 1995 and the Land and Resource Management Plan (Prairie Plan).

Ground application of the herbicides would be the only method used on Midewin; aerial application will not be permitted. In most cases, herbicides would be applied to invasive species and noxious weeds using spot treatment. Spot treatment consists of various techniques for applying herbicides to target weeds without impacting desirable vegetation and other nontarget organisms, including humans. Herbicide drift would be much reduced with spot treatment. Techniques that may be used include spraying foliage using hand held wands or backpack sprayers, basal bark and stem treatments using spraying or painting (wiping) methods, cut surface treatments (spraying or wiping), and tree injections. Broadcast application (using truck mounted sprayers) over wider areas would be used only when necessary to treat large infestations. In some instances, broadcast spraying may be the only effective way to treat very dense and extensive weed infestations.

Specific details on the Proposed Action and alternatives are contained in Section 2 of this EA.

1.5 SCOPE OF THIS ENVIRONMENTAL ANALYSIS

This section defines and explains the scope (boundaries/limits) of the Herbicide Use for Invasive Plant Species and Noxious Weeds Control project environmental analysis. It briefly describes the relevant planning documents, identifies the resource issues studied in detail, and identifies the issues eliminated from detailed study.

Relevant Planning Documents that Influence the Scope of this Environmental Analysis

The following two documents directly influenced the scope of this environmental analysis:

- Midewin National Tallgrass Prairie Land and Resource Management Plan (Prairie Plan).
- Midewin National Tallgrass Prairie Plan Final Environmental Impact Statement (FEIS).

The Prairie Plan and Plan FEIS contain direction for management of Midewin. The proposed management project is consistent with these two documents, meeting all directions and standards for the Restoration Management Area. We have tiered this project EA to both the Prairie Plan and Plan FEIS.

1.6 PUBLIC INVOLVEMENT SUMMARY

The public was invited to participate in this analysis in October 2001. The Forest Service contacted approximately 500 interested parties on October 31, 2001, requesting comments by December 3, 2001. A scoping package was distributed that included a project description, site map, and a request that interested parties consider the following specific questions:

1. Is there any information about the project area (Midewin) that you believe is important in the context of the proposed activities and which the Forest Service might have overlooked?

2. For you or the group you represent, what are the potential effects of this proposal that you are particularly concerned about?

3. Are there reasonable alternative ways to meet the Purpose and Need (the rationale for conducting activities) for which you would like the Forest Service to develop and analyze the environmental effects?

4. Are there environmental effects in addition to the ones listed above which you feel are important and would like to have addressed in the EA? If so, please include your rationale for why they should be analyzed.

1.7 KEY ISSUES

The ID Team carefully considered comments received from the public, other agencies, and Forest Service resource specialists. The ID Team determined that the following issues are relevant to the decisions that must be made for this project. These issues directly influenced the development of alternatives for this project. Resolution of the issues is measured by indicators. Each alternative has been analyzed according to the indicators.

The following issues raised by the public during the scoping period helped guide the formulation of the alternatives. Appendix A provides a summary of the public comments that aided in issue identification. While all of the respondents supported the Forest Service proposed action as described in the Scoping Notice, (Issue 1, Alternative 1) several respondents felt that the Forest Service should not be limited to the six herbicides on the list. This concern is addressed by Alternative 2, which increases the tools available to the Forest Service by the addition of two herbicides, fosamine ammonium salt and imazapic.

Many of the comments expressed concern about possible impacts to human health and natural resources (Issues 2, 3, 4). The concern over the impacts to threatened and endangered species, particularly in the Drummond Dolomite Prairie, is addressed by Alternative 3, which removes this area from herbicide treatment. However, potential adverse effects on humans and natural resources (including threatened and endangered species) will, in large part be minimized or eliminated through proper use and storage of herbicides, appropriate mitigation, and an intensive pre- and post-treatment monitoring plan.

Issue 1: Herbicide use is a reasonable tool to control native and nonnative invasive species and noxious weeds.

- All public comments received in response to the proposed action supported the responsible use of herbicides in combination with other control strategies. Herbicide use may be the least ecologically destructive strategy, and will enable more efficient use of volunteer and staff time.

- Not all invasive plant species are non-native. Undesirable native species have established populations at Midewin, hampering the efforts of Forest Service staff and dedicated volunteers who are trying to fulfill the goals of the enabling legislation and Midewin's Prairie Plan to reestablish a tallgrass prairie ecosystem. Undesirable native and nonnative plant species may be treated with herbicides.

- Several of the respondents felt that the Forest Service may not want to limit the herbicides to the six listed in the Scoping letter (addressed under Alternative 2).

Indicator: Areas (acreage) treated with the herbicide.

Issue 2: Herbicides may impact threatened and endangered species.

- Application of herbicides may affect the Drummond Dolomite Prairie, a sensitive ecosystem supporting seven endangered, threatened, or sensitive plant species that occur in this habitat (addressed under Alternative 3). These species are:

  Leafy Prairie Clover (*Dalea foliosa*, FE, SE)[3]
  Glade Quillwort (*Isoetes butlerii*, SE, RFSS)
  False Mallow (*Malvastrum hispidum*, SE, RFSS)

[3] FE = Federal Endangered species
FT = Federal Threatened species
RFSS = Regional Forester's Sensitive Species
SE = Endangered by Illinois Endangered Species Protection Board (1988)
ST = Threatened by Illinois Endangered Species Protection Board (1988)

Pitcher's Sandwort (*Minuartia patula*, ST, RFSS)
Crawe's Sedge (*Carex crawei*, RFSS)
Glade mallow (*Napaea dioica*, RFSS)
Sullivant's coneflower (*Rudbeckia fulgida sullivantii*, RFSS)

In addition to the listed sensitive plant species, there are several wildlife species that are associated with the Drummond Dolomite Prairie that may be affected by herbicide treatment. King rail nesting and a Blanding's turtle sighting have been documented from the dolomite prairie. One insect, the red-veined prairie leafhopper, *Aflexia rubranura* (RFSS, ST), is currently restricted to the Drummond Dolomite Prairie since it has an obligate host-specific relationship with prairie dropseed, a plant species currently found there. Sensitive grassland birds such as the upland sandpiper, *Batramia longicauda* (RFSS, SE), bobolink, *Dolichonyx oryzivorus* (RFSS, SW), Henslow's sparrow, *Ammodramus henslowi* (RFSS, SE), and migrant loggerhead shrike, *Lanius ludovicianus migrans* (RFSS, ST), are all more common west of Illinois Route 53 and may utilize the dolomite prairie for foraging and loafing (uninterferred resting, displaying, mating).

Indicator: 1. Potential effects of the different alternatives on threatened and endangered species will be determined by proximity of herbicide application to threatened and endangered species, and the potential for non-target species to be affected. 2. Potential effects will also be determined by compliance with the Endangered Species Act and the Prairie Plan.

Issue 3: Herbicides may pose a potential threat to human health.

- If herbicides are not handled, applied, or stored properly they could present a human health hazard.

Indicator: Potential effects of the different alternatives will be estimated as potential health risks to staff, volunteers, and the public through contact with herbicides. Potential health risks will be determined by the mammalian toxicity of the herbicide (scale: very high to very low). However, potential effects to humans will, in large part, be eliminated by proper use of the herbicide and a mitigation and monitoring plan.

Issue 4: Herbicides may have adverse effects on soil, water, non-target vegetation, and wildlife.

Indicator: 1. Potential effects of the different alternatives will be determined by herbicide persistence in the soil (half-life) and movement through the soil, toxicity to nontarget terrestrial and aquatic species, and the potential for contamination of

ground and surface water. 2. Potential effects will also be determined by compliance with the Clean Water Act, the Prairie Plan, and all applicable state and local regulations.

Issues eliminated from further study

Heritage Resources
Impacts to heritage resources were considered but eliminated from further study after it was determined that herbicide treatment for control of invasive species and noxious weeds would not result in ground disturbing activity, and therefore, would have no effect. In coordination with the National Environmental Policy Act (NEPA) process, the National Historic Preservation Act, and other pertinent legislation, heritage resources will be addressed for ground-disturbing actions from other IPM methods on a project-by-project basis as the need arises. Compliance will include consultation with the Illinois State Historic Preservation Office (SHPO).

Hazardous Substances
The impact of limited herbicide treatment on hazardous substances was another issue considered but eliminated from further study. Hazardous substances/materials that remain from past Army actions include the following:

- Telephone poles and railroad ties, most of which contain creosote preservative.
- Railroad ballast (fill) that may contain arsenic.
- Soil with localized arsenic contamination along perimeter fences.
- Transite building materials (containing asbestos).

No direct, indirect, short-term, or adverse effects on existing contaminated features or hazardous substance conditions are expected from herbicide application on Midewin. There would be no effects on the existing soil contaminants since soil-disturbing activity would not occur, and the herbicides proposed for use on Midewin do not contain arsenic or other substances (PAHs, PCBs, lead, mercury, or zinc) that would contribute to the localized existing soil contamination along old security fences. The amount of arsenic in the soil in these areas from former pesticide use is insignificant compared to the amount occurring as a natural element in the soils across Midewin. Since there would be no effects on hazardous materials from herbicide treatment, this issue was eliminated from further study.

1.8 DECISIONS THAT MUST BE MADE

The Prairie Supervisor of Midewin National Tallgrass Prairie must decide whether to conduct invasive species control using herbicides now or whether to defer this activity

until a later time. These activities are described in detail in Section 2. If he decides to manage invasive species with herbicides now, then he must also decide on the following specific management activities:

- Which acres/places to treat.
- Which herbicide application system to use.
- What mitigation and/or monitoring measures to implement to meet Midewin standards and minimize resource damage.
- Whether to close areas (temporarily) under treatment.

The Prairie Supervisor must also determine if the selected alternative would or would not be a major federal action significantly affecting the quality of the human environment. If the Prairie Supervisor determines that it would not significantly affect the quality of the human environment, then he can prepare and sign a Finding of No Significant Impact (FONSI) and the project can proceed.

If the Prairie Supervisor determines that the selected alternative would significantly affect the quality of the human environment, then an Environmental Impact Statement (EIS) and a Record of Decision (ROD) must be prepared and signed before this project can proceed.

Applicable Regulatory Requirements, Required Coordination, Licenses, Permits

Direction in Executive Order 13112 and the National Invasive Species Management Plan provides the basis for the purpose and need to control invasive plant species and noxious weeds. As directed by FS policy (Forest Service Manual [FSM] 2080), Midewin is responsible for preventing, controlling, and eradicating noxious weeds on lands under its jurisdiction. Noxious weeds are defined by the Forest Service as aggressive and difficult-to-manage, non-indigenous plant species. The Federal Noxious Weed Act of 1974 requires Forest Service cooperation with state, local, and other Federal agencies in the application and enforcement of all laws and regulations relating to management and control of noxious weeds. Additionally, Illinois law requires control of certain plant species declared to be noxious weeds by the State of Illinois (IL Noxious Weed Law). The IL Exotic Weed Act further defines exotic (non-native) weeds as plants that "…spread vegetatively or naturalize and degrade natural communities, reduce the value of fish and wildlife habitat, or threaten an Illinois endangered or threatened species."

In addition to legislation on noxious weed control, this project is also in compliance with the following regulations:

1. National Forest Management Act (36 CFR 219.27).
    - ✓ This project is consistent with NFMA guidelines.
    - ✓ This project would prevent or reduce serious long-lasting damage and hazards from pests.
    - ✓ This project would provide and maintain for diversity of plant communities.
    - ✓ This project includes measures to prevent the destruction or adverse modification of critical habitat for threatened and endangered species.
    - ✓ This project would protect soil and water conservation resources.
2. Section 7(c) of the Endangered Species Act (16 U.S.C. 1531 et seq.)
    - ✓ This project will require concurrence with the U.S. Fish and Wildlife Service.
    - ✓ This project will protect federal threatened and endangered species
3. Clean Water Act (33 U.S.C. 1251 et seq.); Executive Order 11990, Protection of Wetlands (42 F.R. 26961)
    - ✓ This project will protect all navigable waters; including all tributaries and wetlands connected to navigable waters.
4. Section 106 of the National Historic Preservation Act of 1966 (U.S.C. sec 470) as amended.
    - ✓ This project will not affect heritage resources. Herbicide treatment will not result in ground-disturbing activity.

2.0 ALTERNATIVES

2.1 ALTERNATIVES TO BE ANALYZED IN THE EA

This section describes the alternatives considered, including the No-action Alternative. Information is provided on how the alternatives were developed, a detailed description of alternatives, alternatives considered but eliminated from detailed study, and a summary of environmental consequences of each alternative.

The intent of this EA is to determine the effects of limited herbicide treatment on the human and natural environment at Midewin. Other Integrated Pest Management (IPM) methods including seeding, cultivation, hand-pulling, mowing, cutting, prescribed burning, and livestock grazing will be used in conjunction with herbicide treatment, but will not be considered here. The NEPA process will occur for IPM ground-disturbing actions on a project-by-project basis as the need arises.

Based upon written comments received in response to the October 31, 2001 scoping notice, the Interdisciplinary Team formulated four project alternatives. The intent of the project is to remain consistent with the enabling legislation and the standards and guidelines of the Prairie Plan.

Alternative 1 – Proposed Action

Alternative 1 is the Proposed Action as defined in the public scoping notice. Under this alternative, the following six herbicides will be considered, and their use as safe and appropriate tools will be analyzed in this EA. Each herbicide is registered with the Environmental Protection Agency (EPA) for weed control:[4]

1. **2,4-D** is a selective herbicide that controls invasive broadleaf herbaceous plants and woody seedlings, but does not harm certain monocots (including grasses). It works by mimicking the growth hormone auxin, which causes uncontrolled growth and eventually death in the target weed. 2,4-D has been found to be effective at controlling Canada thistle (*Cirsium arvense*), crownvetch (*Coronilla varia*), common teasel (*Dipsacus sylvestris*), and white sweet clover (*Melilotus alba*) among others (Carroll et al., 1997).

2. **Glyphosate** is a non-selective, broad spectrum, systemic herbicide that is used to control many grasses, forbs, vines, shrubs, and trees. It is one of the most

[4] Registration of a pesticide is a scientific, legal and administrative process through which EPA examines the pesticide to ensure that it will not have any adverse effects on humans, the environment, and non-target species (USEPA, 1999).

commonly used herbicides in natural areas because it provides effective control of many species. Glyphosate works by preventing the plant from producing amino acids that are the building blocks of plant proteins. One formulation of glyphosate has been approved for use in aquatic systems, and has successfully controlled invasive aquatic species such as common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), reed canary-grass (*Phalaris arundinacea*), and glossy buckthorn (*Rhamnus frangula*) (Tu et. al, 2001b). Because glyphosate is non-selective, appropriate application methods (spot treatment) and seasonal timing will be used to prevent impacts on non-target species (Williams et al., unknown date).

3. **Pelargonic Acid** is a contact herbicide that controls small seedling annuals, biennials, or perennials. Larger annual weeds and perennials usually recover from exposure to pelargonic acid. Pelargonic acid is a naturally occurring fatty acid similar to fatty acids in soap, and is found in almost all species of animals and plants. It has been approved by the U.S. Food and Drug Administration for use as a food additive and is found at low levels in many of the common foods we eat (USEPA, 2000). It works as a herbicide by removing the waxy cuticle of the broadleaf or grassy weed, and drying up the tissue. It has very little persistence in the environment.

4. **Sethoxydim** is a selective herbicide used to control annual and perennial grasses. It has little or no impact on broadleaf herbs or woody plants. It works by preventing the synthesis of lipids in target grasses. Sethoxydim can be used to control bahiagrass (*Paspalum notatum*), crabgrass (*Digitaria sanguinalis*), downy brome (*Bromus tectorum*), quackgrass (*Elytrigia repens*), annual ryegrass (*Lolium multiflorum*), wild oats (*Avena spp.*), and witchgrasses (*Pancium spp*.) among others (BASF, 1997). Species of concern on Midewin that may be controlled with herbicides include downy brome, quackgrass, annual ryegrass, reed canary-grass, smooth brome, bluegrass, and foxtails.

5. **Triclopyr** is a selective herbicide that controls invasive, broadleaf herbaceous and woody plants, but does not harm certain monocots (grasses). It is particularly effective at controlling woody species with cut-stump or basal bark treatments. Like 2,4-D, triclopyr works by mimicking the plant growth hormone auxin, causing uncontrollable growth in targeted weeds. Triclopyr is effective at controlling autumn olive (*Elaeagnus umbellata*), Osage orange (*Maclura pomifera*), white mulberry (*Morus alba*), common buckthorn (*Rhamnus cathartica*) among others (Carroll et al., 1997). A formulation safe for use in aquatic systems is currently being developed (USEPA, Office of Pesticide Programs, 2002).

6. **Clopyralid** is also an auxin mimic herbicide. However, it is much more selective than other auxin mimics like 2,4-D and triclopyr. Like other auxin-mimics, it has little effect on grasses and other monocots. Clopyralid controls many annual and perennial broadleaf weeds, particularly of the Asteraceae (sunflower family), Fabaceae (legume family), Solanaceae (nightshade family), Dipsacaceae (teasel family), and Polygonaceae (knotweed family). Clopyralid is very effective against knapweed, the hawkweeds, Canada thistle, and teasels. The very selective nature of clopyralid makes it an attractive alternative on sites with non-target species that are sensitive to other herbicides. In many situations where other herbicides cannot be used, clopyralid can be applied with no adverse effects on non-target vegetation.

The proposed action includes limited treatment within 10 designated areas at Midewin. Not more than 500 total acres will be treated annually. None of the spot treatment areas are expected to exceed one acre in size, and most will be less than 1,000 square feet. The identified sites are listed below, within which the selected smaller areas will be treated, to control invasive species and noxious weeds. In no case will entire tracts be treated with herbicides.

1. Drummond Dolomite Prairie Area (580 acres)
2. Grant Creek Prairie Annex Area (240 acres)
3. Doyle Creek Wetlands (410 acres)
4. Seed Production Areas (260 acres)
5. Foxglove Prairie (50 acres)
6. Blodgett Road (290 acres)
7. South Patrol Road (420 acres)
8. Prairie Creek Woods (230 acres)
9. Pastures and other agriculture grasslands (5,520 acres)
10. Spot treatment areas for new invasives (3,780 acres)

These areas are indicated in Figure 2. Midewin lands currently leased for row crops (3,950 acres) have not been included in areas designated for herbicide use. They may be analyzed at a later time for spot treating new invasives as agricultural uses are phased out.

Alternative 2 (Preferred Action) - Addition of Fosamine Ammonium Salt and Imazapic to List of Herbicides

Alternative 2 is a modification of Alternative 1. Alternative 2 increases the tools available to the Forest Service by adding two herbicides to the Forest Service list of six herbicides. This change is the result of comments received during the scoping period that suggested that the Forest Service not be limited to just six herbicides. The two additional herbicides, fosamine ammonium salt (FAS) and imazapic, were selected based on suggestions from the public, and by research indicating that both have minimal

environmental impacts, and both will be useful tools for the Forest Service. Alternative 2 is the Preferred Alternative of the Forest Service.

- **Fosamine ammonium salt (FAS)** is a selective herbicide that inhibits growth in undesirable woody species with minimal environmental impact. It is commonly used for brush control in highway rights-of-way, parklands, and reforested areas. FAS works through absorption by leaves, stems, and buds; however, injury may not be observed until the following spring when bud development is restricted. Treated plants will fail to develop leaves and subsequently die. FAS has been used successfully by the Illinois Department of Natural Resources in controlling bush honeysuckle (*Lonicera* spp.) and black locust (*Robinia pseudoacacia*).

- **Imazapic** is a selective herbicide that controls annual and perennial grasses and some broadleaf weeds such as cocklebur (*Xanthium strumarium*), buffalobur (*Solanum rostratum*), Johnsongrass (*Sorghum halepense*), downy brome (*Bromus tectorum*), bermudagrass (*Cynodon dactylon*), bahiagrass (*Paspalum notatum*), smartweed (*Polygonum persecaria*), and leafy spurge (*Euphorbia esula*) (Tu et al., 2001a). Imazapic kills targeted weeds by inhibiting the production of branched chain amino acids, which are essential for protein synthesis and cell growth. Researchers have found that many non-native weeds are more susceptible to imazapic than desirable native grasses, composites and legumes (families that include many prairie wildflowers) (Univ. of Nebraska, Agricultural Research Division webpage, 1998; Harvey et al., unknown date). Consequently, imazapic has been used in prairie renovation and restoration projects.

The areas to receive limited herbicide treatment are the same under Alternative 1 and Alternative 2 (Figure 2).

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Alternative 3 follows the preferred action as described in Alternative 2. However, the proposed area to receive limited herbicide treatment is smaller under Alternative 3. Alternative 3 excludes the Drummond Dolomite Prairie (580 acres) from herbicide treatment because of the following endangered, threatened, or sensitive plant species that are restricted to this habitat:

Leafy Prairie Clover (*Dalea foliosa*, FE, SE),
Glade Quillwort (*Isoetes butlerii*, SE, RFSS),
False Mallow (*Malvastrum hispidum*, SE, RFSS),
Pitcher's Sandwort (*Minuartia patula*, ST, RFSS),
Crawe's Sedge (*Carex crawei*, RFSS),
Glade mallow (*Napaea dioica*, RFSS), and
Sullivant's coneflower (*Rudbeckia fulgida sullivantii*, RFSS).

In addition to the listed sensitive plant species, there are several wildlife species that are associated with the Drummond Dolomite Prairie that may be affected by herbicide treatment. King rail nesting and a Blanding's turtle sighting have been documented from the dolomite prairie. One insect, the red-veined prairie leafhopper, *Aflexia rubranura* (RFSS, ST), is restricted to the Drummond Dolomite Prairie. This insect has an obligate host-specific relationship with prairie dropseed, a plant species currently found there. Sensitive grassland birds such as the upland sandpiper, *Batramia longicauda* (RFSS, SE), bobolink, *Dolichonyx oryzivorus* (RFSS), Henslow's sparrow, *Ammodramus henslowi* (RFSS, SE), and migrant loggerhead shrike, *Lanius ludovicianus migrans* (RFSS, ST), are all more common west of Illinois Route 53 and may utilize the dolomite prairie for foraging and loafing.

Under Alternative 3, the Forest Service would continue other IPM practices such as brush-cutting, mowing, and hand-pulling to control invasive species and noxious weeds on the Drummond Dolomite Prairie (note: livestock grazing, while a viable IPM practice for other parts of Midewin, is not currently proposed on the Drummond Dolomite Prairie).

Alternative 4 – No-action

Alternative 4 is the No-action Alternative. Under this alternative, herbicides would not be used on Midewin to control invasive species and noxious weeds. However, the Forest Service would continue using other IPM practices including seeding, cultivation, hand-pulling, mowing, cutting, prescribed burning, and livestock grazing to control undesirable plant species.

2.2 ALTERNATIVES AND ACTIONS DROPPED FROM FURTHER ANALYSIS

Herbicide list to include all EPA approved herbicides

The EPA approved list of herbicides contains some herbicides that are not appropriate for use at Midewin because of their persistence in the soil and surrounding environment, high

possibility for groundwater leaching, toxicity, and other adverse environmental factors. For example, because they are applied directly to the soil, pre-emergent herbicides offer a greater risk of groundwater contamination and surface runoff (IPM Access, 2002). Because of possible adverse environmental effects, the Forest Service is not considering the use of pre-emergent herbicides. This alternative was discarded in favor of a shortened, select list of commonly used post-emergent herbicides that will effectively treat invasive species and noxious weeds with minimal to no adverse environmental effects.

Provision for broadcast herbicide application to agricultural fields in addition to spot treatment

In addition to limited, localized herbicide treatment, this alternative would allow for broadcast spraying of herbicides over large agricultural fields as special use leases expired, in order to prepare the fields for restoration. This alternative is beyond the scope of this EA, which is specifically to control invasive and noxious species rather than to prepare sites for restoration. Therefore it was discarded from further analysis.

Herbicides to be applied only to nonnative invasive plant species

Undesirable native plant species can inhibit the effectiveness of tallgrass prairie ecosystem restoration by competing with desired species for light, nutrients, and water. Certain undesirable native species have increased at Midewin, and have resulted in negative impacts to the prairie's plant and animal communities. For example, quack grass (*Elytrigia repens*) and Canada thistle (*Cirsium arvense*) are two invasive species that have become a serious problem in Midewin's seed production beds. Native prairie remnants and grassland bird habitat are threatened by aggressive, difficult to eradicate, invaders such as autumn-olive and cut-leaved teasel (*Dipsacus lacinatus*), among others.

Alternately, not all exotic species are undesirable. Some nonnative species are not considered threats at some sites; for example, Eurasian cool-season grasses and scattered Osage-Orange may be desired species in or near grasslands managed for certain bird species. Herbicide treatment applied only to nonnative species does not meet the purpose and need of controlling invasive species and noxious weeds in order to facilitate restoration of the tallgrass prairie ecosystem. Therefore, this action was dismissed from further analysis.

The Forest Service goals for controlling native versus non-native invasive species differ. The Forest Service intends to reduce and eliminate non-native invasives throughout Midewin. For native invasives, the Forest Service intends to reduce the numbers and restrict them to appropriate habitats. For example, the Forest Service plans to remove

green ash (*Fraxinus pensylvanica*) and cottonwood (*Populus deltoides*) from prairie communities, but leave appropriate numbers in floodplain habitats.

2.3 PREFERRED ALTERNATIVE

The Forest Service preferred alternative is Alternative 2.

2.4 SUMMARY MATRIX OF ENVIRONMENTAL IMPACTS

This matrix compares the alternatives by objectives and issues. More information on the issues is provided in Section 1.7.

Consequences	**Alternative 1 (Proposed)**	**Alternative 2 (Preferred)**	**Alternative 3**	**Alternative 4**
Objective: Effective control invasive species and noxious weeds at 10 priority sites.	Yes, but offers fewer choices of herbicides available to FS.	Yes, increases tools available to FS by the addition of two herbicides.	Partially (not at the Drummond Dolomite Prairie)	Partially effective
Objective: Prevent new infestation from establishment.	Yes, but offers fewer choices of herbicides available to FS.	Yes, increases tools available to FS by the addition of two herbicides.	Partially	No
Issue 1: Herbicide use is a reasonable tool to control native and nonnative invasive species and noxious weeds. *Indicator:* Acres treated.	<500 acres annually; spot treatment areas <1 acre in size	Same as Alternative 1	Same as Alternative 1; exclude 580 acres (Drummond Prairie) from treatment	No acres treated

Consequences	Alternative 1 (Proposed)	Alternative 2 (Preferred)	Alternative 3	Alternative 4
Issue 2: Herbicides may impact threatened, endangered, and sensitive (TES) species. *Indicator:* Proximity to TES species. *Indicator:* Compliance with the Endangered Species Act and the Prairie Plan.	No impact when proper management and mitigation techniques are implemented. Compliant	No impact when proper management and mitigation techniques are implemented. Compliant	No impact when proper management and mitigation techniques are implemented. Less potential for impacts to TES species. Compliant	Adverse impacts from invasive species displacing native prairie species; invading sensitive habitat with TES species. Noncompliant with the Prairie Plan.
Issue 3: Herbicides may pose a potential threat to human health. *Indicator:* Potential health risks to staff, volunteers, and the public through contact with herbicides (mammalian toxicity).	No impact when proper management and mitigation techniques are implemented.	No impact when proper management and mitigation techniques are implemented.	No impact when proper management and mitigation techniques are implemented.	No impact
Issue 4: Herbicides may have adverse effects on soil, water, non-target vegetation, and wildlife. *Indicator:* Herbicide persistence in the soil (half-life), movement through the soil, toxicity to nontarget terrestrial and aquatic species, and the potential for contamination of ground and surface water. *Indicator:* Clean Water Act, Prairie Plan, and all applicable state and local regulations.	No impact when proper management and mitigation techniques are implemented. Compliant	No impact when proper management and mitigation techniques are implemented. Compliant.	No impact when proper management and mitigation techniques are implemented. Partially compliant with Prairie Plan	Potential adverse effects on soils, aquatic resources, and wildlife from uncontrolled infestations of invasive species. Noncompliant with the Prairie Plan.

3.0 Affected Environment and Environmental Consequences

This chapter describes the present condition of the environment and changes that may be expected by implementing one of the action alternatives or by taking no action. The key issues generated through the scoping process, and the requirements of NEPA, define the general scope of the environmental concern for this project. This chapter forms the scientific and analytic basis for the comparison of alternatives. Cumulative effects are discussed for each key issue identified below. Cumulative effects result from incremental impacts of proposed activities when added to other past, present, and reasonably foreseeable actions regardless of what agency or person undertakes such other actions.

The proposed action includes limited treatment within 10 designated areas that cover most of Midewin. Invasive species and noxious weeds have become a concern in each of these areas. A description of the 10 sites, including the problematic plant species in each site, is presented below. See Figure 2 for a map of these locations.

1. Drummond Dolomite Prairie Area

This relatively level area of outwash plain includes adjacent floodplain of Jackson Creek and supports most (but not all) remnants of the dolomite prairie community on Midewin. Also included are areas of floodplain forest and former oak savanna near Jackson Creek. Soils become deeper toward the east, and probably once supported more typic prairie and associated wetlands. A large infestation of reed canary-grass (*Phalaris arundinacea*) occurs at this site, both north and south of Drummond Road; additional reed canary-grass is present along Jackson Creek, where scattered patches of common reed are found. Much of the uplands area, including the dolomite prairie, has been, or is being invaded by, non-native cool-season grasses, especially Canada bluegrass (*Poa compressa*), Kentucky bluegrass (*Poa pratensis*), and smooth brome (*Bromus inermis*). Prairie and grassland areas have been invaded by native and non-native woody species, including willows (*Salix* spp.), eastern cottonwood (*Populus deltoides*), hackberry (*Celtis occidentalis*), green ash (*Fraxinus pensylvanicus*), hawthorns (*Crataegus* spp.), European buckthorn (*Rhamnus cathartica*), Amur honeysuckle (*Lonicera maackii*), and Osage-orange (*Maclura pomifera*). Other invasive species in the dolomite prairie area include Canada thistle (*Cirsium arvense*), common teasel (*Dipsacus sylvestris*), common mullein (*Verbascum thapsus*), European St. John's-wort (*Hypericum perforatum*), winter-annual brome grasses (*Bromus tectorum* and *B. japonicus*), wild parsnip (*Pastinaca sativa*), sweet-clover (*Melilotus alba* and *M. officinalis*), and garlic-mustard (*Alliaria petiolaris*). All but garlic-mustard have been detected invading dolomite prairie habitat at this site; garlic mustard infestations are found in the riparian woodlands. Within the past five years, three new and potentially serious invaders have been discovered at this site: purple

loosestrife (*Lythrum salicaria*), crownvetch (*Coronilla varia*), and cut-leaved teasel (*Dipsacus laciniatus*).

2. Grant Creek Prairie Annex

This annex consists of prairie remnants adjacent to Grant Creek Prairie Nature Preserve (IDNR land). Included are some of the highest quality prairie communities on Midewin, largely because they were managed under the Army's administration of the site. Native vegetation communities present include mesic and wet prairie, sedge meadow, and some dolomite prairie. Considerable woody invasion has occurred at the north end of this tract, notably green ash, eastern cottonwood, hawthorn, multiflora rose (*Rosa multiflora*), white mulberry (*Morus alba*), and Amur honeysuckle. Patches of reed canary-grass and common reed have become established within the wet prairie and sedge meadow vegetation. On drier localities, invasive species include cool-season grasses, common teasel, sweet-clovers, and wild parsnip. Within this area lie two of the known infestations of leafy spurge (*Euphorbia esula*) on Midewin.

3. Doyle Creek Wetlands

This area is a wetland complex associated with Doyle Creek, a tributary of Jordan Creek. Most of this site has been significantly altered by agricultural activities, and only small remnants of native vegetation remain, including several small wet prairie and sedge meadow remnants. These remnants have been invaded by woody species, especially green ash, eastern cottonwood, silver maple (*Acer saccharinum*), and willows. Reed canary-grass is invading several native remnants in this area, and large stands occur adjacent to un-infested remnants. Other wetlands and wildlife habitat is found in this wetland complex, including a great blue heron rookery. Most of the wetlands, however, have been altered by the construction of Army facilities and infrastructure (railroad berms). Additionally, activities of beaver have caused some areas to reflood. Near Doyle Lake, large infestations of reed canary-grass and common reed have been noted, and many former wetlands are now severely infested with woody species, notably cottonwood, silver maple, and green ash. Purple loosestrife and Chinese cup-grass have both appeared in this area as well. Other invasives in the Doyle Creek wetlands area include Amur honeysuckle, autumn-olive, common teasel, sweet-clovers, and wild parsnip.

4. Seed Production Areas

The three seed production areas at Midewin are located north of River Road, southeast of the junction of Chicago Road and Road 1N, and at the Midewin Administration Site. These areas include fields planted with one or two species of native grasses (River Road only) and seed production beds planted with native forbs and grasses. Future expansion plans include wetland seed production beds and savanna-woodland beds. Seed from these production areas will be used throughout Midewin. The most serious pest in seed production beds and fields is Canada thistle, but control problems are also posed by

Eurasian cool-season grasses (especially quack-grass and bluegrasses), garlic mustard, bull thistle (*Cirsium vulgare*), sweet-clovers, tall goldenrod (*Solidago canadensis*), sow thistle (*Sonchus* spp.), prickly lettuce (*Lactuca scariola* and *L. saligna*), wild carrot (*Daucus carota*), orache (*Atriplex patula*), hairy aster (*Aster pilosus*), late boneset (*Eupatorium serotinum*), annual grasses, and woody seedlings. Some control of native grasses is also necessary, as the grass seed production fields are invaded by other than the desired species (e.g. switchgrass invading production fields of little bluestem). The surrounding fencerows and open lands planned for future seed beds are additionally infested with musk thistle (*Carduus nutans*), teasels, autumn-olive, white mulberry, and Amur honeysuckle.

5. Foxglove Prairie

Foxglove Prairie is a small remnant of mesic and wet outwash plain prairie that contains two Regional Forester sensitive species; there is potential habitat for a third species. Most of the wet prairie and sedge meadow areas have been shaded and dehydrated by dense stands of green ash, silver maple, and eastern cottonwood. The mesic prairie is rapidly being invaded by woody species, particularly the non-native autumn olive and Amur honeysuckles. However, some native woody species are also a problem in this area and include black cherry (*Prunus serotina*), green ash, and dogwood (*Cornus* spp.).

6. Blodgett Road

The Blodgett Road site is primarily a restoration of former crop fields to dolomite prairie, wet prairie, and sedge meadow. An area with native marsh is located within this site, and contains smaller areas of sedge meadow, dolomite prairie, and wet prairie communities. Numerous fencerows and successional thickets occur, and reed canary-grass and common reed pose problems in both the existing wetlands and in areas that are being restored to wetlands. Sweet-clovers, Canada goldenrod (native but aggressive), and Canada thistle (non-native) currently infest the former croplands and threaten the upland portions of the restoration. Invasive woody species infest areas not previously in crops. Common woody species include green ash, silver maple, hackberry, Osage-orange, black cherry, eastern cottonwood, Amur honeysuckle, and autumn-olive.

7. South Patrol Road

Restoration of former crop fields to wet prairie, upland prairie, and sedge meadow is the primary activity occurring at this outwash plain location. A small area of native wet prairie is found at the east end, and the site adjoins Foxglove Prairie (Site #5) to the southeast. Numerous fencerows and successional thickets have become established within the South Patrol Road site. Invasive woody species in the fencerows and thickets include green ash, box elder, hackberry, Osage-orange, black cherry, eastern cottonwood, Amur honeysuckle, and autumn-olive. Reed canary-grass and common reed are local problems along ditches and in some depressional wetlands. Sweet-clovers, Canada

goldenrod (native but aggressive), and Canada thistle (non-native) infest the former croplands and continue to threaten portions of the restoration.

8. Prairie Creek Woods

Located along Prairie Creek north of River Road, the Prairie Creek Woods area includes remnants of oak savanna and woodlands, seeps, and riparian sedge meadows. Much of the area was used for agricultural purposes prior to 1990, but has since grown into dense stands of young woody species. The savannas and woodlands now host a dense, closed understory of invasive plant species. Problem woody species include Amur honeysuckle, European buckthorn, autumn-olive, Osage-orange, black cherry, honey-locust (*Gleditsia triacanthos*), green ash, willows, and eastern cottonwood, the last three listed having also invaded seeps at this site. Whereas savanna herbs are being displaced by garlic mustard, the remaining open habitats have become infested with such herbaceous invaders as cut-leaved teasel, wild parsnip, and sweet-clover. Reed canary-grass and common reed are invading seeps and riparian sedge meadows in this area.

9. Pastures and other agricultural grasslands

These areas are planted with cool-season grasses and managed through grazing with livestock to meet habitat requirements for grassland birds. The pastures may contain groves (usually at former house sites), fencerows, and small wetlands. Invasive species in pastures and other agricultural grasslands can be divided into three groups, based upon their impacts. Noxious weeds, such as Canada thistle and musk thistle, make up the first group. The second consists of invasive herbs and shrubs, especially common reed, reed canary-grass, Osage-orange, autumn-olive, and multiflora rose. The third group includes woody species that make up fragmenting features in grasslands, for instance, fencerows. Typical fencerow species include Osage-orange, hackberry, green ash, hawthorn, white mulberry, box elder, Siberian elm (*Ulmus pumila*), Amur honeysuckle, and honeylocust.

10. New infestations at other sites

These sites include numerous successional habitats (e.g. thickets, roadsides, old fields), small native vegetation remnants (e.g. Jackson Creek Woods, Hoff Road Prairie), and small restoration projects (e.g. Grant Creek/Hoff Road and Mola tracts) not described under the previous nine sites. In these areas, the targets include invasive species that have only recently arrived and are spreading on Midewin (e.g. globe thistle, *Echinops sphaerocephala*, and Norway maple, *Acer platanoides*) or likely to appear in the near future (Appendix B, Table 3). New infestations of widespread species (reed canary-grass, Canada thistle, garlic mustard, and autumn-olive) would be treated, as would existing sources of infestation in these sites (seed trees of cottonwood, green ash or Osage-orange.

3.1 NOXIOUS WEEDS AND INVASIVE SPECIES

Affected Environment

As discussed above, non-native plants are a common sight on the Midewin landscape and are present in each of the sites designated for herbicide treatment. All agricultural crops currently or historically 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. Appendix B lists the non-native invasive plant species at Midewin that currently threaten restoration, management, or health and safety (Table 1), and also provides those non-native invasive plant species that are likely to appear in the next 5-20 years (Table 3).

The existing native vegetation on Midewin is often heavily infested with non-native plant species. For example, remnants of dolomite prairie often contain Canada bluegrass, common St. John's wort, common teasel, common mullein, and sweet-clover. Natural wetlands and forests on Midewin contain large stands of Amur honeysuckle, white mulberry, and garlic mustard. Reed canary-grass and common reed are aggressive invaders present in Midewin's marshes, sedge meadows, moist grasslands, ditches, and wet dolomite prairie.

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, globe thistle). Other species, such as orange daylily, white poplar, lilacs, and fruit trees, are unable to spread far beyond their original introduction and are restricted largely to abandoned home sites.

Native invasive plants are species that, although indigenous to Midewin and the immediate vicinity, pose threats to management and restoration of native vegetation and grassland habitat. Table 2, Appendix B lists native invasive plant species present at Midewin that threaten restoration and management of specific habitats or health and safety. Where fire suppression or other disturbance of ecological processes has occurred, these native invasives 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 can cause localized human health and safety problems, for instance, allergic reactions or dermatitis. These are plants, such as poison ivy, ragweeds, and nettles that may require spot control.

Environmental Consequences

Alternative 1 – Proposed Action

Limited herbicide treatment, in conjunction with other IPM techniques, offers the most effective way to control noxious weeds and invasive species, and to restore the native prairie ecosystem. Herbicides provide the most effective control of noxious weeds and invasive species relative to the costs, time investment, and potential hazards of other management techniques. However, by offering only six herbicides, Alternative 1 may not be able to treat weed infestations as successfully as Alternative 2. This alternative does not allow the Forest Service to take advantage of FAS, an herbicide recommended by the Illinois Department of Natural Resources to successfully control woody species such as bush honeysuckle and black locust (Appendix A). And this alternative does not allow the Forest Service to take advantage of imazapic, an herbicide that has been used successfully to control noxious weeds and invasive species in prairie restorations. In contrast to Alternative 2, Alternative 1 offers fewer tools for controlling noxious weeds and invasive species.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on noxious weeds and invasive species from the use of these herbicides.)

By increasing the number and diversity of herbicides available to the Forest Service, Alternative 2 would potentially treat the largest number of weed infestations and has the greatest potential to achieve the desired goal of reducing noxious weeds and invasive species and preventing new invader species from becoming established (Prairie Plan, p. 2-6). The eight herbicides selected for use under Alternative 2 have a wide range of selectivity. Several choices for herbicides, many of which are selective for different weeds, would reduce the impact on nontarget plants. The addition of FAS to the list of herbicides would provide an additional tool to control invasive woody species that are

encroaching on, and fragmenting, grassland and prairie areas. Imazapic has been successfully used in prairie renovations to control invasive species without seriously injuring native desirable prairie species (Univ. of Nebraska, Agricultural Research Division webpage, 1998; Harvey et al., unknown date). Alternative 2 is consistent with the Prairie Plan by offering a more fully integrated approach to noxious weed management. This alternative would provide the greatest control of noxious weeds and invasive species on Midewin.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

It may be difficult to control the noxious weeds and invasive species that have become a management problem in the Drummond Dolomite Prairie without the use of herbicides. Weed control in this sensitive habitat is a priority because uncontrolled infestations may displace native prairie plant species, including several threatened, endangered, and sensitive plant species. Herbicides may be the most effective means of controlling certain invasive species that are present on the dolomite prairie. Alternative 3 is inconsistent with the Prairie Plan's management goals to restore, enhance, and maintain dolomite prairie.

Cumulative effects

There would be cumulative benefits from herbicide treatment of noxious weeds and invasive species. Herbicide treatment would add to ongoing efforts by adjacent counties and landowners to control the noxious weeds and invasive species surrounding Midewin. Adjacent properties, including the Illinois Department of Natural Resources (IDNR) conservation area and private agricultural land would benefit from reduced weed populations on Midewin. This is consistent with the objectives of the Prairie Plan to manage noxious weeds and invasive species with a coordinated effort including potentially affected adjacent landowners (Prairie Plan, p. 2-6).

Alternative 4 – No-action

The success of noxious weed and invasive species control on Midewin may be limited without the use of herbicides. It may be difficult to adequately control and eradicate noxious weeds using other IPM techniques alone. For example, rhizomatous perennials, those with creeping root systems that send up many vegetative shoots, are stimulated to increase their shoot density when mowed (Boulder County Parks and Open Space, 1999). Prescribed burnings may, in fact, facilitate regeneration of flowering stalks in garlic mustard if the fires are not hot enough (State Noxious Weed Control Board, 1999).

It would be difficult under the No-action Alternative to adequately control noxious weeds and invasive species on Midewin, and to meet the Prairie Plan guidelines, which direct

the Forest Service to "prevent new or additional infestations of noxious weeds and invasive plant species".

Cumulative effects

Without the use of herbicides as a tool to help control populations of noxious weeds and invasive species, invasions into adjacent areas may be accelerated. These areas include private agricultural lands and the Des Plaines State Fish and Wildlife Area (IDNR land), where there are several state and federal threatened and endangered plant species.

3.2 LAND USE

Affected Environment

Midewin is located in predominantly rural Will County and is surrounded by private agricultural land, industry, land still in U.S. Army ownership, and natural areas. Section 3.10 (Scenic Quality) provides a detailed description of adjacent land uses and the influence on the Midewin landscape.

In 1997, Will County had 506 full-time farms with a total of 293,526 acres dedicated to farmland (NIPC, 1997). On Midewin, soybean and small grain fields continue to be managed as they had been previously managed under both the U.S. Army and the Forest Service. The final decision from the *EA for Continued Agricultural Land Use from 2001 through 2005* (Forest Service, 2001), allows for agricultural leases to continue for the next five years on Midewin, including the production of row crops and small grains on 3,950 acres. This decision also allows for the continued application of glyphosate herbicide on soybean crops grown on Midewin. The extent of agricultural land-use within, and in proximity to, Midewin, is a direct indicator of the level of herbicide treatment currently and historically occurring in the area.

Management Areas

Land uses on Forest Service land are defined by Management Areas. As described in the Prairie Plan, Management Areas designate appropriate locations for specific management activities at Midewin. Midewin has two Management Areas that include specific goals and management direction to achieve the Prairie-wide goals, objectives, and standards found in the Prairie Plan (Figure 3). Noxious weed and invasive species management is prescribed for both Management Area 1 and Management Area 2 (Prairie Plan, p. 3-7).

Management Area 1, Prairie Ecosystem Restoration, makes up much of Midewin. This area encompasses lands that will be managed to restore, maintain, and enhance the tallgrass prairie ecosystem and grassland bird habitat. A desired condition for

Management Area 1 states that noxious weeds and invasive species will not be introduced in wetland or prairie restoration projects. Existing noxious weeds and invasive plant species that are likely to adversely impact restoration will be controlled or eradicated using IPM techniques that include the use of approved herbicides (Prairie Plan, p. 3-5). While land conditions that support prairie and habitat restoration are emphasized, the conditions also provide for recreational opportunities and other uses.

Management Area 2, Administrative and Developed Recreation Sites, consists of areas with facilities developed for administration and recreational use. Administrative sites include all current and proposed sites for the administrative office and work center, seedbed production areas, and parking areas. Developed recreation sites include proposed visitor center and access points, proposed campground and picnic area, and associated grounds and parking areas. As stated above, the desired condition for Management Area 2 includes the control or eradication of noxious weeds and invasive plant species (Prairie Plan, p. 3-6).

Environmental Consequences

Alternative 1 – Proposed Action

The vast majority of Midewin areas where herbicides would be used to control invasive plant species and noxious weeds under Alternative 1 are within the "Prairie Ecosystem Restoration Management Area" (Management Area 1). The use of herbicides, as described for this alternative, is consistent with the long terms goals for Management Area 1 (Prairie Plan, p.3-5). These goals include restoring, enhancing, and maintaining dolomite prairie, upland prairie, wet prairie/sedge meadow, cool season grassland habitat, savanna, and forest/woodland.

Herbicides would also to be used to control invasive plant species and noxious weeds at three identified seed production areas and a potential visitor center/environmental learning center site (currently in pasture/agricultural grassland production) under Alternative 1. These areas are within the "Administrative and Developed Recreation Sites Management Area" (Management Area 2). The use of herbicides would be consistent with this desired condition (Prairie Plan, p. 3-6).

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on land use from the use of these herbicides.)

Alternative 2 would have the same effects on land use as Alternative 1. The addition of FAS and imazapic would provide more resources to control noxious weeds and invasive

species so that the goals for Management Area 1 would be met in a more efficient manner.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Similar to Alternatives 1 and 2, the vast majority of areas where herbicides would be used to control invasive plant species and noxious weeds under Alternative 3 are within the "Prairie Ecosystem Restoration Management Area" (Management Area 1). The use of herbicides would be consistent with the long terms goals for this management area.

Under Alternative 3, no herbicides would be applied to the Drummond Dolomite Prairie area (580 acres within Management Area 1) in order to protect endangered, threatened, and sensitive plant species located in this area. The Forest Service would continue brush cutting, mowing, and hand pulling to control invasive species and noxious weeds on the Drummond Dolomite Prairie. Without the use of herbicides in the Drummond area it would be impossible to restore, enhance, and maintain dolomite prairie, which is one of the stated goals for Management Area 1 (Prairie Plan, p. 3-1, 3-3).

Herbicides would be used to control invasive plant species and noxious weeds at three identified seed production areas and a potential visitor center/environmental learning center site (currently in pasture/agricultural grassland production) under Alternative 3. These same locations, which are part of Management Area 2, would be treated with herbicides under Alternatives 1 and 2. The desired condition for these locations, as stated in the Prairie Plan (p. 3-6), includes prairie restoration and natural resource management. The Plan directs that noxious weeds and invasive plant species will be controlled or eradicated. The use of herbicides would be consistent with the desired condition.

Cumulative effects

Will County lands surrounding Midewin are overwhelmingly rural, with agricultural uses making up about two-thirds of the area (Openlands, date unknown). There is evidence that herbicides applied on agricultural land off-site are drifting onto Midewin (E. Ulaszek, pers. comm.) (Section 3.5 Air Quality). Within Midewin, 3,950 acres are used for the production of row crops and small grains with the continued application of glyphosate herbicide on soybean crops.

In terms of population growth between 1990 and 1998, Will County ranked as the fastest growing of the 6-County Chicagoland (northeast Illinois) area. This growth is expected to continue and affect towns surrounding Midewin, such as Elwood, Manahattan, and Wilmington with the development of new residential areas. This population would likely have an urban-suburban view and could object to herbicide treatment on nearby lands, particularly if it is found to drift in the vicinity of residential areas.

Herbicide treatment on Midewin is not expected to add to drift-related impacts from adjacent areas. The Forest Service intends to use herbicide treatment sparingly on Midewin (<1 acre to receive treatment at a time; <500 acres annually). This is an insignificant effort in comparison with the potential application of herbicides for agricultural land uses in Will County. Spot treatment would also drastically minimize the possibility of drift from Midewin to surrounding areas. The limited area to be treated, the use of appropriate herbicides and methodology, and proper mitigation, would preclude adverse cumulative impacts to the surrounding agricultural land and future residential areas.

In fact, herbicide treatment on Midewin would result in beneficial cumulative impacts by complementing ongoing efforts by the Will County Forest Preserve District and the IDNR to control invasive species in natural areas in Will County (Bill Glass, IDNR, pers. comm.; Dave Mauger, Will County Forest Preserve District, pers. comm.).

Alternative 4 – No-action

Under Alternative 4, herbicides would not be used on Midewin to control invasive species and noxious weeds. However, the Forest Service would continue using hand pulling, mowing, cutting, and prescribed burning to control undesirable plant species.

Without the use of herbicides it would likely be impossible to restore, enhance, and maintain dolomite prairie, upland prairie, wet prairie/sedge meadow, cool season grassland habitat, savanna, and forest/woodland, which are goals set forth in the Prairie Plan for Management Area 1 (p. 3-1).

Without the use of herbicides it would be difficult to meet the desired condition for Management Area 2 (Prairie Plan, p. 3-6), which incorporates prairie restoration and natural resource management, including noxious weeds and invasive plant species control or eradication. The use of herbicides would be consistent with this desired condition in the Prairie Plan for Midewin.

Cumulative Effects

As described above, the residential population will likely expand in areas surrounding Midewin. This population will likely have an urban-suburban view and could object to herbicide treatment on nearby lands, particularly if it is found to drift in the vicinity of residential areas. As herbicide use would not occur under Alternative 4, the objection of the residential population could be reduced relative to Alternatives 1, 2, and 3. Herbicides would continue to be applied, however, to agricultural lands on Midewin under a separate authorized action.

Alternative 4 may result in adverse impacts to other natural areas in Will County. Uncontrolled infestations of invasive species on Midewin could spread to adjacent IDNR conservation land and other nearby natural areas, hindering efforts by the IDNR and Will County Forest Preserve District to control invasive species.

Under this alternative, no herbicides would be used to control invasive plant species and noxious weeds, making the management of Midewin lands more difficult and less cost efficient, relative to Alternatives 1, 2, and 3. This could slow the restoration process and result in lower quality plant communities.

3.3 HUMAN ENVIRONMENT

Affected Environment

The affected area for human health risks includes all lands on Midewin where people will be present. Public access to Midewin has been minimal because of the hazards remaining from the Army arsenal operations as well current cleanup activities. However, even with public access restrictions, every year hundreds of people visit Midewin, including volunteers, school groups, tour groups, hunters, and hikers (two trails are now open to the public). Section 3.9 (Recreation), describes the human element at Midewin in detail. The number of visitors to Midewin will continue to increase as restoration activities continue to transform the area, and more recreation opportunities become available.

Environmental Consequences

Alternative 1 – Proposed Action

There is a concern that inappropriate application, handling, and storage of herbicides could cause injury to applicators and to members of the public that may recreate on Midewin. Workers and the public may be exposed to herbicide drift, to vegetation with herbicide residues, or to accidental spills of herbicides. The risks to human health from each of the proposed herbicides is presented in Table 1. Nearly all of the herbicides exhibit low toxicity to mammals. None of the herbicides pose an increased risk to human health if applied according to label directions, although the herbicides can be a skin and eye irritant, and three (2,4-D, triclopyr, clopyralid) can cause serious eye damage if splashed into the eyes.

Worker doses would vary depending on the conditions under which a given herbicide is applied. For example, high winds may create more drift. Mitigation, including applying herbicides under favorable conditions, using appropriate protective gear, and proper training for mixing and application, would reduce risks to workers. Mitigation measures

would ensure that potential health risks to workers would be reduced or eliminated. Mitigation (including short-term use restrictions) should ensure that members of the public are not exposed at all to herbicides on Midewin.

Table 1
Selected herbicides and risks to human health

Herbicides	Characteristics
	Toxicology information
2,4-D acetic acid	Considered moderately toxic to mammals. Can produce serious eye and skin irritation. Acid and salt formulation can cause severe eye damage if splashed into the eyes, while the ester formulation can cause moderate damage.[1] Conflicting reports on carcinogenicity. However, several expert review panels including the U.S.EPA and the World Health Organization concluded that 2,4-D alone is not carcinogenic.[1] Studies suggest that 2,4-D is not mutagenic or has low mutagenic potential.[2]
Glyphosate	Low toxicity to mammals. Has not shown evidence of carcinogencity in humans.[3] Negative in tests for mutagenicity. Low risk of general health effects for multiple exposures of ground-based applications. Can cause skin and eye irritation.[4]
Pelargonic acid	Low toxicity to mammals. Not expected to increase human exposure or risk. Ingesting or inhaling in small amounts has no known toxic effects. Skin and eye irritant.[5]
Sethoxydim	Low toxicity to mammals. May cause skin and eye irritation.[1] Chronic effects in humans from expected exposure levels are unlikely.[2] Not mutagenic or carcinogenic in humans.
Triclopyr	Slightly toxic to mammals.[1] Low risk for people who receive multiple exposures from ground-based applications. Can cause eye and skin irritation with exposure. Can cause severe eye damage if splashed into the eye. No reported cases of long-term human health effects.[6]
Clopyralid	Practically non-toxic to mammals.[1] Not carcinogenic, nor mutagenic. Non-irritant to skin. Can be an eye irritant with exposure, and can cause severe eye damage if splashed into the eyes.[7]

[1] Tu et al., 2001a. [2]EXTOXNET-2,4-D, 1996. [3] Tu et al., 2001b. [4]USDA Forest Service, 1997. [5]U.S. EPA Office of Pesticide Programs, 2000. [6]USDA Forest Service, 2001. [7]Dow AgriSciences, 2000.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on human health from the use of these herbicides.)

The addition of FAS and imazapic to the list of herbicides for use on Midewin would not pose an increased risk to human health over Alternative 1. Both these herbicides exhibit low toxicity to mammals (Table 2).

Table 2
Risks to human health from imazapic and FAS

Herbicides	Characteristics
	Toxicology information
Imazapic	Low toxicity to mammals. Not considered carcinogenic.[1] No indication of adverse effects on development or reproduction and no carcinogenic or mutagenic activity. Appears to be non-irritating and non-sensitizing to the skin and minimally irritating to the eyes.[2]
FAS	Only slightly toxic to mammals, but excessive contact with the skin may cause skin irritation. The EPA regards it as mildly toxic for acute oral ingestion and acute inhalation. Can cause eye irritation.[1]

[1] Tu et al., 2001a. [2]USDA Forest Service, Unknown date.

Neither FAS nor imazapic pose risks to human health that would make them less desirable in comparison to the six herbicides under Alternative 1. Application per label instructions and proper mitigation would ensure that potential health risks to workers from FAS and imazapic would be reduced or eliminated. Mitigation (including short-term use restrictions) should ensure that members of the public are not exposed at all to FAS or imazapic on Midewin.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

The removal of the Drummond Dolomite Prairie from Herbicide Treatment would not have any effects on human health. The potential risk to human health from herbicide treatment is addressed under Alternatives 1 and 2.

Cumulative effects

Cumulative effects apply to both workers and to the public, who may experience continued exposure to herbicides. Cumulative effects in members of the public would not likely occur because members of the public would not be allowed in areas in which a treatment has recently occurred. There is very little likelihood that a member of the public would be exposed more than once to herbicide treatments. However, with Forest Service staff and herbicide applicators it may be possible for cumulative overdoses to occur. Workers who move from site to site, applying herbicides repeatedly may be at a greater risk for cumulative impacts. However, if proper mitigation is adhered to, it is expected that human health impacts from herbicide application on the proposed sites would be insignificant.

Alternative 4 – No action

There would be no impacts to human health from chemical exposure under the No-action Alternative. However, if other IPM techniques fail to adequately control populations of

certain noxious weeds, humans may have allergic reactions and skin irritation from exposure to these undesirable species, although the probability of this is low.

Cumulative effects

Since there are no human health effects under the No-action Alternative, there would be no cumulative effects.

3.4 WATER QUALITY AND AQUATIC ECOLOGY

Affected Environment

The streams and wetlands of Midewin are organized into four drainage systems (watersheds): Jackson Creek, Grant Creek, Prairie Creek, and Jordan/Lower Forked Creek. Together these perennial streams drain nearly 110 square miles of urban, agricultural, and undeveloped land to the Des Plaines or Kankakee rivers (Table 3).

Table 3
Streams of Midewin's Watersheds Potentially Affected by the Project Alternatives (Sources: Openlands, Date Unknown; USFS, 2002, Final Environmental Impact Statement).

Stream	Perennial stream miles	Drainage area Mi^2	Drainage area on Midewin Mi^2 (acres)	% of watershed in Midewin
Jackson Creek (Des Plaines River subbasin)	25	37	1.0 (638)	1.9
Grant Creek (Des Plaines River subbasin)	4.5	11	6.33 (4052)	40
Prairie Creek (Kankakee River Subbasin)	21	47	17.06 (10,923)	35
Jordan Creek/Lower Forked Creek (Kankakee River subbasin)	8	14	5.26 (3368)	13
TOTAL	**58.5**	**109**	**29.7**	**N/A**

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. However, the downstream waters of the Des Plaines and Kankakee rivers are used for drinking water, industrial process, water-contact recreation, and fishing.

According to the Illinois Environmental Protection Agency's (IEPA) 2000 Water Quality Report, Jackson, Prairie, and Forked creeks are in full support of their designated uses (Table 4). Grant Creek is only partially supporting its designated use; however, the causes of impairment were not identified in the report. The report did not assess Jordan Creek.

Table 4
Regulatory status of Midewin's Streams
(Source: Illinois EPA, 2000, Illinois Water Quality Report)

	Data source	**Use support***	**Designated Use****	**Causes of impairment**
Jackson	Intensive basin survey	Full	Overall Use; Aquatic Life	Not impaired
Grant	Monitoring data > 5 years old	Partial	Overall Use; Aquatic Life	Unknown
Prairie	Intensive basin survey; monitoring data from other agencies	Full	Overall Use; Aquatic Life	Not impaired
Jordan/Lower Forked Creek	None listed	Jordan – not assessed; Forked - Full	Overall Use: Aquatic Life	Not impaired

*Illinois streams are assigned the following use support rankings according to how well each stream meets its designated use: Full, Threatened, Partial Support, or Non-support.
**Illinois streams are assigned one or more of the following designated uses: Overall use, Aquatic Life, Fish Consumption, Swimming, Secondary Contact, Drinking Water Supply.

Jackson Creek qualifies as a "High Quality Aquatic Resource" based upon the IEPA Biological Stream Characterization. Past inventories have assigned Jackson Creek a high rating for biological integrity (a Biological Stream Characterization index of B). Jackson Creek has been described by Glass (1994) as one of the "least disturbed streams in Northeast Illinois". In a survey (documented in Openlands, date unknown) of mussel fauna, the Ellipse Mussel (*Venustaconcha elipsiformis*, Regional Forester Sensitive Species) was recorded in Jackson Creek.

Prairie Creek scored slightly lower than Jackson Creek (index of C) using EPA's Biological Stream Characterization. Grant Creek and Jordan Creek (index of C) show stronger signs of distress in their aquatic communities due to insufficient flow, poor water quality, or both. All four streams on Midwin receive runoff from upstream sources that

include croplands and other agricultural areas, roads and transportation facilities, and areas of industrial and urban development.

Wetland protection is required under Executive Order 11990 and Section 404 of the Clean Water Act. Approximately 1,050 acres of Midewin (6.4%) have been classified as wetlands. Most wetlands on Midewin are part of the palustrine system with emergent communities or unconsolidated bottoms that cover approximately 320 acres. 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 and threatened species.

Important marshes on Midewin 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.

Three aquifers provide groundwater for Midewin. A shallow dolomite aquifer (Kankakee Formation) is connected to the overlying glacial till aquifer (Chadron Till). Both aquifers are separated from a deep sandstone aquifer by a thick shale formation. Groundwater from shallow wells generally contains high concentrations of sulfur and other dissolved solids that reduce its palatability for human consumption, but the water is commonly used for livestock. Midewin currently maintains seven wells to provide water to livestock, producing 500 to 2000 gallons per day.

Environmental Consequences

Alternative 1 – Proposed Action

Potential effects to aquatic organisms from noxious weed management are largely associated with the herbicide application on and around streams, lakes, or wetlands. Contamination can occur through direct application to surface water, by herbicides leaching through the soils into groundwater, or by herbicides carried away in runoff to surface waters. Aerial spraying has the greatest potential to expose aquatic organisms to contaminants. This method is not permitted on Midewin. Herbicides from ground-based equipment may also enter streams, but risk of contamination is greatly reduced because application occurs more slowly and applicators are able to recognize problems and adjust application techniques. It is important to note that the majority of a herbicide would be absorbed into the plant with ground application. However, if herbicide residues originating from ground application reach stream channels or wetlands, it is most likely through surface runoff. The potential for surface runoff and impacts to groundwater is dependent on the behavior of the herbicides in soil. The mechanisms of degradation, persistence, and mobility in the soil are explored in Section 3.6 of this EA. These

properties directly influence the possibility of herbicide residues leaching into groundwater or surface waters.

Nearly all of the six herbicides included in this alternative have demonstrated low toxicity toward fish and aquatic invertebrate species (Table 5). The ester formulations of 2,4-D and triclopyr are toxic to fish and aquatic invertebrates, and care must be used during application to ensure that these herbicides do not enter aquatic resources. The salt formulations are much less virulent (slightly to non toxic), with some salt formulations of 2,4-D registered for aquatic use. With the exception of 2,4-D, there is no evidence that the proposed herbicides bioaccumulate (Table 5). Conflicting studies both support and reject the bioaccumulation of 2,4-D in fish and aquatic invertebrates (Table 5). Nevertheless, bioaccumulation of 2, 4-D in Midewin's aquatic resources would be highly unlikely with the small amount of 2,4-D that would be applied in an area (<1 acre treated in an area) and proper mitigation. Most of the proposed herbicides are rapidly degraded in aquatic systems by sunlight or by microbial activity in the sediment.

Out of the six herbicides proposed for use under Alternative 1, 2,4-D (ester formulation) is one of the strongest, and has the potential to harm aquatic resources. Therefore it is an appropriate herbicide to analyze in depth in this section. Presented below is a scenario from a Risk Assessment on 2,4-D modeling the effects of 2,4-D on fish and amphibian species in the event of a large spill (USDA Forest Service 1998).

> …."200 gallons of a 2,4-D solution released into a shallow pond that has an average depth of 1 meter and a surface area of about one-quarter of an acre (1000 m^2), would result in concentrations of 2,4-D ranging from 1-6 mg/L. The consequences of this scenario will greatly depend on the formulation of 2,4-D that is spilled. At a concentration of 1-6 mg/L, 2,4-D salt would not likely result in fish kills. And, while amphibians may be more sensitive to 2,4-D than fish, the lower end of the range 1 mg/L is a factor of 10 below the estimate of possible lethal exposures for at least some species of amphibians. However, if this scenario involves 2,4-D ester there would likely be some fish mortality and adverse effects on other aquatic species"….

This spill scenario could not occur on Midewin with the low volume of herbicide to be used per treatment (<1 acre in size per area) and proper mitigation. The volume of herbicide that would be used for spot treatment would be far below the volume of herbicide presented in the scenario above.

Table 5
Behavior of the selected herbicides in water included toxicity data on fish and aquatic animals.

Herbicides	Characteristics		
	Solubility	Half-life	Toxicity to fish and aquatic organisms; tendency for bioaccumulation
2,4-D acetic acid	Water soluble at pH>7. At lower pH, is more likely to adsorb to organic particles present in water, thus increasing its persistence.[1]	1 week to several weeks. [2]	Ester formulations are toxic to fish as well as aquatic invertebrates. Some salt formulations are registered for use against aquatic weeds and are non-toxic to aquatic species.[1] Conflicting reports on bioaccumulation. According to some studies, nearly all of the dose of 2,4-D is excreted in urine and does not accumulate in animals. [2] Field studies indicate that the application of 2,4-D amine or ester to a lake, at high application rates, did not result in the bioconcentration of 2,4-D in game fish.[3] According to other studies, 2,4-D can accumulate in fish and aquatic invertebrates. However, the highest concentrations of 2,4-D were reached shortly after application, and dissipated within three weeks after exposure. [1]
Glyphosate	Rapidly dissipated through adsorption to suspended and bottom sediments.[4]	12 days to 10 weeks. [4]	Technical grade is moderately toxic to fish. A formulation is registered for aquatic use that is practically non-toxic to fish, aquatic invertebrates, and amphibians.[4] Does not bioaccumulate in fish. [5]
Pelargonic acid	Emulsifiable in water.[6]	Rapidly degraded by light with a half-life of minutes.[7]	Little to no toxicity to fish. Rapid decomposition in land and water, so it does not accumulate. [8]
Sethoxydim	Soluble in water and does not bind strongly with soils.[1]	Rapidly degraded by light in less than 1 hour. [1]	Moderately to slightly toxic to aquatic species. [1] The tendency to dissipate quickly precludes any bioaccumulation in the food chain. [1]
Triclopyr	Salt formulation is water-soluble. The ester formulation is insoluble in water.[1]	Salt formulation can degrade in sunlight with a half-life of several hours. The ester formulation takes longer to degrade.[1]	Ester formulation is extremely toxic to fish and aquatic invertebrates. Acid and salt formulation is lightly toxic to fish and aquatic invertebrates.[1] The hydrophobic nature of the ester formulation allows it to be readily absorbed through fish tissues where it is converted to triclopyr acid which can be accumulated to a toxic level. However, most authors have concluded that if applied properly, triclopyr would not be found in concentrations adequate to harm aquatic organisms. [1]
Clopyralid	Highly soluble in water and will not bind with particles in water column.[1]	8 to 40 days.[1]	Low toxicity to aquatic animals. [1] Does not bioaccumulate in fish tissues. [9]

[1]Tu et al., 2001a. [2] EXTOXNET-2,4-D, 1996. [3] USDA Forest Service, 1998. [4] Tu et al., 2001b. [5] USDA Forest Service Pacific Northwest Region, 1997. [6] Mycogen Corporation, "Scythe Herbicide" Specimen label. [7] Mycogen Corporation, 1997. [8] U.S. EPA Office of Pesticide Programs, 2000. [9] USDA Forest Service, Unknown date, Pesticide Fact Sheet.

Based on the data presented in Table 5 above, and in Section 3.6 (Soil Quality), and based on the results of the spill scenario for 2,4-D, and on the mitigation measures presented in this EA, it is unlikely that there would be a notable effect on the water quality of the streams and wetlands on Midewin, or to aquatic organisms within these water bodies. It is highly unlikely that any herbicide would be detected in surface water

as a result of herbicide applications, because of the very small areas to be treated (<1 acre at a site; <500 acres annually), and low levels of use. Should a herbicide enter the water, its concentration would quickly decline because of mixing and dilution, volatilization, and degradation by sunlight and secondarily microorganisms (Felsot, 1998).

Only those herbicides registered for use in aquatic resources would be used near open water. The use of herbicides may benefit aquatic organisms, as it may be the most effective tool for managing noxious weeds and invasive species such as reed canary-grass, common reed, and cattails that have become a management problem on Midewin. The U.S. Fish and Wildlife Service has successfully used the aquatic formulation of glyphosate to control monotypic stands of cattails, reversing declining trends in waterfowl populations and loss of wetland habitat (Henry et al., Unknown Date; McEnroe, M.R., Unknown date).

Herbicide treatment is consistent with the Prairie Plan guidelines (p. 4-5) for reducing noxious weeds and invasive species on Midewin. Removing invasive woody vegetation and other non-native vegetation from riparian areas and preventing invasion of undesirable species into Midewin's wetlands is also consistent with the Prairie Plan goals, objectives, and standards for all aquatic threatened, endangered, and sensitive species.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on Midewin's aquatic resources from the use of these herbicides.)

The addition of FAS and imazapic to the list of herbicides would not increase the risk to water quality or aquatic resources over Alternative 1. FAS and imazapic are not toxic to fish or other aquatic organisms, and there is no evidence that either herbicide bioaccumulates (Table 6).

Table 6
Behavior of FAS and imazapic in water including toxicity data on fish and aquatic animals.

Herbicides	Characteristics		
	SOLUBILITY	Half-life	Toxicity to fish and aquatic organisms; tendency for bioaccumulation
Imazapic	Soluble in water. Is not degraded hydrolytically in aqueous solutions.[1]	Rapidly degraded in sunlight, with a half-life of 1-2 days.[1]	Moderate toxicity to fish by itself. But, in an aqueous solution it is relatively safe for aquatic animals due to its rapid degradation. Not registered for use in aquatic systems.[1] According to other studies, imazapic has a low order of toxicity to fish and aquatic invertebrates with exposures of 100 mg/L unlikely to be associated with mortality or reproductive effects.[2] * It is rapidly excreted and does not bioaccumulate in animals.[1]
FAS	Highly soluble in water; however it is stable and persistent once it enters an aquatic system.[1]	Highly water soluble, but is stable & persistent once it enters aquatic systems. It is degraded rapidly through microbial activity in aquatic sediments.[1]	Low toxicity to fish and aquatic invertebrates.[1] There is no evidence that FAS bioaccumulates in fish.[1] Can be applied to floodplains where no surface water is present and to low-lying areas where water is drained but may be isolated in pockets due to uneven land use.[3]

[1]Tu et al., 2001a. [2] USDA Forest Service, unknown date. [3] DuPont, Krenite UT, Specimen Label.
* Ecotoxicological categories: >10-100 mg/L is slightly toxic for aquatic organisms; >100 mg/L is practically non-toxic for aquatic organisms. Source: USDA Forest Service, unknown date; Pesticide Fact Sheet, 2,4-D.

FAS and imazapic are far more benign to aquatic resources than the ester formulation of 2,4-D which is discussed in detail under Alternative 1. FAS, in fact, has been approved for use in floodplains and other low-lying areas because of its low potential to adversely affect aquatic resources (Table 6). With responsible application procedures and mitigation measures, it is highly unlikely that there would be an effect on the aquatic resources on Midewin from the use of FAS and imazapic. It is highly unlikely that FAS or imazapic would be detected in surface water as a result of herbicide applications, because of the very small areas to be treated (<1 acre at a site; <500 acres annually), and low levels of use.

Neither FAS nor imazapic pose risks to Midewin's aquatic resources that would make them less desirable than the six herbicides under Alternative 1. However, the addition of these herbicides to the six herbicides under Alternative 1 would provide additional tools that have been successfully used by others to control noxious weeds and invasive species.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

The removal of the Drummond Dolomite Prairie from herbicide treatment would not have any effects on aquatic resources. The potential risk to aquatic resources from herbicide treatment is addressed under Alternatives 1 and 2.

Cumulative effects

The application of herbicides on Midewin is not expected to have cumulative effects on water quality. The area to receive herbicide treatment is small. Nearly all of the proposed herbicides rapidly degrade in aquatic systems, and nearly all exhibit low toxicity to fish and aquatic invertebrates, and do not bioaccumulate. For these reasons, the doses are expected to be negligible under the three action alternatives. In addition, only those herbicides registered for aquatic use would be used over open water. Therefore, there would be no cumulative effects on water quality.

Alternative 4 – No-action

The No-action Alternative would not have any effects on water quality. However, herbicide treatment may be the only effective tool to control infestations of purple loosestrife, reed canary-grass, and common reed, invasive species present on Midewin that can form dense, single species stands in wetland and riparian habitat (NDSU Extension, 1997; Wisconsin DNR, 1999; USFWS, 1989). Without the use of herbicides it may be difficult to improve the quality of Midewin's wetlands and riparian areas.

Cumulative effects

There would be no cumulative effects to water quality under the No-action Alternative.

3.5 AIR QUALITY

Affected Environment

Midewin and all of Will County lie within a designated ozone non-attainment area surrounding greater Chicago (USEPA, 2000).[5] Ozone concentrations in the non-attainment area tend to exceed one-hour National Ambient Air Quality Standards for ozone during mid-afternoon hours of summer days. However, the Illinois Environmental Protection Agency (EPA) ranked the air quality in the Will County/Joliet Sector during 2000 as "good" more than 90 percent of the time. The remainder of the time, air quality was described as "moderate". At no time during 2000 did the area exhibit "unhealthy for sensitive groups", or "unhealthy" air quality.

Current row cropping and small grain cropping at Midewin is done using no-till practices and little dust is generated. Farm machinery used to plant, maintain, and harvest row

[5] U.S. Environmental Protection Agency, Air and Radiation Division. Personal communication with Jacquiline Nwia, January 24, 2002. Chicago is still a non-attainment zone. However, the 2001 data is still being processed and there is evidence that Chicago will meet the 1-hour ozone standard for 2001.

crops and small grain crops within Midewin adds an insignificant amount of pollution to the air in comparison to surrounding industries and automobile use.

The Illinois Environmental Protection Agency enforces air quality regulations in the non-attainment area under the Clean Air Act. Midewin does not presently have any regulated point emission sources of air pollution (major or stationary sources). Aerial application of herbicides/pesticides is not permitted on agricultural land within Midewin.

Environmental Consequences

Alternative 1 – Proposed Action

The implementation of Alternative 1 is not expected to have significant impacts on air quality. Most of the six herbicides proposed for Forest Service use under Alternative 1 are not volatile; that is, they are unlikely to vaporize and be carried by wind (drift) to unintended locations (Table 7). The exceptions are the low-volatile ester formulations of 2,4-D and triclopyr. Auxin-like, growth-regulating herbicides such as 2,4-D and triclopyr can be offenders of drift if applied inappropriately (Kansas State University, 2001). These formulations should be applied cautiously and only under appropriate climatic conditions. The potential to volatize increases with increasing temperature and increasing soil moisture (Tu et al., 2001a). The salt formulations of both herbicides are less likely to vaporize and may be a desirable alternative in some instances (Tu et al., 2001a; Putnam et al., unknown date).

Table 7
Mobility of the selected herbicides in the air

Herbicides	Characteristics
	Volatility
2,4-D acetic acid	Volatile. It should not be applied under high temperatures or windy conditions. [1] Salt formulation is much less volatile than the ester formulation.[2]
Glyphosate	Does not readily volatilize.[3]
Pelargonic acid	Does not readily volatilize.[4]
Sethoxydim	Does not volatilize readily.[1]
Triclopyr	Ester formulations can be volatile, and care should be taken during application. Salt formulation is much less volatile than the ester formulation.[1]
Clopyralid	Does not volatilize readily.[1]

[1] Tu et al., 2001a. [2]Putnam et al., unknown date. [3]Tu et al., 2001b. [4] Mycogen Corporation, "Scythe Herbicide" Specimen label.

Different methods of application can have significantly different effects on air quality. Herbicide drift is greatest under aerial application. This method of application is not allowed on Midewin. Spot spraying would result in little or no drift as applications are made close to the ground surface. Broadcast spraying would have greater impacts than

spot spraying. However, mitigation would reduce drift from broadcast spraying and prevent impacts to air quality. Spot treatment and broadcast spraying may result in temporary, localized odors that may persist at the spray site for several hours or days. Temporary closures of sprayed sites to the public would eliminate odor effects.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on air quality from the use of these herbicides.)

The addition of FAS and imazapic to the list of herbicides to be used on Midewin is not expected to have significant impacts on air quality. The two herbicides are not volatile, and are unlikely to vaporize and drift to unintended locations (Table 8). Proper application and mitigation would reduce or eliminate effects to air quality from FAS and imazapic. The potential risk to air quality from herbicide treatment is discussed in detail under Alternative 1.

Table 8
Mobility of the FAS and imazapic in the air

Herbicides	**Characteristics**
	Volatility
Imazapic	Does not readily volatilize.[1]
FAS	Not highly volatile.[1]

[1] Tu et al., 2001a.

Neither FAS nor imazapic pose risks to air quality that make them less desirable than the six herbicides under Alternative 1.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

The removal of the Drummond Dolomite Prairie from herbicide treatment would not have any effects on air quality. The potential risk to air quality from herbicide treatment is addressed under Alternatives 1 and 2.

Cumulative effects

Will County lands surrounding Midewin are overwhelmingly rural, with agricultural uses making up about two-thirds of the area (Openlands, date unknown). There is evidence that herbicides applied off-site are drifting onto Midewin (E. Ulaszek, pers. comm.). During a survey of Midewin's east side, the Forest Service observed leaf deformation on

wild grapes (*Vitis riparia*), a plant species particularly sensitive to the effects of herbicide drift (Oregan State University Extension, 1999). However, while there is evidence that herbicides applied to surrounding agricultural lands are affecting air quality and nontarget species, herbicide treatment on Midewin is not expected to add to these impacts. The Forest Service intends to use herbicide treatment sparingly on Midewin (<1 acre to receive treatment at a time; <500 acres annually). The limited area to be treated, the use of appropriate herbicides and methodology, and proper mitigation, would preclude cumulative impacts to the air quality in the surrounding area.

Alternative 4 – No-action

There would be no effects to air quality under the No-action Alternative.

Cumulative effects

Since there are no impacts to air quality under the No-action Alternative, there would be no cumulative effects.

3.6 SOIL QUALITY

Affected Environment

Thirty-three soil series have been mapped on Midewin excluding borrow pits and man-made land. The topography of Midewin is characterized by low slopes. The soils are finely textured and poorly drained. Surveys of soil maps indicate that hydric soils cover approximately 41% of Midewin. At one time these areas were most likely wetlands before drainage and land use changes that began in the mid-1800s.

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 on Midewin soils through several decades.

Environmental Consequences

Alternative 1 – Proposed Action

Herbicide application may have some short-term effects on soil resources. However, noxious weed infestations can also adversely impact soils by removing nutrients and increasing soil erosion (Montana Weed Control Association, Unknown date; University of Arizona AgNIC, 2001). To determine the level of risk for accumulation of herbicide residues on soils and possible contamination of ground and surface water, factors such as persistence (measured in half-life), mobility, and mechanisms for degradation must be reviewed (Table 9). Precipitation patterns following application also heavily influence potential effects to soils, and potential contamination of groundwater and surface waters.

Table 9
Mobility and persistence of the selected herbicides in the soil

Herbicides	Characteristics		
	Mechanisms of degradation	Half-life in soil	Mobility
2,4-D acetic acid	Degradation is primarily due to microbes in the soil[1]	7 to 10 days.[2]	Most formulations do not bind tightly with soils, and therefore have the potential to leach down into the soil and migrate off-site.[1] However, in many instances, extensive leaching does not occur, most likely because of the rapid degradation of the herbicide. [1]
Glyphosate	Degradation is primarily due to soil microbes[3]	Average of 47 days[3]	Glyphosate has an extremely high ability to bind to soil particles, preventing it from being mobile in the environment.[3]
Pelargonic acid	Pelargonic acid is rapidly degraded by microbes in the soil.[4]	No residual activity[4]	Rapid degradation to background levels eliminates risk of migration.[4]
Sethoxydim	Sethoxydim is rapidly degraded by photolysis as well as microbes in the soil.[1]	4 to 5 days[1]	Does not bind strongly with soils, so it could potentially have high mobility, but degrades rapidly so there is limited movement.[1]
Triclopyr	Triclopyr is rapidly degraded to triclopyr acid by photolysis, microbes in the soil, and hydrolysis.[1]	30 days[1]	Ester formulation binds readily with the soil, giving it low mobility. The salt formulation binds only weakly in soil, giving it higher mobility. However, both formulations are rapidly degraded to triclopyr acid, which has an intermediate adsorption capacity, thus limiting mobility.[1]
Clopyralid	Clopyralid is degraded by soil microbes.[1]	40 days[1]	Does not bind strongly to soils. During the first few weeks, there is a strong potential for leaching and possible contamination of groundwater, but adsorption may increase over time.[1]

[1] Tu et al., 2001a. [2] EXTOXNET-2,4-D, 1996. [3] Tu et al., 2001b. [4] Mycogen Corporation, 1997.

The persistence of an herbicide is defined as the length of time that residues of the initial application remain active in the soil. Half-life is the period of time it takes for 50 percent of an herbicide in the soil to degrade. The six herbicides proposed for use on Midewin under Alternative 1 have very little persistence in the soil with a half-life of several weeks or less; and many have a half-life of just days. Soil microbes readily degrade each of the herbicides proposed for use.

The soil mobility of the herbicides proposed for Midewin is varied. The majority of the proposed herbicides pose little risk of migration. However, both 2,4-D and clopyralid have the potential to be highly mobile in the environment (Tu et al., 2001a). Alternately, both are minimally persistent in the environment, thus reducing the potential for impacts to soils and water resources.

Label direction would be followed to prevent groundwater and surface water contamination from mobile chemicals. Only those herbicides registered for aquatic use would be applied near open water. Herbicide treatment in riparian areas would follow the guidelines presented in Table 18 (Chapter 4 Mitigation and Monitoring) to protect aquatic resources. When used according to label specifications no long-term impacts to soils, groundwater, or surface waters are expected.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on soil resources from the use of these herbicides.)

The addition of FAS and imazapic to the list of herbicides to be used on Midewin is not expected to have significant impacts on Midewin soil resources. FAS has very little persistence in the soil with a half-life of just days (Table 10). The rapid degradation of FAS, combined with its affinity to bind with soils, strongly reduces the risk of migration. Imazapic, however, does appear to be fairly persistent in the soil with an average half-life of 120 days. Proper planning would ensure that if imazapic is used on Midewin, its persistence in the soil would not inhibit future restoration projects. However, research indicates that non-native weeds are more susceptible to imazapic than desirable native grasses, composites and legumes (families that include many prairie wildflowers) (Univ. of Nebraska, Agricultural Research Division webpage, 1998; Harvey et al., unknown date). Therefore, imazapic persistence in the soil is less likely to impact native species, and may instead provide continued protection against future infestations of noxious weeds in a treated area.

Table 10
Mobility and persistence of the FAS and imazapic in the soil

Herbicides	Characteristics		
	Mechanisms of degradation	Half-life in soil	Mobility
Imazapic	Degradation is primarily due to soil microbes.[1]	Average of 120 days (can range from 31 - 233 days)[1]	Weakly adsorbed in high pH soil. Limited horizontal mobility, but may leach vertically depending on soil type.[1]
FAS	Rapidly degraded by soil microbes, so it does not persist.[1]	Average of 8 days (can range from 1 – 2 weeks.[1]	It has limited mobility due to its rapid degradation, and because it binds readily with some soils [1]

[1] Tu et al., 2001a.

Responsible application of FAS and imazapic, and appropriate mitigation would minimize or eliminate any threats to soil resources. With responsible application and mitigation procedures neither FAS nor imazapic pose risks to soil resources that make them less desirable than the six herbicides under Alternative 1. Adding these two herbicides to the six herbicides discussed under Alternative 1 would increase the number of tools available to control noxious weeds and invasive species on Midewin.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

By removing the Drummond Dolomite Prairie from herbicide treatment, the threatened, endangered, and sensitive plant species that are located in this habitat would not be affected by possible residues persisting in the soil, or by the mobility of certain herbicides. However, when proper mitigation is employed it is unlikely for there to be any impacts on sensitive plant species in this area. Uncontrolled noxious weeds and invasive species pose a greater threat to sensitive species in the Drummond Dolomite Prairie than do herbicides. It would be impossible to control and eradicate populations of noxious weeds and invasive species that have invaded the Drummond Dolomite Prairie using only IPM techniques other than herbicide treatment. Many invasive species are aggressive competitors and would out-compete native prairie species if left unchecked.

Cumulative effects

Based on the predicted movement and persistence of the herbicides and typical treatment scenarios, no accumulation of herbicides is expected in either soil or groundwater. Most of the herbicides are expected to be decomposed in the soil, within weeks or several months, by natural processes. Therefore, cumulative effects would be minimal for all three action alternatives.

Alternative 4 – No-action

There would be no impacts to Midewin's soils under the No-action Alternative.

Cumulative effects

Since there are no impacts to soils under the No-action Alternative, there would be no cumulative effects.

3.7 THREATENED, ENDANGERED, AND SENSITIVE PLANT AND ANIMAL POPULATIONS

Affected Environment

All state or Federal endangered (SE, FE) or threatened (ST, FT) plant or animal species occurring in the project region, as well as the Regional Forester's Sensitive Species (RFSS), have been considered in terms of their known or potential presence in areas expected to be directly or indirectly affected by herbicide use. There are thirty-two threatened or endangered, and sensitive species known or suspected to be present at Midewin. Because the possible locations for spot treatment of herbicides include most of Midewin, all thirty-two species will be evaluated for possible impacts in this document. Sensitive wildlife species and their status[6] that will be considered are listed below.

Plants

- **Leafy Prairie Clover**, *Dalea foliosa* (FE, SE) is a short-lived herbaceous perennial that occurs in dolomite prairie, barrens and cedar glades. Leafy prairie clover occurs in a small tract of degraded mesic and wet-mesic dolomite prairie at the northwest margin of Midewin. The population was discovered in 1997 and has fluctuated between 130 and 178 individual plants since discovery.

- **False Mallow**, *Malvastrum hispidum* (RFSS, SE) is a summer annual herb of glades, dolomite prairie, limestone barrens and other thin-soiled prairie. At Midewin, it is found in Drummond Dolomite Prairie, at the northwest margin of Midewin. A small population consisting of at least 30-35 plants was discovered in a highly degraded site at the Blodgett Road Restoration Project in 2001. The

[6] FE = Federal Endangered species
FT = Federal Threatened species
RFSS = Regional Forester's Sensitive Species
SE = Endangered by Illinois Endangered Species Protection Board (1988)
ST = Threatened by Illinois Endangered Species Protection Board (1988)

population probably consists of several thousand plants, which fluctuates annually, depending on weather conditions.

- **Pitcher's Sandwort**, *Minuartia patula* (RFSS, ST) is a winter annual herb of calcareous rocky habitats. Some of these habitats include glades, limestone barrens, rock outcrops and dolomite prairies. It only occurs in a small tract of degraded mesic dolomite prairie at the northwest margin of Midewin. The population was discovered in 1993. The population varies from several hundred plants to several thousand plants, and fluctuates annually, depending on weather conditions.

- **Glade Quillwort**, *Isoetes butleri* (RFSS, SE) is an herbaceous perennial that arises from a corm-like rootstock. It 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. It only occurs in a small tract of degraded mesic dolomite prairie at the northwest margin of Midewin where the microhabitat conditions are appropriate. The population was discovered in 1994 and consists of approximately 250 individual plants.

- **Crawe's Sedge***, Carex crawei*, (RFSS) is a low stature, perennial rhizomatous sedge of calcareous habitats. Some of the habitats include glades, calcareous typic prairie, dolomite prairie, pannes, alvars and calcareous prairies, limestone barrens, stream banks and open forests. At Midewin, this plant occurs in dolomite prairie at the Drummond Dolomite Prairie and in prairie communities along the western boundary south of Grant Creek. At the latter site, the population is fairly large and extends onto adjacent IDNR land. Crawe's sedge may also be present in Foxglove Prairie; suitable habitat is present, and this site contains several species of low-stature prairie sedges.

- **Sullivant's Coneflower***, Rudbeckia fulgida*, var. *sullivanti* (RFSS) is a rhizomatous, perennial herb of calcareous, mesic habitats; known habitats include fens, calcareous prairies, woodland edges, open forests, and dolomite prairies. In Illinois, this species is scattered throughout the eastern half of the state, with a relatively large number (>40) of extant populations. At Midewin, this species is locally common west of Illinois Route 53, usually growing on outwash plain soils in pastures, prairie remnants, moist forests, seeps, roadsides, and wetland margins. Elsewhere on Midewin, Sullivant's coneflower is very local, usually associated with riparian habitats. Populations of this species on Midewin usually consist of 50-1000+ individuals; because this species is rhizomatous, it is likely that the smaller populations may consist of one or a few genetic individuals.

- **Glade Mallow**, *Napaea dioica* (RFSS) is a perennial forb of floodplains and alluvial terraces; some populations survive along drainage ditches and stream

banks. This species can be found in a variety of successional habitats associated with floodplains and stream terraces. Plants are often suppressed by competition from woody plants in floodplains, and openings are important to produce vigorous growth and prolific flowering. At Midewin, this species is restricted to the Jackson Creek floodplain near the northwest boundary, and in Drummond Dolomite Prairie. This population is small (less than 30 plants) and scattered over at least 250 acres.

- **Eastern Prairie White-fringed Orchid,** *Platantherea leucophaea* (FT, SE) is a perennial monocot, growing from a compact tuber. This orchid occurs in wet and mesic tall grass prairie, sedge meadows, fens, bogs, wet hay meadows and moist abandoned fields. Eastern prairie white-fringed orchid has not been found on Midewin. However, a population of this species is present on adjacent land and individual plants occur near the property boundary. Plant communities containing this orchid are contiguous from the adjacent land onto Midewin.

- **Earleaf False-Foxglove**, *Tomanthera auriculata* (RFSS, ST) is an annual herb of mesic prairies. Sometimes it is also present in dry prairie, dolomite prairie, open savannas, hayfields and old fields. This species has been found only at three sites at Midewin. Two populations are located north of Blodgett Road, approximately two miles north of Prairie Creek, and the other is some two miles south of Prairie Creek.

- **Hill's Thistle**, *Cirsium hilli* (RFSS, ST) is a relatively short-lived perennial herb associated with dry-mesic prairie, sand prairie, savanna and open woods. This thistle occurs in a diversity of well-drained grassland, including dolomite prairie, hill prairie, mesic prairie, gravel prairie, alvars and pastures. This species is not found at Midewin; however, within the Prairie Parklands there are two populations. One population occurs on adjacent IDNR property within approximately 200 feet of Midewin. Plant communities containing Hill's thistle are contiguous from IDNR land onto Midewin.

- **Hairy Valerian**, *Valeriana edulis* var. *ciliata* (RFSS) is a perennial herb of wet and mesic tallgrass prairie, sedge meadows and fens. At Midewin, hairy valerian is restricted to a prairie remnant along the western boundary. Only a few plants (less than 10) are present, but these are part of a larger population present on adjacent IDNR land.

- **White Lady's Slipper**, *Cypripedium candidum* (SE) is a small orchid that flowers in mid-May and early June, and seed pods ripen in September. It occurs in high quality wet or mesic prairie and fens. At Midewin, White Lady's Slipper has been documented south of Grant Creek. Like the hairy valerian, only a few plants are present, but these are part of a larger population present on adjacent IDNR land.

- **American Ginseng**, *Panax quinquefolia* (RFSS) is a long-lived herbaceous perennial with a thick taproot that abruptly narrows into a rhizome. This species can be found in undisturbed mesic upland forest and woodland. Approximately 194 acres of Midewin are considered native forest or woodland. Currently at Midewin, this species is restricted to one native woodland remnant. Only a small population is present.

- **Goldenseal**, *Hydrastes canadensis* (RFSS) is a long-lived rhizomatous herbaceous perennial that blooms from April to May. Like American ginseng, this species can be found in moist upland forests and woodlands. Currently at Midewin, goldenseal is restricted to one native forest remnant. There are only a few colonies present.

Birds

- **Cerulean Warbler**, *Dendroica cerulea* (RFSS) typically nests in mature deciduous forest. Approximately 194 acres of Midewin are considered native forest or woodland. This forest species is uncommon at Midewin, having been found occasionally in the Jackson Creek drainage. Additional habitat is adjacent and north of Midewin at the Joliet Army Training Area. Cerulean warblers have not been confirmed to nest on Midewin, and there have been very few sightings of this species on Midewin during the breeding season.

- **Common Moorhen**, *Gallinula chloropus* (ST) is a uniformly gray, duck-like wetland bird associated with open water and emergent vegetation. The common moorhen has been known to breed only at Doyle Lake, near the southeast corner of the site, and at the Blodgett Road wetland along Midwin's western boundary. Presently, there are only small remnants of marsh at Midewin with appropriate habitat for common moorhens.

- **Pied-billed Grebe**, *Podilymbus podiceps* (ST) is a diving bird that requires open-water wetland with emergent vegetation. At Midewin, this species has been seen breeding in the Blodgett Road wetland and Doyle Lake wetland.

- **King Rail**, *Rallus elegans* (RFSS, ST) is a large rusty-colored rail with a slender bill, longer than the head and slightly de-curved. This bird prefers tidal freshwater and brackish marshes, non-tidal freshwater marshes, and successional stages of marsh-shrub swamp. This wetland species has been found at Midewin only at Doyle Lake, near the southeast corner of the site, and at Drummond Dolomite Prairie.

- **Least Bittern**, *Ixobrychus exilis* (RFSS, ST) is the smallest member of the heron family. The least bittern is found primarily in cattail marshes where it prefers

extensive marshes dominated by dense emergent vegetation to nest. The least bittern has been seen only in the Blodgett Road wetland, where it was found nesting.

- **Migrant Loggerhead Shrike**, *Lanius ludovicianus migrans* (RFSS, ST) is a predatory songbird slightly smaller than the American robin. This songbird prefers short-grass prairie for nesting and foraging. For nesting, it utilizes small trees, preferring thorny species. Loggerhead Shrikes require a territory of at least 25 acres that consists of at least a 90% herbaceous ground cover. Loggerhead shrikes nest primarily in or adjacent to grazing tracts at Midewin, and is more common on the west side at Midewin.

- **Upland Sandpiper**, *Batramia longicauda* (RFSS, SE) is a long distance migrant shorebird that prefers relatively short-stature grasslands and prairies. This shorebird requires large, open, relatively treeless areas with short grasses, preferably greater than 1,235 acres. Upland sandpipers nest primarily in or adjacent to grazing tracts at Midewin. These areas are characterized by short herbaceous stature dominated by Kentucky bluegrass and smooth brome, and a lack of woody vegetation. The upland sandpiper has bred in many grazed fields west and east of Illinois Route 53.

- **Bobolink,** *Dolichonyx oryzivorus* (RFSS) is a grassland bird that prefers intermediate grass height. It requires grassland tracts exceeding 75-123 acres for breeding. At Midewin, bobolinks are present as a breeding species in many lightly-grazed pastures, hayfields, and other grasslands that meet the above requirements, most of which are found west of Illinois Route 53.

- **Henslow's Sparrow,** *Ammodramus henslowi* (RFSS, SE) is a long-distance migrant songbird that breeds in a variety of grassland habitats with tall, dense grass and herbaceous vegetation. Henslow's sparrow prefers to breed in relatively tall grassland with standing herbage 40-80 cm tall and accumulated litter averaging 3-4 cm. Prime breeding habitat for Henslow's sparrow is contiguous grassland greater than 135 acres. It is considered an area-sensitive grassland bird, susceptible to fragmentation of habitat. As invading woody plants reach 2 meters tall, grassland habitat becomes unsuitable for this species. This small grassland sparrow has been found nesting at Midewin, primarily in former pastures that have been taken out of the cattle grazing rotation, and in prairie remnants. Like the bobolink, while Henslow's sparrow is found throughout Midewin, it is more common west of Illinois Route 53.

- **Northern Harrier**, *Circus cyaneus* (RFSS, SE) is a sexual dimorphic hawk of slim body, long wings and tail, and long slender legs. This hawk is an area-sensitive grassland species. It requires a minimum of 75 acres of breeding habitats and prefers contiguous grassland of more than 160 acres. Preferred breeding habitats

for northern harrier is open grassland or wetlands with dense herbaceous cover, including native prairie. At Midwin, northern harriers have been observed foraging over most of the grassland areas over the years. Northern harriers have nested at the former Joliet Arsenal prior to its closing, but not in an area now managed by the Forest Service (Bill Glass, pers. ob.). However, it is likely that nesting has occurred on Midewin in the past.

- **Short-eared Owl**, *Asio flammeus* (RFSS, SE) requires large tracts of contiguous habitats for foraging. This species is highly nomadic, and its presence is often determined by prey (small rodents) population cycles. It forages over grassland in search of voles, preferring brush-free pastures and ungrazed fields. This owl has not been recorded nesting on Midewin, although nesting has been recorded at nearby Goose Lake Prairie. At present, short-eared owls only visit Midewin during the winter.

- **Bald Eagle**, *Haliaeetus leucocephalus* (FT, SE) is known to migrate through Midewin occasionally. Bald eagles have been observed during the winter along the Des Plaines River to the north of Midewin. Bald eagles are transient visitors, however, there is little habitat (large water body) appropriate for roosting or foraging, and there is no nesting habitat at Midewin.

Amphibians

- **Plains Leopard Frog**, *Rana blairi* (RFSS) is a medium sized frog associated with lentic wetlands. The plains leopard frog has been found sporadically at several localities along Prairie Creek west of Illinois Route 53. It may breed in one or more wetlands near the stream. This species requires permanent grasslands for foraging habitat, but does not show fidelity towards high quality native prairie. Plains leopard frogs are uncommon at Midewin. The reasons are unknown, but may be caused by competition from the locally common northern leopard frog (*Rana pipiens*). Other factors that may be linked to the scarcity of the plains leopard frog may include past pollution from ordnance manufacturing, or climatic factors that are reflected by the margin of this species range.

Reptiles

- **Blanding's Turtle**, *Emydoidea blandingi* (RFSS, ST) is a semi-aquatic medium-sized turtle that requires large areas of wetlands within a mosaic of undisturbed uplands. Currently extensive surveys at Midewin have failed to turn up this turtle in the Prairie Creek or Jordan Creek watersheds, although one population was discovered in 1993 and the turtle has been documented elsewhere at Midewin. The population size on Midewin is unknown.

Invertebrates

- **Blazing-star Stem Borer**, *Papaipema beeriana* (RFSS) is considered to be a prairie-restricted insect species. This moth only produces one generation annually. The only known food plant is the dense blazing-star, a forb of wet prairies, fens and dolomite prairies. The blazing-star stem borer was probably found throughout the tallgrass prairie region where its larval food was found. At Midewin, this moth is restricted to a prairie remnant along the western boundary. Apparently, most of the other populations of blazing-star at Midewin are not large enough to support the moth, which appears to require at least 100 plants for a viable population.

- **Red-veined Prairie Leafhopper**, *Aflexia rubranura* (RFSS, ST) is a flightless leafhopper considered to be a prairie-restricted species. This leafhopper produces two generations annually. The only known food plant is prairie dropseed (*Sporobolus heterolepis*). Currently at Midewin this leafhopper is documented solely from the Drummond Dolomite Prairie. This site supports scattered populations of prairie dropseed. However, the Drummond area was the only area surveyed for this insect. It is possible that other populations exist at other sites supporting prairie dropseed.

- **Rattlesnake-master Stem Borer**, *Papaipema eryngi* (RFSS, SE) is a noctuid moth that, as larvae, has an obligate host-specific relationship with rattlesnake master (*Eryngium yuccifolium)*, a prairie plant restricted to high quality and relatively undisturbed prairie. On Midewin, the moth's food plant and moth have been found only in prairie remnants along the western boundary adjacent to IDNR land. Other populations of the food plant occur in small remnants on Midewin. These two populations of the rattlesnake-master (food plant) are likely too small to support a viable population of the moth.

- **Ellipse**, *Venustaconcha ellipsiformis* (RFSS) 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. This freshwater mussel has been found in Jackson Creek, but not in Jordan, Grant, or Prairie creeks.

Environmental Consequences

PLANTS

FEDERAL ENDANGERED AND THREATENED PLANT SPECIES

Alternative 1 – Proposed Action

The leafy prairie clover and the eastern prairie white-fringed orchid would not sustain any adverse impacts under Alternative 1 if proper mitigation and monitoring techniques are followed for herbicide treatment. If improperly applied, certain herbicides could cause mortality of individuals of the leafy prairie clover and the eastern prairie white-fringed orchid if these species were to come in contact with herbicides. Both the leafy prairie clover and the eastern prairie white-fringed orchid could be adversely affected by each of the six herbicides proposed for use under Alternative 1 except for the herbicide sethoxydin. The leafy prairie clover is also sensitive to clopyralid, which is selective for specific plant families, including the leafy prairie clover family Fabaceae.

The Midewin Prairie Plan provides direction to minimize adverse impacts to the leafy prairie clover and the eastern prairie white-fringed orchid during herbicide treatment. According to the Prairie Plan Standards for Ecological Sustainability, management activities (including herbicide treatment) will avoid or minimize adverse effects to the leafy prairie clover during the growing season from April 30th to October 30, and during the growing season of the eastern prairie white-fringed orchid from April 1 to October 15th. (Prairie Plan, p. 4-20). In addition, Prairie Plan Guidelines state that herbicide use in leafy prairie clover and eastern prairie white-fringed orchid habitat will include approved herbicides applied with special care, using wipe-type applicators or other techniques to eliminate drift. The treatment area will be surveyed prior to treatment, and known leafy prairie clover and eastern prairie white-fringed orchid plants will be covered near application areas. No pre-emergent herbicides will be used. Individuals applying herbicides will be trained in leafy prairie clover and eastern prairie white-fringed orchid identification (Prairie Plan, p. 4-20).

Leafy prairie clover and the eastern prairie white-fringed orchid habitat would be enhanced and expanded by the control and eradication of invasive species through herbicide treatment. There are many invasive species and noxious weeds currently present that are extremely difficult to control and eradicate without herbicides. Herbicides, in many situations provide the least ecologically disruptive method for controlling invasive species, in comparison to other IPM techniques such as mowing and controlled burns, which often have negative effects on native plant production and soil structure. Furthermore, it could take many years of effort before there is a reduction in

plants using IPM techniques other than herbicides. Years of effort would be long enough for the infestation to have adverse effects on sensitive plant species.

By allowing the use of herbicides throughout Midewin, Alternative 1 offers an effective, tool for protecting the leafy prairie clover and the eastern prairie white-fringed orchid habitat from degradation by invasive species.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on Federal listed plant species from the use of these herbicides.)

The addition of FAS and imazapic to the list of herbicides would not increase the risk to the leafy prairie clover or the eastern prairie white-fringed orchid over Alternative 1. FAS is selective for woody species, and therefore, would have no impact on the two Federal listed plant species. The herbicide offers a safe alternative for treating woody invasive species in areas with sensitive nontarget vegetation. It is possible, however, that imazapic would have an adverse effect on the two species. While many native plants are tolerant to imazapic, the effect this herbicide could have on the leafy prairie clover and eastern prairie white-fringed orchid is unknown. Responsible application of imazapic, and appropriate mitigation would minimize or eliminate any threats to the leafy prairie clover and eastern prairie white-fringed orchid. Neither FAS nor imazapic would pose a risk to the leafy prairie clover or the eastern prairie white-fringed orchid that make these herbicides less desirable than the herbicides discussed under Alternative 1.

By increasing the number and diversity of herbicides available to the Forest Service, Alternative 2 would potentially treat the largest number of weed infestations. This alternative offers the most effective, and least ecologically disruptive, tool for protecting the leafy prairie clover and the eastern prairie white-fringed orchid habitat from degradation by invasive species.

Alternative 3 – Remove the Drummond Dolomite Prairie from Herbicide Treatment

Alternative 3, by removing the Drummond Dolomite Prairie from herbicide treatment, removes the leafy prairie clover from possible harmful contact with herbicides. While the removal of herbicides from the Drummond Dolomite Prairie would eliminate a possible threat to the leafy prairie clover, uncontrolled infestations of invasive species pose a far more serious threat to this federally protected species. It may not be possible to control invasive species in the Drummond area without the use of herbicides. For example, efforts to remove Canada thistle by pulling have been continuous for the past several years. Yet, there has not been any decline in vigor or size of the infestation on

Midewin. Canada thistle has invaded the Drummond area, and without the use of herbicides would be impossible to control. If Canada thistle and other invasive species remain uncontrolled they would quickly outcompete and displace sensitive prairie species like the leafy prairie clover.

Alternative 3 would have no effects on the eastern prairie white-fringed orchid since this species does not occur in the Drummond Dolomite Prairie.

Cumulative effects

Alternatives 1 and 2 would have a positive cumulative effect on the leafy prairie clover and the eastern prairie white-fringed orchid. Herbicide treatment on Midewin would complement ongoing efforts by the Will County Forest Preserve District and the IDNR to control invasive species and improve habitat for native species in natural areas in Will County using herbicides (Dave Mauger, Will County Forest Preserve District; Bill Glass IDNR; pers. comm.). Alternative 3 would result in adverse cumulative impacts to the leafy prairie clover. Alternative 3 would also assist the county-wide efforts to control invasive species, but to a lesser extent than Alternatives 1 and 2. Under Alternative 3, conditions would likely not improve for the Drummond Dolomite prairie on Midewin or on dolomite areas on adjacent IDNR land, both locations of the leafy prairie clover. The IDNR uses herbicide treatment to improve habitat on adjacent IDNR land, including management of dolomite prairie habitat. In addition, the IDNR safely applies herbicides in areas with threatened, endangered and sensitive species to enhance habitat for these species. Uncontrolled infestations on Midewin's Drummond Dolomite prairie habitat would likely spread to adjacent IDNR land and hinder management efforts.

<u>Alternative 4 – No-action</u>

The No-action Alternative would result in adverse impacts to the leafy prairie clover and the eastern prairie white-fringed orchid. Although the eastern prairie white-fringed orchid is not currently found on Midewin, it is found near Midewin on adjacent IDNR land and would be adversely affected by uncontrolled infestations on Midewin.

As discussed previously, restoration and management of habitat for species of concern, including the leafy prairie clover and the eastern prairie white-fringed orchid, would be impossible without herbicides to kill or control certain species that have taken over certain areas (e.g. autumn olive, Canada thistle). In many instances, other IPM methods are more ecologically disruptive than herbicides, and much less effective. For example, methods such as mowing that have been used to control invasive species could have adverse effects on native plant reproduction and soil structure. For some invasive species, prescribed burning and mowing would only prevent flowering and seed production. Resprouts of these species will continually require management. Alternative

4 does not provide for adequate control of the invasive species and noxious weeds on Midewin. These species are a direct threat to the endangered, threatened, and sensitive species on Midewin, including the leafy prairie clover and the eastern prairie white-fringed orchid. Left unchecked, invasive species would outcompete the leafy prairie clover and the eastern prairie white-fringed orchid for space, water, and nutrients.

Cumulative effects

The No-action Alternative would likely result in adverse cumulative impacts to the leafy prairie clover and eastern prairie white-fringed orchid. Without herbicides, uncontrolled infestations of invasive species on Midewin would spread to adjacent IDNR land affecting threatened, endangered, and sensitive species including the leafy prairie clover and eastern prairie white-fringed orchid whose populations are located near the Midewin/IDNR land boundary. The IDNR uses herbicides as a management tool to control invasive species and enhance native habitat for sensitive species. Alternative 4 would hinder efforts by the IDNR to manage habitat for these species.

STATE ENDANGERED AND THREATENED SPECIES, AND REGIONAL FORESTER SENSITIVE PLANT SPECIES

Alternative 1 – Proposed Action

As long as prescribed mitigation measures and proper application procedures are followed, Alternative 1 would not have adverse affects on the state listed plant species and Regional Forester Sensitive Species: Crawe's sedge, Hill's thistle, white lady's slipper, goldenseal, glade quillwort, false mallow, Pitcher's sandwort, glade mallow, American ginseng, Sullivant's coneflower, earleaf false-foxglove, and hairy valerian. If improperly applied, certain herbicides could cause mortality of individuals of these species if they were to come in contact with the herbicides. However, several of the proposed herbicides exhibit selectivity in the plants that they affect which provides alternatives for treatment in areas with desirable non-target species. In addition, measures such as seasonal timing of herbicide application would avoid adverse effects on the annual species, including false mallow, pitcher's sandwort, and earleaf false-foxglove.

Each of the above plant species would be adversely affected by the herbicides 2,4-D, glyphosate, and triclopyr, but would not be susceptible to sethoxydin. The herbicide clopyralid is selective for Hill's thistle and Sullivant's coneflower family, Asteraceae, and therefore, could adversely affect these species. Hairy valerian is distantly related to this family and to the thistle, and therefore could also be adversely affected by clopyralid. The above species may, or may not, be affected by pelargonic acid, an herbicide that affects young plants, but allows mature plants to recover.

The habitat for the above listed plants would be enhanced and expanded by the control and eradication of invasive species through herbicide treatment. Herbicide treatment is necessary for the restoration and management of habitat for the sensitive plant species. Herbicides, while posing some risk to non-target plant species, would provide the least ecologically disruptive method for controlling invasive species, in comparison to other IPM techniques such as mowing and controlled burns, which often have negative effects on native plant production and soil structure. Furthermore, it could take many years of effort before there is a reduction in plants using IPM techniques other than herbicides. Years of effort would be long enough for the infestation to have adverse effects on the plant species of concern on Midewin. There are many invasive species on Midewin that would be difficult to control without the use of herbicides. For example, years of effort have gone into the pulling of Canada thistle, with no sign of a reduction of vigor or size. By allowing the use of herbicides throughout Midewin, Alternative 1 offers an effective tool for protecting the state endangered and threatened, and RFSS plant species on Midewin. The use of herbicides is the only way to improve the quality of habitat for the listed plant species on Midewin.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on state listed plant species and Regional Forester Sensitive [plant] Species from the use of these herbicides.)

When prescribed mitigation measures and proper application procedures are followed, the addition of FAS and imazapic to the list of herbicides would not increase the risk to the listed plant species: Crawe's sedge, Hill's thistle, white lady's slipper, leafy prairie clover, goldenseal, glade quillwort, false mallow, Pitcher's sandwort, glade mallow, American ginseng, Sullivant's coneflower, earleaf false-foxglove, and hairy valerian. FAS is selective for woody species, and therefore, would have no impact on the above plant species. The herbicide offers a safe alternative for treating woody invasive species in areas with sensitive nontarget vegetation. It is possible, however, that imazapic would have an adverse effect on the above species. While many native plants are tolerant to imazapic, the effect this herbicide could have on the listed plant species is unknown. However, responsible application of imazapic, and appropriate mitigation would minimize or eliminate any potential threats. Neither FAS nor imazapic would pose a risk that make these herbicides less desirable than the herbicides discussed under Alternative 1.

The addition of FAS and imazapic to the herbicide list would provide additional tools with which to control invasive species and facilitate restoration of native prairie and grassland habitat. By increasing the number and diversity of herbicides available to the Forest Service, Alternative 2 would potentially treat the largest number of weed

infestations. This alternative offers the most effective, and least ecologically disruptive, tool for protecting sensitive habitat from degradation by invasive species.

Alternative 3 – Remove Drummond Dolomite Prairie from Herbicide Treatment

Alternative 3, by removing the Drummond Dolomite Prairie from herbicide treatment, removes the following plant species found in this area from possible harmful contact with herbicides: leafy prairie clover, glade quillwort, false mallow, pitcher's sandwort, Crawe's sedge, glade mallow, and Sullivant's coneflower. While removal of herbicides from the Drummond Dolomite Prairie would eliminate a possible threat to these plant species, uncontrolled infestations of invasive species pose a far more serious threat. Without herbicides, it would be would be very difficult to control certain invasive species in the Drummond area. Canada thistle is one species that has not been affected by other IPM techniques such as hand pulling. This species has invaded the Drummond area, and all indications suggest that without the use of herbicides it would be difficult to control. If invasive species are not controlled in the Drummond Dolomite Prairie, the glade quillwort, false mallow, pitcher's sandwort, Crawe's sedge, glade mallow, and Sullivant's coneflower would be severely impacted, and their populations would likely decline.

Cumulative Effects

Alternatives 1 and 2 would have a positive cumulative effect on the listed plant species. Herbicide treatment on Midewin would complement ongoing efforts by the Will County Forest Preserve District and the IDNR to control invasive species in natural areas in Will County using herbicides (Dave Mauger, Will County Forest Preserve District; Bill Glass, IDNR; pers. comm.). With the exception of American ginseng and goldenseal, each of the listed plant species found on Midewin is also located on the adjacent IDNR land (Bill Glass, pers. comm.). Herbicide use on both Midewin and IDNR land would provide improved habitat for these species.

Alternative 3 would result in adverse cumulative impacts to the glade quillwort, false mallow, pitcher's sandwort, Crawe's sedge, glade mallow, and Sullivant's coneflower. Like Alternatives 1 and 2, Alternative 3 would assist county-wide efforts to control invasive species, but to a lesser extent than either Alternative 1 or 2. Under Alternative 3, infestations of invasive species taking over the Drummond area would be difficult to control. Uncontrolled infestations would continue to degrade the Drummond area, and would likely spread to adjacent IDNR land. Both areas support populations of glade quillwort, false mallow, pitcher's sandwort, Crawe's sedge, glade mallow, and Sullivant's coneflower which would likely decline if invasive species are not controlled.

Alternative 4 – No-action

The No-action Alternative would result in adverse impacts to the listed plant species. Herbicides offer the only tool for control of many invasive species that threaten the health and integrity of the listed plant species. As discussed previously, restoration and management of habitat for species of concern, would be difficult without herbicides to kill or control certain species that have taken over certain areas (e.g. autumn olive, Canada thistle). In many instances, other IPM methods are more ecologically disruptive than herbicides, and much less effective. Methods such as mowing that have been used to control invasive species may have adverse effects on native plant reproduction and soil structure. For some invasive species, prescribed burning and mowing would only prevent flowering and seed production. Resprouts of these species would continually require management. IPM techniques such as hand pulling and mowing oftentimes require an enormous amount of repeat effort which may also have adverse environmental consequences. Without the use of herbicides, invasive species would continue to threaten the health and viability of Crawe's sedge, Hill's thistle, white lady's slipper, leafy prairie clover, goldenseal, glade quillwort, false mallow, Pitcher's sandwort, glade mallow, American ginseng, eastern prairie white-fringed orchid, Sullivant's coneflower, earleaf false-foxglove, and hairy valerian.

Cumulative Effects

The No-action Alternative would result in adverse cumulative impacts to the listed plant species. Without herbicides, uncontrolled infestations of invasive species on Midewin would spread to adjacent IDNR land affecting other populations of the listed plant species. The IDNR uses herbicides as a management tool to control invasive species and enhance native habitat for sensitive species. Alternative 4 would hinder effort by the IDNR to manage habitat for these species.

BIRDS

FEDERAL THREATENED BIRD SPECIES

Alternative 1 – Proposed Action

As a transient visitor, the bald eagle would not be affected by herbicide treatment. Nearly all of the six herbicides proposed for use under Alternative 1 exhibit low toxicity for birds. The herbicides do not bioaccumulate when used under prescribed conditions, and therefore, do not pose a threat to organisms, such as the bald eagle, that feed in the upper levels of food chains.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on the Federal listed bird species from the use of these herbicides.)

The addition of FAS and imazapic to the list of herbicides would not increase the risk to the bald eagle over Alternative 1. FAS and imazapic exhibit low toxicity for birds and do not bioaccumulate. Adding these two herbicides to the six herbicides discussed under Alternative 1 would increase the number of tools available to control noxious weeds and invasive species on Midewin.

Alternative 3 – Remove Drummond Dolomite Prairie from Herbicide Treatment

There would be no effects to the bald eagle under Alternative 3. The eagle is a transient visitor and would not be affected by any of the alternatives.

Cumulative Effects

There are no effects to the bald eagle under Alternatives 1, 2 and 3. Therefore, there would be no cumulative effects.

Alternative 4 – No-action

Because the bald eagle and its prey are associated with habitats that are less susceptible to an invasive species and noxious weed invasion than other species, it would not be affected by the No-action Alternative.

Cumulative Effects

There would be no effects to the bald eagle under Alternative 4. Therefore, there would be no cumulative effects.

STATE ENDANGERED, THREATENED AND REGIONAL FORESTER SENSITIVE BIRD SPECIES

Alternative 1 – Proposed Action

Alternative 1 would not result in adverse effects to any of the bird species of concern on Midewin. Nearly all of the six herbicides proposed for use under Alternative 1 exhibit low toxicity for birds and none of the herbicides bioaccumulate when used under

prescribed conditions (Table 11). Mitigation measures, including surveys and seasonal timing to avoid nesting birds, would be implemented to avoid adverse impacts from herbicide treatment.

Table 11
Herbicide toxicity data on birds, mammals, and invertebrates

Herbicides	Characteristics		
	Toxicity to birds and mammals	Toxicity to other organisms	Bioaccumulation
2,4-D acetic acid	According to some studies, 2,4-D ranges from being practically nontoxic to moderately toxic to birds. Mammals have a moderate sensitivity to exposure.[1] According to other studies, 2,4-D is moderately toxic to animals although sensitivities vary significantly between formulations and species.[2]	At moderate doses, honeybee brood production was severely impaired, but at lower levels of exposure they lived significantly longer than the controls.[1]	Conflicting reports on bioaccumulation. According to some studies nearly all of the dose of 2,4-D is excreted in urine. These studies cite no evidence that it accumulates to significant levels in mammals and other organisms.[3] According to other studies, 2,4-D can bioaccumulate in animals. However concentrations in browsing wildlife were found to be below concentrations known to cause effects.[2]
Glyphosate	Low toxicity to birds & mammals.[4]	No long term threat to any microbial populations.[4]	In mammals, the vast majority is excreted unchanged and does not bioaccumulate.[5]
Pelargonic acid	Low toxicity to birds & mammals.[6]	Little to no toxicity to honeybees.[6]	It is a naturally occurring fatty acid that is metabolized in mammalian systems to produce energy, so it will not bioaccumulate.[7]
Sethoxydim	Low toxicity to birds & mammals.[2]	Little to no impact on soil microbes.[2] Non-toxic to honeybees.[8]	The tendency to dissipate quickly precludes any bioaccumulation in the food chain.[2]
Triclopyr	Slightly toxic to birds & mammals.[2]	Relatively non-toxic to terrestrial vertebrates and invertebrates[2]	The tendency to dissipate quickly precludes any bioaccumulation in the food chain.[2]
Clopyralid	Practically non-toxic to birds & mammals.[2]	Low toxicity to soil invertebrates and microbes.[2]	In mammals, the vast majority is excreted unchanged and does not bioaccumulate.[2]

[1] USDA Forest Service, Unknown date, 2,4-D Pesticide Fact Sheet. [2] Tu et al., 2001a. [3] EXTOXNET-2,4-D, 1996. [4] Tu et al., 2001b. [5] USDA Forest Service Pacific Northwest Region, 1997. [6] U.S. EPA, Office of Pesticide Programs, 2000. [7] Mycogen Corporation,1997. [8] EXTOXNET Sethoxydim, 2001.

Those birds that require large tracts of unfragmented grassland for foraging and nesting (Henslow's sparrow, short-eared owl, upland sandpiper, northern harrier, bobolink, and loggerhead shrike) would benefit from herbicide treatment since effective control of encroaching woody growth would reduce fragmentation of grassland and prairie (herbicides would not be used to control and remove all shrubby vegetation within loggerhead shrike habitat in order to maintain nesting habitat). In fact, it would be impossible to control many of the encroaching woody species such as autumn-olive

without herbicide treatment. Herbicide treatment to control woody growth would provide increased foraging opportunities, increased nesting sites, and additional breeding habitat for grassland birds.

The cerulean warbler would benefit from herbicide treatment. Herbicides would control and eradicate undesirable species in forested areas thereby promoting oak regeneration and improving cerulean warbler habitat.

Bird species dependent on wetland habitat for foraging and nesting, the least bittern, pied-billed grebe, common moorhen, and king rail, would benefit from herbicide treatment. Herbicide treatment could be the only effective means of controlling reed canary-grass, common reed, and purple loosestrife, species that threaten the integrity of the wet prairies, sedges meadows, riparian buffers, and other wetland areas on Midewin. These invasive species can quickly form impenetrable monotypic stands that prevent native emergent species from being established. Increasingly dense reed beds have been linked to a decrease in common moorhen sightings in other areas (UNEP, 2002).

Alternative 1 offers an effective IPM strategy to control invasive species so that management efforts for sensitive bird habitat would be successful.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on the state listed bird species and Regional Forester Sensitive [bird] Species from the use of these herbicides.)

The addition of FAS and imazapic to the list of herbicides would not increase the risk to the listed bird species in comparison to Alternative 1. FAS and imazapic exhibit low toxicity for birds and do not bioaccumulate (Table 12). The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration of grassland and native prairie habitat. In particular, the addition of FAS would benefit sensitive grassland birds since it can provide effective control of problematic woody species that are fragmenting Midewin's grassland habitat. Those birds that require large tracts of unfragmented grassland for foraging and nesting (Henslow's sparrow, short-eared owl, upland sandpiper, northern harrier, bobolink, and loggerhead shrike) would benefit from the addition of FAS to the herbicide list.

Table 12
Toxicity data of FAS and imazapic on birds, mammals, and invertebrates

Herbicides	Characteristics		
	Toxicity to birds and mammals	Toxicity to other organisms	Bioaccumulation
Imazapic	Low toxicity to birds & mammals. [1]	Non-toxic to honeybees.[1]	It is rapidly excreted and does not bioaccumulate in animals.[1]
FAS	Very slightly toxic to birds & mammals.[1]	No impact to fungal or bacterial populations.[1]	In mammals, the vast majority is excreted unchanged and a small amount is excreted as a hydrolyzed metabolite. Does not bioaccumulate.[1]

[1] Tu et al., 2001a.

By increasing the number and diversity of herbicides available to the Forest Service, Alternative 2 would potentially treat the largest number of weed infestations. Alternative 2 offers the most effective, and least ecologically disruptive, tool for protecting sensitive habitat from degradation by invasive species.

Alternative 3 – Remove Drummond Dolomite Prairie from Herbicide Treatment

Alternative 3 would have adverse impacts on the king rail, upland sandpiper, bobolink, Henslow's sparrow, and migrant loggerhead shrike, each of which have been observed in the Drummond area. It would be very difficult to control some invasive species in the Drummond area without the use of herbicides. Other IPM techniques such as burning or mowing would be ineffective on some invasive species, and could adversely affect the bird species by destroying habitat. Under Alternative 3, uncontrolled invasive species would continue to degrade the Drummond area, making the habitat unsuitable for the listed bird species.

Cumulative Effects

By matching the county-wide efforts of other agencies to control invasive species and noxious weeds with herbicides, Alternatives 1 and 2 would benefit all species of concern on Midewin, including the sensitive bird species. Alternative 3 could result in adverse cumulative effects to the king rail, upland sandpiper, bobolink, Henslow's sparrow, and migrant loggerhead shrike which utilize the Drummond area in addition to other areas. It is likely that these bird species also utilize similar habitat on adjacent IDNR land. The IDNR uses herbicides as a management tool to control invasive species and manage habitat on their land. However, without the use of herbicides in the Drummond area, infestations would spread to adjacent IDNR land, which could result in the decline of bird habitat in this area.

Alternative 4 – No-action

The No-action alternative would have an adverse effect on the listed grassland, woodland, and wetland bird species. Herbicides offer the only tool for control of many species of noxious weeds and invasive species that have invaded bird habitat. For example, it would be impossible to restore and manage grassland bird habitat without herbicides to control certain species such as autumn-olive which has formed impenetrable thickets in grassland areas. Efforts such as mowing have been repeatedly unsuccessful on Midewin when used as a control technique for autumn olive. Mowing may also negatively impact the listed bird species by adversely affecting bird habitat. Alternative 4 offers an ineffective, ecologically damaging strategy for managing bird habitat on Midewin.

Cumulative Effects

By not matching similar efforts to control noxious weeds and invasive species in conservation areas throughout the county, Alternative 4 would allow for the continued persistence in Will County of invasive species that are invading grassland, woodland, and wetland habitat and degrading bird habitat.

In addition, there could be cumulative effects to the listed birds from repeated efforts to control invasive species using other IPM techniques without herbicides. In particular, the environmental consequences of repeated mowing to control woody species that are encroaching on grassland bird habitat could pose a problem for grassland birds by destroying bird habitat.

AMPHIBIANS

Alternative 1

The effects of herbicides on amphibians is of special concern, particularly to the plains leopard frog, a Regional Forester Sensitive Species (RFSS). Amphibians have skin that is more permeable than the skin of other vertebrates. However, there is a paucity of literature on the effects of the chosen herbicides under Alternative 1 on amphibians. The information presented in Table 13, indicates that while herbicides can have severe adverse effects on amphibians, generally these effects are observed well above concentrations that would occur in the environment. Midewin has specifically not proposed for use certain herbicides that are known to have high toxicity to amphibians. For example, there is strong evidence that the triazines (atrazine is within this group) functions as an endocrine disruptor in amphibians (Sparling, unknown date).

Table 13
Effects of the proposed herbicides on amphibian species

	Amphibian Ecotoxicology
2,4-D	2,4-D esters can be 100 to 1000 times more toxic than 2,4-D acid or salts. In general, the acute LC_{50} (concentration resulting in 50 percent mortality) for amphibians are comparable to fish although at the lower range. However, the evidence suggests that some amphibian species have LC_{50} values for 2,4-D acid that are much lower than for fish (96-hour LC_{50} of 8 mg/L). 2,4-D has been shown to produce teratogenic effects to *Xenopus* frog embryos only at high concentrations (>200 mg/L) that are unlikely to occur in natural waters. However, toad tadpoles (*Bufo melanostictus*) exhibited behavioral abnormalities and later death following exposure to 2,4-D acid at lower levels (96-hour LC50 was 8.05 mg/L). Amphibian eggs appear to be more resistant to pesticides and herbicides than larvae. [1]
Glyphosate	Results of the Frog Embryo Teratogenic bioassay –Xenopus (FETAX) demonstrated that with the proper use of Roundup and Rodeo, neither produced any effects on the normal development of larval frogs.[2]
Pelargonic acid	Specific data for amphibians was not encountered. The EPA has provided a waiver of data for pelargonic acid. Because it is naturally occurring, and exhibits low toxicity, pelargonic acid has been proposed for exemption from the requirement of tolerances (for low application rates) [3]
Sethoxydim	No literature was encountered on the effects of sethoxydim to amphibians during preparation of this report.
Triclopyr	Exposures to 0.6, 1.2, and 4.6 mg/L resulted in no effect on hatching success, malformations, or subsequent avoidance behavior of embryos. However, newly hatched tadpoles died or became immobile after exposure to the two higher concentrations.[4] In comparison, LC50 for trout is 117 mg/L and 148 mg/L for bluegill. [5] However, in another study no significant effects were observed up to 100 mg/L for formulated tripclopyr.[6]
Clopyralid	According to the USDA Forest Service Risk Assessment for clopyralid, neither the published literature nor the U.S. EPA files include data regarding the toxicity of clopyralid to amphibian species.[7]

[1]USDA Forest Service, 1998. [2] Monsato, 2002. [3] US Environmental Protection Agency, 1998. [4] USDA Forest Service, 1996. [5]EXTOXNET – Triclopyr, 1996. [6]Pauli et al., 2000. [7] USDA Forest Service, 1999.

Of the six herbicides proposed for use by the Forest Service under Alternative 1, 2,4-D is one of the strongest, and has the potential to harm aquatic systems (ester formulation). Therefore it is an appropriate herbicide to analyze in depth in this report. According to the Ecological Risk Assessment for 2,4-D (USDA Forest Service, 1998), the direct application of the aquatic formulation of 2,4-D to bodies of water for the control of undesirable vegetation may lead to concentration on the order of 0.5-0.7 mg/L. This is well below the 8.0 mg/L where adverse effects, including mortality, is observed (Table 13).

Presented below (and in Section 3.4 Water Quality and Aquatic Ecology) is a "worst case" analysis for the effects of 2,4-D on fish and amphibian species in the event of a large spill (USDA Forest Service 1998).

> Two hundred gallons of a 2,4-D solution released into a shallow pond that has an average depth of 1 meter and a surface area of about one-quarter of an acre (1000 m^2), would result in concentrations of 2,4-D ranging from 1-6 mg/L. The consequences of this scenario will greatly depend on the formulation of 2,4-D that is spilled. At a concentration of 1-6 mg/L, 2,4-D amine would not likely result in fish kills. And, while amphibians may be more sensitive to 2,4-D than fish, the lower end of the range 1 mg/L is a factor of 10 below the estimate of possible lethal exposures for at least some species of amphibians (Table 13). However, if this scenario involves 2,4-D ester there would likely be some fish mortality and adverse effects on other aquatic species….

This spill scenario could not occur on Midewin with the low volumes of herbicides to be used per treatment (<1 acre in size per area) and proper mitigation.

Although agricultural pesticide use is one factor, among many, that has been linked to birth defects and population decline for amphibians in the Great Lakes Region (Minister of Public Works and Services Canada, 1995), the very low volume of herbicide proposed for use on Midewin annually (<500 acres to receive treatment) would not pose a risk to local amphibian species. Mitigation measures, including a survey for the plains leopard frog prior to treatment, would minimize any adverse impacts.

Herbicide treatment may be the only effective tool to control infestations of purple loosestrife, reed canary-grass, and common reed, invasive species that can form dense, single species stands in wetland and riparian habitat (NDSU Extension, 1997; Wisconsin DNR, 1999). Infestations of purple loosestrife may cause a wetland to dry out and no longer support many plant and animal species that previously thrived (Minister of Public Works and Services Canada, 1995).

There is no evidence that the herbicides chosen for use by the Forest Service, if applied according to label instructions, would have an adverse effect on the plains leopard frog. The judicious use of herbicides is the only way to improve the quality of Midewin's wetlands and riparian areas, thereby improving the habitat available for the plains leopard frog.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on the plains leopard frog from the use of these herbicides.)

It is unlikely that the addition of FAS and imazapic to the list of herbicides would increase the risk to the plains leopard frog over Alternative 1. While specific data pertaining to the effects of the two herbicides on amphibian species have not been encountered in the literature (USDA Forest Service, 200l; USEPA Prevention, Pesticides, and Toxic Substances, 1995), risk modeling for FAS indicated that there is a low risk to endangered species using the highest concentration of FAS permitted by the label (Table 14). In fact, because of its low potential to adversely affect aquatic resources (and organisms associated with such resources) FAS has been approved for application to floodplains and low-lying areas (DuPont, Krenite UT, Specimen Label). FAS and imazapic are far more benign to aquatic resources (and organisms associated with such resources) than the ester formulation of 2,4-D which is discussed in detail under Alternative 1. There is no evidence to suggest that FAS and imazapic, if applied according to label instructions, would have an adverse effect on the plains leopard frog.

Table 14
Effects of the FAS and imazapic on amphibian species

	Amphibian Ecotoxicology
Imazapic	According to the USDA Forest Service Risk Assessment for imazapic, no toxicity studies have been encountered on the effects of imazapic on amphibians. [1]
FAS	No data specific to amphibians encountered. Risk modeling for aquatic animals indicated that the acute risk quotients (the estimated environmental concentrations ÷ LC_{50}) using the highest concentration of FAS permitted by the label do not exceed the level of concern for endangered species.[2]

[1] USDA Forest Service, 2001. [2]US Environmental Protection Agency, 1995.

Neither FAS nor imazapic pose risks to the plains leopard frog that would make them less desirable than the six herbicides under Alternative 1. However, the addition of these herbicides to the six herbicides under Alternative 1 would provide additional tools to control noxious weeds and invasive species and enhance restoration activities.

Alternative 3 – Remove Drummond Dolomite Prairie from Herbicide Treatment

Alternative 3 would have no impact on the plains leopard frog since it is not present in the Drummond Dolomite Prairie.

Cumulative Effects

Throughout Will County, and on approximately 4,000 acres leased for row crops within Midwin, herbicides are applied on large tracts of agricultural land. It can be assumed that some concentration of the herbicides used in Will County does enter ground and surface waters, and could potentially have some impact on amphibian species, including the plains leopard frog. It is difficult to know the county-wide effect, if any, that herbicide use in Will County is having on the plains leopard frog. However, it is highly unlikely that the small amount of herbicides proposed for application on Midewin (<500 acres annually, <1 acre per treatment) would have adverse cumulative impacts on this species.

Alternative 4 – No-action

The No-action alternative would have a negative effect on plains leopard frog populations. Currently purple loosestrife is rare on Midewin. However, reed canary-grass is locally abundant and is actively invading the wetlands and riparian edges on site, including the edges of Prairie Creek where the plains leopard frog has been sighted. It would be difficult or impossible to control some infestations of invasive species in wetland and riparian areas using IPM techniques other than herbicide treatment. IPM techniques can have much more disruptive effects on wetland and riparian areas than herbicide use. Cutting and hand-pulling require the effort of many individuals working in this sensitive habitat. Even with care, it would be difficult for people not to have an impact on these areas; walking can injure or destroy desirable vegetation; large numbers of workers pulling invasive species along riparian areas can damage the streambanks. Without the use of herbicides, infestations of invasive species would continue to displace native wetland plant species, further degrading habitat for wetland amphibian species such as the plains leopard frog.

Cumulative impacts

By not matching similar efforts to control noxious weeds and invasive species in conservation areas throughout the county, Alternative 4 could adversely affect all amphibian species on Midewin, including the plains leopard frog.

In addition, there could be cumulative effects to the plains leopard frog from repeated efforts to control reed canary-grass, and other wetland species, using other IPM techniques without herbicides. As discussed above, other IPM techniques may adversely affect sensitive wetland and riparian areas, while having no impact on noxious weeds and invasive species.

REPTILES

Alternative 1 – Proposed Action

Alternative 1 would benefit reptiles at Midewin, including Blanding's turtle, a Regional Forester Sensitive Species and listed as threatened by the State of Illinois. Toxicity data specific to reptiles is not available; however, nearly all of the six herbicides proposed for use under Alternative 1 demonstrate low toxicity to birds, mammals, and other wildlife (Table 11). Mitigation measures would minimize any adverse impacts to the Blanding's turtle from herbicide treatment. It would be extremely difficult to improve the quality of Midewin's wetland and grassland habitat, which are required by to support Blanding's turtle, without the use of herbicides.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on the Blanding's turtle from the use of these herbicides.)

The addition of FAS and imazapic to the list of herbicides would not increase the risk to Blanding's turtle in comparison to Alternative 1. Toxicity data on the effects of FAS and imazapic on reptiles is not available. These two herbicides, however, exhibit low toxicity to birds, mammals, and other wildlife (Table 12).

FAS and imazapic do not pose risks to Blanding's turtle that would make them less desirable than the six herbicides under Alternative 1. However, the addition of these herbicides to the herbicide list would provide additional tools to control invasive species and facilitate restoration of the grassland and wetland habitat that is required by Blanding's turtle.

Alternative 3 – Remove Drummond Dolomite Prairie from Herbicide Treatment

There has been a Blanding's turtle sighting in the Drummond Dolomite Prairie. Alternative 3, by removing the Drummond area from herbicide treatment, removes from the Blanding's turtle the possible threat posed by herbicide treatment. However, the threat from herbicides is very small since they all demonstrate low toxicity to wildlife and only very low volumes of herbicide would be applied. As stated previously in this analysis, without herbicides it would be difficult to control invasive species in the Drummond area and restore potential habitat for the Blanding's turtle. Alternative 3 would result in the continued degradation of this area, making it unsuitable for the Blanding's turtle.

Cumulative effects

Alternatives 1, 2, and 3 would complement efforts by the Will County Forest Preserve District and IDNR to control invasive species and noxious weeds in natural areas throughout Will County. This would provide benefits to all reptiles on Midewin, including Blanding's turtle.

Alternative 4 – No-action

The effects of the No-action Alternative on Blanding's turtle would be similar to the effects described for the plains leopard frog.

Cumulative effects

The cumulative effects for the No-action Alternative for Blanding's turtle are similar to those described for the plains leopard frog.

INVERTEBRATES

Alternative 1 – Proposed Action

Under Alternative 1 the effects on invertebrates, notably the red-veined prairie leafhopper (Regional Forester Sensitive Species [RFSS], state threatened), the blazing-star stem bore (RFSS), and the rattlesnake-master stem borer (RFSS, state endangered) would be beneficial. Specific toxicity data for these species is not available. However, nearly all of the six herbicides under Alternative 1 pose little or no threat to honeybees, soil invertebrates, and terrestrial invertebrates (Tables 9 and 11). The removal of noxious weeds and invasive species would provide room for desirable prairie plant species such as prairie dropseed, dense blazing-star, and rattlesnake-master, the host plants and food sources to the three sensitive insect species.

Under Alternative 1 there could be adverse effects on the ellipse, (RFSS) if herbicides are sprayed on infestations of reed canary-grass that have invaded the gravel wash and bars in the shallow waters of Jackson Creek. This is the habitat of the ellipse, which prefers clean, shallow gravel bars and riffle areas (Kevin Cummings, INHS, pers. comm.). The ellipse is immobile and feeds on plankton and detritus that it filters from the water, and thus is particularly sensitive to pollutants in the water. While nearly all of the herbicides have demonstrated low toxicity toward fish and aquatic invertebrate species (Table 5), it would be difficult to determine what effect herbicide application would have on the ellipse if it were present in an area that received treatment.

Alternately, allowing reed canary-grass to invade the gravel washes and bars along Jackson Creek could also have adverse impacts on the ellipse. Infestations of reed canary-grass may degrade the quality of habitat and cause these areas to become unsuitable for the ellipse. Mechanical methods could be used to remove invasive species from Jackson Creek (No-action Alternative below). However, using mechanical methods to control invasive species is labor and time costly, and it is likely that this technique, if used alone, would be unsuccessful. The ellipse could also be adversely impacted by mechanical IPM methods.

Allowing reed canary-grass, common reed, and other invasive species to remain in Jackson Creek would obstruct restoration efforts and could eventually threaten the integrity of the stream ecosystem. The control of invasive species in ellipse habitat may require the implementation of several techniques so that there would be no adverse impact on the ellipse. It is unlikely that the ellipse would be present in gravel bars that are infested with reed canary-grass. However, potential impacts to the ellipse from herbicide treatment along Jackson Creek would be significantly reduced if a survey of the gravel washes and bars identified for treatment were to be performed prior to treatment. Through the judicious use of herbicides, in conjunction with other IPM techniques and mitigation measures, Alternative 1 minimizes adverse impacts to the ellipse and protects ellipse habitat.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides discussed under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on the red-veined prairie leafhopper, blazing-star stem borer, the rattlesnake-master stem borer, and the ellipse from the use of these herbicides.)

The addition of FAS and imazapic to the list of herbicides would not increase the risk to the red-veined prairie leafhopper, blazing-star stem borer, and the rattlesnake master stem borer over Alternative 1. Toxicity data on the effects of FAS and imazapic on these insect species is not available. However, FAS and imazapic pose little or no threat to honeybees, soil invertebrates, and terrestrial invertebrates (Tables 10 and 12). The addition of these two herbicides to the Forest Service list would benefit the sensitive insect species because it would provide for additional tools to control noxious weeds and invasive species. In particular, the addition of imazapic may benefit the sensitive insect species since this herbicide is specifically used in prairie restorations and many native prairie plants exhibit tolerance to it. Nonetheless, while many native plants are tolerant to imazapic, the effect on such desirable prairie plant species as prairie dropseed, dense blazing-star, and rattlesnake-master, the host plants and food sources to the three sensitive insect species, is unknown.

The addition of FAS and imazapic to the herbicide list would not pose more risk to the ellipse than those discussed under Alternative 1. FAS and imazapic exhibit low toxicity to fish and aquatic invertebrates. And there is no evidence that either of them bioaccumulate in aquatic systems. Neither FAS nor imazapic are approved for application to open water. Therefore, these herbicides would not be used along the gravel bars that are preferred ellipse habitat.

FAS and imazapic do not pose risks to the red-veined prairie leafhopper, blazing-star stem borer, the rattlesnake-master stem borer, and the ellipse that make them less desirable than the six herbicides under Alternative 1. However, the addition of these herbicides to the six herbicides under Alternative 1 would provide additional tools to control invasive species and enhance restoration of grassland and native prairie habitat.

Alternative 3 – Remove Drummond Dolomite Prairie from Herbicide Treatment

The removal of the dolomite prairie from herbicide treatment may have an adverse effect on the red-veined prairie leafhopper. This species is found on the Drummond Dolomite prairie. It would be very difficult to control and eradicate some populations of noxious weeds and invasive species that have invaded the Drummond Dolomite Prairie using only IPM techniques other than herbicide treatment. Many of the invasive species and noxious weeds are aggressive competitors and may out-compete and displace native, prairie-dependent plants such as prairie dropseed, the host plant and food source for this insect species.

The effects on the ellipse from Alternative 3 would be identical to the effects under Alternatives 1 and 2.

Cumulative effects

Alternatives 1 and 2 would have a positive cumulative effect on the red-veined prairie leafhopper, the blazing-star stem borer, and the rattlesnake-master stem borer and their host plants. Alternatives 1 and 2 would complement ongoing efforts by the IDNR and Will County to control invasive species and improve habitat for native species in natural areas in Will County through the careful use of herbicides. In particular, the insect species would benefit from management practices (herbicide use) to control invasive species on Midewin and on adjacent IDNR land since all three of the insect's host plants are located in close proximity to the property boundary. However, under Alternative 3, there would be adverse effects to the red-veined prairie leafhopper. Alternative 3 would also complement efforts by the IDNR to control invasive species, but to a lesser extent than Alternatives 1 and 2 because of the removal of the Drummond area from herbicide treatment. This would result in adverse impacts the red-veined leafhopper since it would be extremely difficult to control invasive species and restore this area without herbicides.

Under Alternative 3, conditions would not improve for the Drummond Dolomite Prairie on Midewin, or for areas on adjacent IDNR land. Uncontrolled infestations on Midewin's dolomite prairie habitat would likely spread and hinder management efforts on adjacent IDNR land.

Cumulative efforts by Midewin, IDNR, and the Will County Forest Preserve District to control infestations of reed canary-grass would benefit the ellipse, by removing this invader species from wetlands, riparian areas, and stream beds, including ellipse habitat.

Alternative 4 – No-action

Under Alternative 4, infestations of invasive species would continue to displace desirable native species such as prairie dropseed, dense blazing star, and rattlesnake master. The use of IPM techniques such as mowing may have much more disruptive effects on the high quality prairie habitat required by the host plant species than herbicides. Mowing can adversely affect these remnants by destroying native vegetation and altering soil structure.

While the removal of herbicides from the IPM techniques to be used on Midewin would eliminate one possible threat to the ellipse, uncontrolled infestations of reed canary-grass in Jackson Creek pose another, equally serious threat. Reed canary-grass is aggressively invading the gravel washes and bars along Jackson Creek, resulting in the degradation of ellipse habitat. Under Alternative 4, the most effective IPM technique for removing reed canary-grass from Jackson Creek would be by mechanical means. However, mechanical techniques alone are labor and time intensive and may, very likely be unsuccessful. In addition, because it is an immobile filter-feeder, the ellipse is sensitive to habitat alterations, particularly increased sediment loads in the water. Mechanical techniques would include staff and volunteers in the channel hand-pulling invasive species, which would disturb the stream substrate and increase the sediment loads in the water. Mechanical techniques would need to be performed repeatedly, and the success of this technique alone is doubtful. Alternative 4 would adversely affect the ellipse; this alternative does not protect ellipse habitat.

Cumulative Effects

Alternative 4 would have adverse cumulative effects on the red-veined prairie leafhopper, the blazing-star stem borer, and the rattlesnake-master stem borer. Since these insects have an obligate relationship with native prairie plants, the cumulative effects would be similar to the cumulative effects discussed under the No-action Alternative for the endangered, threatened, and sensitive plant species. Each of the insect's host plant species is restricted to sites along the western boundary of Midewin, in close proximity to

adjacent IDNR land, and therefore, the insect and its host plant would be sensitive to differences in management practices between the two areas.

Alternative 4 would result in adverse cumulative impacts to the ellipse. It may be impossible to remove the reed canary-grass along the gravel washes and bars in Jackson Creek using mechanical methods. Adverse cumulative effects would be felt from repeated (cumulative) unsuccessful efforts to control these infestations. If allowed to remain uncontrolled year after year, reed canary-grass would continue to degrade ellipse habitat and make it unsuitable for this invertebrate species.

3.8 MANAGEMENT INDICATOR SPECIES

The Forest Service is required to address Management Indicator Species (MIS) under the current planning regulations 36 CFR §219 to gauge the effects of management activities implemented under land management plans. MIS are plant and animal species, communities, or special habitats selected for emphasis in planning (Forest Service Manual [FSM] 2620.5). Species selected are those that "best represent the issues, concerns, and opportunities to support the recovery of Federally-listed species, provide continued viability of sensitive species, and enhance management of wildlife and fish…" (FSM 2621.1). A set of Management Indicators Species for Midewin has been identified in the Prairie Plan (Table 15). Midewin's MIS include several species and ecological conditions or selected vegetation communities that would be monitored to determine population trends and to evaluate effects of management activities on selected species.

Table 15
Management Indicators and associated species of interest for Midewin

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
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

Environmental Consequences

Dolomite Prairie

Alternative 1 – Proposed Action

Approximately 120 acres of dolomite prairie occur on Midewin; restoration of approximately 230 acres has been initiated. By allowing herbicide treatment on the Drummond Dolomite Prairie, Alternative 1 would control invasive species and noxious

weeds that have become a serious threat to the management and restoration of rare dolomite prairie habitat. Habitat conditions would improve and result in a positive trend in the plant and animal species of interest for the dolomite prairie.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on dolomite prairie from the use of these herbicides.)

Effects on dolomite prairie would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control the invasive species that threaten the integrity of Midewin's rare dolomite prairie.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

The removal of the Drummond Dolomite Prairie from herbicide treatment would make it difficult or impossible to control infestations of invasive species on dolomite prairie. Uncontrolled infestations would cause habitat conditions to decline and would result in a negative trend in the plant and animal species of interest for the dolomite prairie. Those elements used to monitor the condition of dolomite prairie, including species diversity, seasonal flowering diversity, relative cover of native herbs, and total area of habitat, would be expected to decline under Alternative 3.

Alternative 4 – No-action

The No-action Alternative would result in the same adverse impacts to dolomite prairie as Alternative 3. Furthermore, if herbicide treatment is not included as an IPM technique on Midewin, uncontrolled infestations of invasive species present on other parts of Midewin could spread to the dolomite prairie.

Upland Typic Prairie

Alternative 1 – Proposed Action

Approximately 4 acres of upland typic prairie occur on Midewin; restoration of approximately 80 acres has been initiated. Alternative 1 would control invasive species and encroaching woody species which threaten management and restoration of upland typic prairie habitat. Habitat conditions would improve, and would result in a positive trend in the plant and animal species of interest for upland typic prairie.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on upland typic prairie from the use of these herbicides.)

Effects on upland typic prairie would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration of upland typic prairie.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on upland typic prairie would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

Under the No-action Alternative, it would be difficult to control invasive species and encroaching woody plants that threaten management and restoration. Uncontrolled infestations would cause habitat conditions to decline and would result in a negative trend in the plant and animal species of interest for upland typic prairie. Those elements used to monitor the condition of upland typic prairie, including species diversity, seasonal flowering diversity, relative cover of native herbs, and total area of habitat, could be expected to decline under Alternative 4.

Wet Typic Prairie

Alternative 1 – Proposed Action

Approximately 26 acres of wet typic prairie occur on Midewin; restoration of approximately 465 acres has been initiated. Alternative 1 would control invasive species and encroaching woody species which threaten management and restoration of wet typic prairie habitat. Habitat conditions would improve and result in a positive trend, including increases in population sizes, in the plant and animal species of interest for wet typic prairie.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on wet typic prairie from the use of these herbicides.)

Effects on wet typic prairie would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration activities at Midewin.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on wet typic prairie would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

Under the No-action Alternative, it would be difficult to control invasive species and encroaching woody plants that threaten management and restoration. Uncontrolled infestations would cause habitat conditions to decline and would result in a negative trend in the plant and animal species of interest for the wet typic prairie. Those elements used to monitor the condition of wet typic prairie, including species diversity, seasonal flowering diversity, relative cover of native herbs, and total area of habitat, are expected to decline under Alternative 4.

Sedge Meadow

Alternative 1 – Proposed Action

Approximately 20 acres of sedge meadow occur on Midewin; restoration of approximately 55 acres has been initiated. Alternative 1 would control invasive species and encroaching woody species which threaten management and restoration of sedge meadow habitat. Habitat conditions would improve, and would result in a positive trend, including increases in population sizes, in the plant and animal species of interest for sedge meadow.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on sedge meadow from the use of these herbicides.)

Effects on sedge meadow would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration activities at Midewin.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on sedge meadow would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

Under the No-action Alternative, it would be difficult to control invasive species that threaten management and restoration. Uncontrolled infestations would cause habitat conditions to decline and result in a negative trend in the plant and animal species of interest for sedge meadow. Those elements used to monitor the condition of sedge meadow, including species diversity, relative cover of native herbs, and total area of habitat, would likely be found to decline under the No-action Alternative.

Marsh

Alternative 1 – Proposed Action

Approximately 58 acres of marsh are found on Midewin; restoration of approximately 32 acres has been initiated. Alternative 1 would control invasive species and encroaching woody species which threaten management and restoration of marsh habitat. Habitat conditions would improve and result in a positive trend, including increases in population sizes, in the plant and animal species of interest for marshes.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on marsh habitat from the use of these herbicides.)

Effects on marsh habitat would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration activities at Midewin.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Marsh is present on the Drummond Dolomite Prairie. The removal of the Drummond Dolomite Prairie from herbicide treatment would make it difficult to control infestations of invasive species that are a threat to marsh habitat in the Drummond area. Uncontrolled infestations would cause habitat conditions to decline and would result in a negative trend in the plant and animal species of interest for the marsh. Those elements used to monitor the condition of marsh habitat, including species diversity, seasonal flowering diversity, relative cover of native herbs, and total area of habitat, could be expected to decline under Alternative 3.

Alternative 4 – No-action

Under the No-action Alternative, it would be difficult to control invasive species that threaten management and restoration. Uncontrolled infestations would cause habitat conditions to decline and would result in a negative trend in the plant and animal species of interest for marshes. Those elements used to monitor the condition of marshes, including species diversity, relative cover of native herbs, and total area of habitat, could be expected to decline under the No-action Alternative.

Seep

Alternative 1 – Proposed Action

Approximately 0.6 acres of seep occur at Midewin; no restoration has been initiated. Alternative 1 would control invasive species and encroaching woody species which threaten management and future restoration of seep habitat. Habitat conditions would improve and result in a positive trend, including increases in population sizes, in the plant species of interest for seeps.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on seep habitat from the use of these herbicides.)

Effects on Midewin's seeps would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration activities at Midewin.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on seep habitat would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

Under the No-action Alternative, it would be difficult to control invasive species that threaten management and future restoration of seep habitat. Uncontrolled infestations would cause habitat conditions to decline and result in a negative trend in the plant species of interest for seeps. Those elements used to monitor the condition of seeps, including species diversity, relative cover of native herbs, and total area of habitat, could be expected to decline under the No-action Alternative.

Savanna

Alternative 1 – Proposed Action

Approximately 25 acres of savanna are found at Midewin; no restoration has been initiated. Alternative 1 would control invasive species and encroaching woody species which threaten management and future restoration of savanna habitat. Habitat conditions would improve and result in a positive trend, including increases in population sizes, in the plant and animal species of interest for savanna.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on savanna from the use of these herbicides.)

Effects on Midewin's savanna would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration of savanna.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on savanna would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

Under the No-action Alternative, it would be difficult to control invasive species that threaten management and future restoration of savanna habitat. Uncontrolled infestations would cause habitat conditions to decline and would result in a negative trend in the plant

and animal species of interest for savanna. Those elements used to monitor the condition of savanna, including species diversity, seasonal flowering diversity, relative cover of native herbs, and total area of habitat, could be expected to decline under the No-action Alternative.

Woodland/Forest

Alternative 1 – Proposed Action

Approximately 150 acres of woodland and forest are found on Midewin; no restoration has been initiated. Alternative 1 would control invasive species and noxious weeds which threaten management and future restoration of woodland and forest habitat. Habitat conditions would improve and result in a positive trend, including increases in population sizes, in the plant and animal species of interest for woodland and forest.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on woodland/forest from the use of these herbicides.)

Effects on woodland/forest would be the same under Alternative 2 as under Alternative 1. The addition of the FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration of woodland/forest.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on woodland/forest would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

Under Alternative 4, it would be difficult to control invasive species that threaten management and future restoration of woodland and forest habitat. Uncontrolled infestations would cause habitat conditions to decline and would result in a negative trend in the plant and animal species of interest for woodland and forest. Those elements used to monitor the condition of woodland and forest, including species diversity, seasonal flowering diversity, and relative cover of native herbs could be expected to decline under Alternative 4.

Short-stature Grassland Habitat

Alternative 1 – Proposed Action

Approximately 2800 acres of agricultural grasslands are available as grassland bird habitat. Approximately 50% is maintained as short-stature grassland habitat through livestock grazing and brush mowing. Alternative 1 would control invasive species and encroaching woody vegetation which threaten management of short-stature grassland habitat. Habitat conditions would improve and result in a positive trend, including increases in population sizes, in the animal species of interest for short-stature grassland habitat.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on short-stature grassland habitat from the use of these herbicides.)

Effects on short-stature grassland habitat would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration of short-stature grassland habitat. In particular, FAS is an effective tool that could be used to control problematic woody species that are fragmenting Midewin's short-stature grassland habitat.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on short-stature grassland habitat would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

Under the No-action Alternative, it would be difficult to control invasive species and encroaching woody vegetation that threaten management of short-stature grassland habitat. Uncontrolled infestations would cause habitat conditions to decline and would result in a negative trend in the animal species of interest for short-stature grassland habitat. Elements used to monitor the condition of short-stature grassland habitat, including total area and size of unfragmented tracts, could be expected to decline under the No-action Alternative. The number of shrubs (>1.5m tall), another monitoring element for short-stature grassland habitat, could also be expected to increase under the No-action Alternative.

Medium-stature Grassland Habitat

Alternative 1 – Proposed Action

Approximately 2800 acres of agricultural grasslands are available as grassland bird habitat. Approximately 20% is maintained as medium-stature grassland habitat through low-intensity livestock grazing, hay-cutting, and brush mowing. Alternative 1 would control invasive species and encroaching woody vegetation which threaten management of medium-stature grassland habitat. Habitat conditions would improve and result in a positive trend, including increases in population sizes, in the animal species of interest for medium-stature grassland habitat.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on medium-stature grassland habitat from the use of these herbicides.)

Effects on medium-stature grassland habitat would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration of medium-stature grassland habitat. In particular, FAS is an effective tool that could be used to control problematic woody species that are fragmenting Midewin's medium-stature grassland habitat.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on medium-stature grassland habitat would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

Under the No-action Alternative, it would be difficult to control invasive species and encroaching woody vegetation that threaten management of medium-stature grassland habitat. Uncontrolled infestations and woody encroachment would cause habitat conditions to decline and would result in a negative trend in the animal species of interest for medium-stature grassland habitat. Elements used to monitor the condition of medium-stature grassland habitat, including total area and size of unfragmented tracts, could be expected to decline under the No-action Alternative. The number of shrubs (>1.5m tall), another monitoring element for medium-stature grassland habitat, could also be expected to increase under the No-action Alternative.

Tall-stature Grassland Habitat

Alternative 1 – Proposed Action

Approximately 2800 acres of agricultural grasslands are 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 acres exist as inclusions within ungrazed agricultural grasslands. Alternative 1 would control invasive species and encroaching woody vegetation which threaten management of tall-stature grassland habitat. Habitat conditions would improve and result in a positive trend, including increases in population sizes, in the animal species of interest for tall-stature grassland habitat.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on tall-stature grassland habitat from the use of these herbicides.)

Effects on tall-stature grassland habitat would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species and facilitate restoration of tall-stature grassland habitat. In particular, FAS is an effective tool that could be used to control problematic woody species that are fragmenting Midewin's tall-stature grassland habitat.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on tall-stature grassland habitat would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

Under the No-action Alternative, it would be difficult to control invasive species and encroaching woody vegetation that threaten management of tall-stature grassland habitat. Uncontrolled infestations and woody encroachment would cause habitat conditions to decline and result in a negative trend in the animal species of interest for tall-stature grassland habitat. Elements used to monitor the condition of tall-stature grassland habitat, including total area and size of unfragmented tracts could be expected to decline under the No-action Alternative. The number of shrubs (>1.5m tall), another monitoring element for tall-stature grassland habitat, could also be expected to increase under the No-action Alternative.

Benthic Macroinvertebrates

Alternative 1 – Proposed Action

Benthic macroinvertebrates are 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 more sensitive to pollutants and disturbances in habitat (Berkman et al., 1986). Each species within this group has different tolerances to pollution (EPA 1997). Thus the composition of macroinvertebrate samples can indicate the ecological health of a stream.

There would be no adverse effect on the benthic macroinvertebrate community present in Midewin streams with limited herbicide applications. Nearly all of the six herbicides under Alternative 1 have demonstrated low toxicity toward aquatic invertebrates (Section 3.4 Table 5). Furthermore, only those herbicides registered for aquatic use would be used in aquatic ecosystems. Herbicide treatment, used as a tool as part of stream and wetland restoration activities, may improve aquatic habitat, and may result in a positive trend in the benthic macroinvertebrate community and in the associated animal species of interest.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on the benthic macroinvertebrate community from the use of these herbicides.)

Effects on benthic macroinvertebrates would be the same under Alternative 2 as under Alternative 1. Both FAS and imazapic have demonstrated low toxicity toward aquatic invertebrates (Section 3.4 Table 6); neither herbicide would adversely affect the benthic macroinvertebrate community present in Midewin's streams.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Effects on the benthic macroinvertebrate community would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

The success of stream and wetland restoration activities may be compromised without the use of herbicides to control infestations of invasive species such as reed canary-grass and common reed, species that have become a serious management threat to Midewin's

aquatic resources. The success of restoration activities would affect stream quality and the quality of habitat available to the benthic macroinvertebrate community and associated species of interest. Uncontrolled infestations of invasive species may cause habitat conditions to decline and may result in a negative trend in the benthic community and in the associated aquatic animal species of interest.

Leafy Prairie Clover

Alternative 1 – Proposed Action

There would be no adverse impacts to the leafy prairie clover under Alternative 1 when proper mitigation and monitoring techniques are followed for herbicide treatment. According to the Prairie Plan Standards for Ecological Sustainability, management activities (including herbicide treatment) will avoid or minimize adverse effects to the leafy prairie clover during the growing season from April 30th to October 30 (Prairie Plan, p. 4-20). In addition, Prairie Plan Guidelines state that herbicide application in leafy prairie clover habitat will use approved herbicides with special care, using wipe-type applicators or other techniques to eliminate drift; the treatment area will be surveyed prior to treatment; known leafy prairie clover plants will be covered near application areas, no pre-emergent herbicides will be used; and all personnel will be trained in leafy prairie clover identification (Prairie Plan, p. 4-20).

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on the leafy prairie clover from the use of these herbicides.)

Effects on the leafy prairie clover would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species on the dolomite prairie, and to facilitate restoration of this sensitive habitat, which is the location of Midewin's only population of leafy prairie clover.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Alternative 3, by removing the Drummond Dolomite Prairie from herbicide treatment, removes the leafy prairie clover from possible contact with herbicides. However, rather than providing protection, Alternative 3 would likely adversely impact this species. It would be difficult to control invasive species in the Drummond area without the use of herbicides. Without adequate control, invasive species would out-compete and displace sensitive prairie species like the leafy prairie clover.

Alternative 4 – No-action

The No-action Alternative would result in the same adverse impacts to the leafy prairie clover as Alternative 3. Furthermore, if herbicide treatment is not included as an IPM technique on Midewin, uncontrolled infestations of invasive species present on other parts of Midewin could spread to the dolomite prairie, exacerbating the existing invasive species threat for this area, and adversely impacting the leafy prairie clover.

Henslow's Sparrow

Alternative 1 – Proposed Action

Henslow's sparrow would benefit from herbicide treatment under Alternative 1. Henslow's sparrow is an area-sensitive bird and is susceptible to fragmentation of habitat. As invading woody plants reach 2 meters tall, grassland habitat becomes unsuitable for this species. Effective control of encroaching woody growth would reduce fragmentation of grassland and prairie and would provide increased foraging opportunities, increased nesting sites, and additional breeding habitat for Henslow's sparrow.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on Henslow's sparrow from the use of these herbicides.)

Effects on Henslow's sparrow would be the same under Alternative 2 as under Alternative 1. The addition of FAS and imazapic would provide additional tools with which to control invasive species that are encroaching on Midewin's grasslands. In particular, FAS is an effective tool that could be used to control problematic woody species that are fragmenting and degrading Henslow's sparrow habitat.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

The effects on Henslow's sparrow would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

The No-action Alternative would likely have an adverse effect on Henslow's sparrow. Uncontrolled encroachment of woody species would fragment Henslow's sparrow habitat, decreasing foraging and nesting opportunities, and cause the population to decline.

White-tailed Deer

Alternative 1 – Proposed Action

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. 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.

Alternative 1 would have no effect on white-tailed deer populations on Midewin. There is a possibility that browsing white-tailed deer may ingest vegetation that has been treated with herbicides. However, nearly all of the six herbicides proposed for use under Alternative 1 exhibit low toxicity to mammals; therefore treated plants should not cause ill effects to browsing deer.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on white-tailed deer from the use of these herbicides.)

Effects on white-tailed deer would be the same under Alternative 2 as under Alternative 1. Both FAS and imazapic have demonstrated low toxicity to mammals; therefore browsing deer would not be adversely affected by ingestion of either herbicide.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

The effects on white-tailed deer would be the same under Alternative 3 as under Alternatives 1 and 2.

Alternative 4 – No-action

The No-action Alternative would have no effect on white-tailed deer.

Cumulative Effects

Herbicide treatment on Midewin is consistent with ongoing efforts by the Will County Forest Preserve District and the IDNR to control infestations of invasive species in other conservation areas in Will County. Alternatives 1 and 2 provide for improved conditions in Will County for nearly all of the species and conditions associated with the Management Indicators over the current condition. Alternative 3 also provides for improved conditions, but to a lesser extent cumulatively than Alternatives 1 and 2. Under Alternative 3, conditions may not improve for the dolomite prairie, marsh habitat, and the leafy prairie clover. The IDNR is using limited herbicide treatment to improve habitat on adjacent IDNR land, including management of dolomite prairie and leafy prairie clover populations. Uncontrolled infestations on Midewin's dolomite prairie habitat would hinder control efforts on adjacent IDNR land.

Alternatives 1, 2, and 3 are not expected to have cumulative impacts on the white-tailed deer population in Will County since this species is common throughout the county.

Past activities at Midewin, when combined with present and reasonably foreseeable future activities, are not expected to result in adverse cumulative effects on Midewin's Management Indicator Species.

Cumulative benefits for Will County would not occur under the No-action Alternative.

3.9 RECREATION

Affected Environment

Recreation Opportunity Spectrum

Nationally, the Forest Service uses a system called the Recreation Opportunity Spectrum (ROS) to inventory and classify National Forest System lands. The range of recreational experiences, opportunities, and settings available on a given area of land is classified using the ROS system. ROS classes are based on access, remoteness, visitor management, on-site recreation development, social encounters, and visitor impacts. Based on these seven elements, the Forest Service assigns one of six ROS settings to all land that it manages. These settings range from "primitive" to "urban".

Midewin is the largest single public land holding in the Chicagoland area. The public anticipates extensive opportunities to recreate in what they believe to be a large open and natural setting. However, at approximately15,000 acres, Midewin is much smaller than a typical national forest, which averages 1-2 million acres. In addition, much of Midewin will need extensive restoration and cleanup before it is ready to be opened up for general public use. Forest Service standard definitions for primitive lands do not apply to Midewin primarily due to size limitations. Instead, Forest Service lands within Midewin lie within the Rural (a substantially modified environment), Roaded Natural (resource modification and utilization are evident within a predominately natural appearing environment), and Semi-Primitive (a natural or natural-appearing environment of moderate to large size). These ROS classes are described in detail in Appendix D of the Prairie Plan.

Recreational Amenities and Use

Section 2914(c) of the legislation establishing Midewin (The Illinois Land Conservation Act) identifies the basic purposes of Midewin. These purposes include the provision of a variety of recreation resources that are consistent with conservation of land and water resources, scientific education and research, and continuing agricultural uses.

Public access to Midewin has been minimal because of the hazards remaining from the Army arsenal operations as well current cleanup activities. Two "interim" hiking trails in the west-central portion of Midewin (Figure 4) are now open for use by the general public. The 1.5-mile long Henslow Interim Trail, which has an easy to moderate level of difficulty, forms a loop to the north of the trailhead and provides views of sensitive grassland bird species habitat and vacant Joliet Arsenal bunkers. The 1.5-mile long Newton Interim Trail, which has an easy level of difficulty, forms a loop to the south of the trailhead. Both of these interim trails are located within pasture and agricultural grassland (Area 9) identified for herbicide treatment.

The Forest Service continues to allow deer hunting in the southwest portion of Midewin. 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, the boundaries of the deer hunting area were expanded and hunters were required to sign up for designated sites.

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 2000.

School groups guided by Midewin 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 and participate in environmental education programs.

Hundreds of dedicated volunteers access Midewin. Some of the areas identified for herbicide treatment are accessed and monitored by volunteers. Most volunteer efforts focus on restoration activities, although some volunteers also lead tours, build and remove fences, collect litter, and assist in the recreation program. Staff or trained volunteer leaders are present to guide volunteer activities, provide interpretation, and control their access on the site.

Transportation corridors, trail corridors, a visitor center, a picnic area, a campground, and other recreational facilities are planned for Midewin. These facilities will be located throughout the areas identified for herbicide application.

Environmental Consequences

Alternative 1

The use of herbicides, as described for this alternative, would be consistent with the desire for a natural appearing landscape encompassing all ROS classes (Rural, Roaded Natural, and Semi-Primitive) within the Project area. Relative to the other alternatives considered, the use of herbicides in Alternative 1would result in less need for brush cutting and mowing, generating less noise and fewer odors that recreationists may find objectionable.

Herbicides would be used to control invasive species and noxious weeds in pastures, agricultural grasslands, future environmental restoration areas, and seed production areas adjacent to the existing interim trails and hunting areas that are located in the southwest portion of Midewin. Herbicides would also be applied in areas currently used for interpretive tours/talks and areas visited by staff and/or trained volunteers. Lastly, herbicides would be used in pastures, agricultural grasslands, future environmental restoration areas, and seed production areas where potential recreational trails, developments, and access points may be located.

The effects of herbicides proposed for use in Alternative 1 on humans are described in Section 3.3 of this document. Measures used to temporally and spatially separate recreationists and volunteers from herbicide applications, along with measures to mitigate herbicide drift and other unavoidable effects are described in Chapter 4.

In addition to the direct effects of herbicides to be applied under Alternative 1, recreationists and volunteers could be affected by herbicides that drift onto their locations within Midewin from surrounding portions of the Project area and from lands adjacent to

Midewin. The potential effects of this herbicide drift on humans are described in Section 3.3.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on recreation from the use of these herbicides.)

Effects on recreation would be the same under Alternative 2 as under Alternative 1. Herbicide treatment using FAS or imazapic would not adversely affect recreationists (Section 3.3 and Chapter 4). In fact, the addition of the two herbicides would provide additional tools with which to control invasive species and facilitate restoration, thereby improving the natural area for recreationists to enjoy.

Alternative 3 – Exclude the Drummond Dolomite Prairie from Herbicide Treatment

Because no herbicides would be used in the Drummond Dolomite Prairie, restoration, enhancement, and maintenance of dolomite prairie would rely heavily on hand-pulling, brush cutting and mowing. While consistent with the desire for a natural appearing landscape that comprises the physical setting in this ROS class, these activities would generate noise and odors that recreationists in this and surrounding ROS settings, and visitors to the adjacent National Cemetery, may find objectionable. Fewer mechanical methods such as cutting and mowing would be needed to control invasive species if herbicides were applied in this area.

As no herbicides would be applied to the 580-acre Drummond Dolomite Prairie area, there would be no direct herbicide effects on staff and/or trained volunteers engaged in interpretive tours/talks here. However, recreationists and volunteers in the Drummond area could be affected by herbicides that drift onto this area from surrounding portions of the Project area and from lands adjacent to Midewin. The potential effects of this herbicide drift on humans are described in Section 3.3.

In areas other than the Drummond Dolomite Prairie, the effects of Alternative 3 on recreation would be similar to those described for Alternatives 1 and 2.

Cumulative Effects

Rapid population growth is expected to occur in the areas surrounding Midewin. This increased population would likely recreate at future Midewin trails, picnic areas, campgrounds, and other areas. However, access to areas that receive herbicide treatment would be restricted so that there should be no cumulative effects of herbicide use from expected increases in recreationists at Midewin.

Alternative 4 – No-action

No herbicides would be used as part of this alternative. Restoration, enhancement, and maintenance activities would rely heavily on methods such as hand pulling, mowing, cutting, and prescribed burning. While consistent with the desire for a natural appearing landscape that comprises the physical setting in all Midewin ROS classes (Rural, Roaded Natural, and Semi-Primitive), these activities would generate more noise and odors than Alternatives 1, 2, and 3. Recreationists in all ROS settings and visitors to the adjacent National Cemetery could find mowing, cutting, and burning objectionable.

As no herbicides would be applied on Midewin under this alternative, there would be no direct herbicide effects on staff and/or trained volunteers engaged in interpretive tours/talks or other activities. However, recreationists and volunteers could be affected by herbicides that drift onto this area from surrounding portions of the Project area and from lands adjacent to Midewin.

Cumulative effects

No herbicides would be used under this alternative, eliminating the need to temporally or spatially separate recreationists and herbicide applications to control invasive plant species and noxious weeds. However, temporal and spatial separation would still be required for burning, mowing, cutting, and other IPM measures. Separation would also be required for agricultural herbicide applications and livestock grazing, which have been authorized under a separate authorized action.

3.10 SCENIC QUALITY

Affected Environment

The historic scenery of Midewin was a gently rolling, subtle, and expansive mix of prairie, open-grown woodland mixed with prairie, and dense woodland. Meandering streams drained the area. A mix of medium to tall grasses and forbs dominated the land. Patches of woodland provided the primary vertical elements, while flowering forbs provided color throughout much of the summer and fall. Views would have varied from extremely close to extensive vistas, depending on the position of the viewer.

Little of the historic scenery remains today. The scenery of Midewin is currently an irregular patchwork quilt of cultural influences that have been laid on the land over the past 200 years. Some land is in crop production, while other land is in hay production and pasture. Many streams have been straightened/channelized and deepened. In some areas rip-rap lines the banks to control erosion. Kemery and Doyle lakes are small

impoundments and havens for waterfowl with cattails and arrowheads emerging from the surface of the waters. Occasional prairie remnants exist where the land was not disturbed. Midewin is divided into a grid pattern of roads at one-mile intervals. Along the roads are the remnants of numerous farmsteads, primarily building foundations and ornamental/exotic vegetation, including windbreaks, fruit, shade, walnut trees, various perennials, and invasive shrubs. Rows of Osage orange trees that were planted by farmers to create living fences in the mid 1800s are still evident today.

Evidence of the former Joliet Arsenal remains an important landscape feature at Midewin. The largest bunker field contains over 130 bunkers on 800 acres; the smallest contains 23 bunkers on 120 acres. Viewed from the sides or rear they appear as grassy knolls that fade into the surrounding landscape as the viewer moves away. Four rectangular groups of warehouses (each being 60 feet by 500 feet) cover approximately 800 acres, with the largest array containing 34 buildings.

A second transportation system, consisting of additional roads and over 100 miles of railroad, is laid over the original grid system. This system served the arsenal infrastructure, including bunker fields, warehouse clusters, and other miscellaneous buildings. In many instances, roads and rail beds run parallel to each other. The rails have been removed from the rail beds and vegetation is beginning to encroach on some rail beds and little-used roads. Unsafe railroad trestles, constructed to span streams and other drainages, are being removed as restoration efforts continue at Midewin.

The lands adjacent to Midewin have a substantial influence on the scenic character of Midewin. Four large areas, still in US Army ownership, cover approximately 600 acres. Facilities on these lands are constructed of masonry, corrugated steel and wood frame, following long straight lines. Various support structures, including guard huts, personnel changing buildings, and personnel evacuation bunkers are located on the periphery of Midewin.

Privately owned agricultural land also borders Midewin. This land is primarily tilled or pasture with scattered farmhouses and outbuildings (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.

Illinois State Route 53, a four-lane divided highway, runs north and south through Midewin. Within the Route 53 corridor are a high-speed rail line, private and Army properties, farmhouses, an agricultural products supplier, and grain silos. The east side of Midewin is bordered on the north by Hoff Road, a two-lane county road.

The Exxon-Mobil refinery is the prominent visual feature to the northwest of Midewin. The refinery is a complex of tanks, pipes, and other steel structures that extend several

stories in the air. Steam emanating from the complex is occasionally visible throughout the northwest portion of Midewin.

Other existing and proposed developments on lands immediately adjacent to Midewin include: the Deer Run Industrial Park (currently under construction along the west boundary of Midewin), the Abraham Lincoln National Cemetery (currently under development between State Route 53 and the Deer Run Industrial Park), the Island City Industrial Park, and the Will County Sanitary Landfill (currently being planned along the southeast border of Midewin).

Scenic Integrity Objectives

Scenic Integrity Objectives (SIO) are the result of the compilation of analyses and survey to classify the desired scenic quality of the land. The objectives are used to guide management practices to ensure that the scenic and ecological integrity of the land is maintained or improved. The relative visibility of the landscape, the level of concern for the landscape, and the inherent scenic attractiveness of the land are combined to form the Proposed SIOs for Midewin.

Areas of High Scenic Integrity should appear unaltered and valued landscape character should appear intact. Deviations may be present, but are not evident because they so completely repeat the lines, forms, colors, and patterns of the characteristic landscape.

Areas of Moderate Scenic Integrity appear slightly altered. Noticeable deviations to the valued landscape character should remain visually subordinate.

Areas of Low Scenic Integrity may appear altered. Deviations from the valued landscape character may begin to dominate the area being viewed, but should borrow valued attributes, such as size, shape, and pattern that occur elsewhere.

High Scenic Integrity is proposed for much of Midewin, with Moderate and Low Scenic Integrity proposed for smaller areas.

The desired visual condition of Midewin is a more natural appearing landscape than exists today. As stated in the Prairie Pla (p. 4-11): “Resource management activities should not reduce scenic integrity levels below the prescribed objective for a given area, except in the case of specific resource rehabilitation projects to meet management area objectives.”

Environmental Consequences

Alternative 1 – Proposed Action

The use of herbicides, as described for Alternative 1, would be consistent with Scenic Integrity Objectives (SIO) for Midewin, which seek to ensure that the scenic and ecological integrity of the land is maintained or improved. Relative to the No-action Alternative, the use of herbicides would make Alternative 1 more cost effective, allowing more undesirable trees, brush, and herbaceous vegetation to be removed in a given time period and allowing restoration to occur at a faster pace. The increase in the rate of undesirable vegetation removal would result in more efficient maintenance and improvement of scenic and ecological integrity.

Alternative 2 (Preferred Action) - Addition of FAS and Imazapic to List of Herbicides

(Note: The six herbicides included under Alternative 1 are included in Alternative 2. Alternative 1 discusses the potential effects on scenic quality from the use of these herbicides.)

Effects on scenic quality would be the same under Alternative 2 as under Alternative 1. Alternative 2 would also be consistent with the SIO for Midewin. The addition of FAS would provide another option for controlling problematic woody species that are fragmenting prairie and grassland habitat and are reducing the scenic integrity of these areas. Imazapic is an herbicide successfully used in prairie enhancements and restorations. This herbicide may facilitate prairie restoration on Midewin which would enhance the area's scenic and ecological integrity.

Alternative 3 – Exclude Drummond Dolomite Prairie from Herbicide Treatment

Under Alternative 3 no herbicides would be used in the 580-acre Drummond Dolomite Prairie area. Instead, the Forest Service would rely heavily on brush cutting and mowing to restore, enhance, and maintain this area. While consistent with the Low SIO for the area, these activities would be less cost effective than if they were employed in conjunction with herbicides. Implementation of Alternative 3 would decrease the rate of undesirable vegetation removal and result in inefficient maintenance and improvement of scenic and ecological integrity.

In areas other than the Drummond Dolomite Prairie, the effects of Alternative 3 on visual quality would be similar to those described for Alternatives 1 and 2.

Cumulative Effects

Rapid population growth is expected to occur in the areas surrounding Midewin. This increased population would likely use potential Midewin trails, picnic areas, group

campgrounds, roads, and other areas, increasing the visual sensitivity (i.e., the overall concern for scenic quality) of the Midewin landscape. Herbicides to be used to control invasive plants and noxious weeds under these alternatives would have little negative visual effect and would allow Scenic Integrity Objectives to be achieved in a cost effective manner.

Alternative 4 – No-Action

No herbicides would be used as part of this alternative. Restoration, enhancement, and maintenance activities would rely heavily on methods such as hand pulling, mowing, cutting, and prescribed burning. While consistent with the SIO's (High, Moderate, and Low) for the Project area, these activities would be less cost effective than if they were employed in conjunction with herbicides (as would occur in Alternatives 1, 2, and 3). This alternative would decrease the rate of undesirable vegetation removal and result in less timely maintenance and improvement of scenic and ecological integrity.

Cumulative Effects

As no herbicides would be used, this alternative would rely heavily on burning, mowing, cutting, and other IPM measures to control invasive plants and noxious weeds. These measures would have more negative visual effects than herbicide treatment (Alternatives 1, 2, and 3), during and immediately after implementation.

Restoration activities associated with this alternative would be less cost effective than those associated with Alternatives 1, 2, and 3. As a result, a larger percentage of Midewin funds could be required for management of existing lands, leaving fewer funds available to achieve Scenic Integrity Objectives.

3.11 ENVIRONMENTAL JUSTICE

Executive Order 12898, titled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, mandates that federal agencies take the appropriate steps to identify, address, and mitigate all disproportionately high and adverse impacts of federally funded projects on the health and socioeconomic condition of minority and low-income populations. In order to address the magnitude of impacts to minority and low-income populations, it must first be determined that concentrated populations exist near a project area. If such populations are identified, the analysis can then determine if said populations are shouldering an unequal share of the project's impacts. For this analysis, the following definitions will be used:

- *Ethnic minorities*, defined as: African Americans, American Indian and Alaska Native, Asian, Hispanic or Latino, and Native Hawaiian and other Pacific Islander.

- *Low income persons*, defined as: people with incomes below the federal poverty level.

The proposed action and the alternatives to it affect Forest Service lands on Midewin in Will County, Illinois. Data from the 2000 U.S. Census, the Northeastern Illinois Planning Commission (NIPC), and the Illinois Economic and Fiscal Commission were reviewed for Will County in order to determine if concentrations of ethnic minorities and low-income populations exist near the project area.

Table 16 shows that the percentage of minorities in Will County is equal to or below the statewide percentage in all cases. In no case is the minority concentration in Will County greater than the minority concentration throughout Illinois. Thus, the minority population in Will County is not sufficiently concentrated to warrant further analysis.

Table 16
Percentages of minority and low-income populations in Will County and the State of Illinois

	Will County Percent of population	Illinois Percent of population
African Americans	10.5	15.1
American Indian & Alaskan Native	0.2	0.2
Asian	2.2	3.4
Hispanic or Latino	8.7	12.3
Native Hawaiian and other Pacific Islander	-	-
Persons below poverty level	6.5	11.3

Will County is fairly affluent. In 1999, Will County had a per capita personal income of $26,483. This income was 85% of the state of Illinois average and 93% of the national average (NIPC, 1999). Within Will County, 6.5% of the population lives below poverty level (Table 16). This is well below the statewide percentage (11.3) of the population that is below poverty level. The low-income population within Will County is not sufficiently concentrated to warrant further analysis.

3.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The three action alternatives (Alternatives 1, 2, and 3) would involve an irretrievable commitment of labor and economic resources. There would not be an irreversible commitment of resources with the action alternatives.

4.0 MITIGATION AND MONITORING

4.1 MITIGATION

- All guidelines and mitigation measures presented in the Forest Service Manual 2150, *Pesticide Use Management and Coordination*, and in the Forest Service Handbook 2109.14, *Pesticide Use Management and Coordination Handbook*, will be adhered to in herbicide application at Midewin. Also, compliance with all federal, state, and local regulations regarding herbicide use will be met.

- Guidelines are provided in Table 17 to determine the length of time treated areas will be closed to the public. In general, all treated areas will be closed until the herbicide dries and clearance is given for visitors to re-enter the area. In areas such as trailheads that may be difficult to close, applicators/helpers will stay at the treated locatiom until the treated foliage is dry and the public can safely re-enter the area. Information will be available for members of the public about the target species and herbicide used.

Table 17
General guidelines for reentry into areas treated with herbicides*

Herbicide	Non-Worker Protection Standard Uses	Restricted Entry Interval (REI) (under Worker Protection Standard, 40 CFR part 170)**
2,4-D acetic acid	Do not allow people or pets on treatment area during application, or until sprayed areas have dried.	48 hours
Glyphosate	Keep people and pets off treated areas until spray solution has dried.	12 hours
Pelargonic acid	Keep people and pets off treated areas until spray solution has dried.	12 hours
Sethoxydim	Not stated on label.	12 hours
Triclopyr	Not stated on label.	48 hours
Clopyralid	Not stated on label.	12 hours
Imazapic	Not stated on label.	Not stated on label.
FAS	Not stated on label.	Not stated on label.

* Data obtained from herbicide product labels.

** Midewin does not meet the criteria for 40 CFR part 170. 40 CFR part 170 applies to occupational exposures to pesticides used in the production of agricultural plants on farms, nurseries, greenhouses, and forests. Agricultural plant means any plant grown or maintained for commercial or research purposes (USEPA, Office of Pesticide Programs, unknown date). While Midewin has issued special use permits for the production of crops for commercial purposes, the lands currently leased for row crops (3,950 acres) have not been included in areas designated for herbicide use. They may be analyzed at a later time for spot treating new invasives as agricultural uses are phased out.

- Notices will be posted near all treated areas and will contain the following information:
  -notice that the area has, or will be, treated
  -name of herbicide used
  -date of treatment
  -appropriate precautions
  -date and time when re-entry is safe

  Notices will be removed by Midewin staff when the treated areas are considered safe.

- To minimize herbicide drift, herbicides will be applied only when wind speeds are less than 10 mph. Where possible, the low nozzle pressure and large droplet size will be used as permitted by the label (Forest Service Handbook [FSH] 2109.14, 52.22).

- Herbicides will be applied in complete compliance with the product label (FSH 2109.14, 52.11).

- Herbicide application will be performed by certified personnel (FSM 2154.2).

- Applicators or operators must wear all protective gear required on the label of the herbicide they are using (FSH 6709.11).

- Grazing restrictions will be implemented according to the product label.

- Herbicide containers will be recycled or disposed of per guidelines in FSH 2109.14, 43.

- Herbicides will be stored in appropriate buildings or facilities according to label specifications, state and federal laws, and Forest Service regulations. Containers will be labeled with the following: contents, date mixed, and approximate volume remaining when placed in storage (Pesticide Use Management and Coordination Handbook; FSH 2109.14).

- Material Safety Data Sheets (MSDS) on each herbicide will be kept on site (FSH 2109.14, 41.11).

- All rinse water (rinsate) generated during the cleaning or rinsing of equipment or containers used to store, transport or apply pesticides will be collected and disposed of according to EPA regulations.

- To prevent application prior to extreme rain events and prevent runoff to adjacent sites and aquatic systems, herbicide applicators will obtain a weather forecast of the treatment area prior to initiating a spraying project.

- In order to ensure that threatened and endangered or sensitive species are not impacted adversely, a Midewin resource specialist will survey each area before treatment. In the event a threatened, endangered, or sensitive species is likely to be impacted, then appropriate mitigation measures will be implemented.

- Temporary covers may be used to protect individuals or populations of threatened, endangered, or sensitive plant species during nearby application of herbicides.

- Spot application will be used in sites with sensitive plant species. This will allow effective weed control with little or no impact to sensitive plant populations or habitat.

- In identified sensitive plant locations herbicides will be applied only according to site-specific mitigation measures developed by a qualified botanist.

- Herbicide treatment will not occur near active nest sites for threatened, endangered, and sensitive bird species.

- Only those herbicides registered for aquatic use will be applied near open water. Herbicide treatment in riparian areas will follow the guidelines presented in Table 18 (end of this section) to protect aquatic resources.

- In general, a 25-foot buffer will be maintained around livestock water resources. However, the guidelines presented in Table 18 will also be referenced to protect water resources for livestock.

- All spraying within riparian areas will be with a hand-held wand rather than a boom-type broadcast sprayer.

- Herbicides will not be applied during days of high temperatures (greater than 85º F), as the heat may cause some herbicides to vaporize and drift to areas outside of the site of application.

4.2 MONITORING

- Monitoring of herbicide use will be completed annually and on a daily basis during periods of herbicide application. Daily logs will be completed within 24 hours of herbicide application and will include information on the type of herbicide, total amount of the herbicide used, method of application, and location of treatment. This information will be consolidated in the annual Forest Service Pesticide Use Report.

- The Forest Service will monitor the regrowth in treated areas to ensure that that resulting habitat is what is intended. Appropriate monitoring techniques, or other evaluations may be used, as appropriate. (FSH 2109.14

Table 18
Summary of herbicide behavior in water and soil to provide guidance for herbicide treatment near aquatic systems

Herbicides	Characteristics						
	Registered for aquatic use	**Toxicity to fish and aquatic organisms**	**Bioaccumulation**	**Half-life in water**	**Half-life in soil**	**Mobility in soil**	**Guidance for application near aquatic systems**
2,4-D acetic acid	Yes, some salt formulations	Ester formulations are toxic; salt formulations nontoxic.	Conflicting reports on bioaccumulation. According to some studies, 2,4-D is rapidly excreted in urine and does not bioaccumulate. Field studies indicated that high applications of 2,4-D amine or ester to a lake, at high application rates, did not result in bioconcentration. Other studies state that 2,4-D can accumulate in fish and aquatic invertebrates.	1 week to several weeks.	7 to 10 days.	Leaching potential high because most formulations do not bind tightly with soils. However, in many instances, extensive leaching does not occur, most likely because of the rapid degradation of the herbicide.	Some salt formulations can be safely applied to aquatic resources. Strong preference will be given to other herbicides over the 2,4-D ester formulation, for application within 100 feet of aquatic resources.
Glyphosate	Yes	Moderately toxic; formulation registered for aquatic use is practically non-toxic.	Does not bioaccumulate in fish.	12 days to 10 weeks.	Average of 47 days.	Leaching potential very low.	Formulation registered for aquatic use can be safely applied to aquatic resources. Preference will be given to the aquatic use formulation for application within 100 feet of aquatic resources.
Pelargonic acid	No	Little to no toxicity.	Rapid decomposition on land and in water, so it does not bioaccumulate.	Half-life of minutes.	No residual activity.	Rapid degradation; leaching potential low.	Should not be applied to open water; however may be safely applied to dry aquatic resources and around aquatic resources.
Sethoxydim	No	Moderately to slightly toxic.	Tendency to dissipate quickly precludes any bioaccumulation in the food chain.	Rapidly degraded by light in less than 1 hour.	4 to 5 days.	Degrades rapidly; leaching potential low.	Do not apply directly to open water; however, minimal impacts if applied around aquatic resources due to rapid degradation and low leaching potential.

Herbicides	Characteristics						
	Registered for aquatic use	**Toxicity to fish and aquatic organisms**	**Bioaccumulation**	**Half-life in water**	**Half-life in soil**	**Mobility in soil**	**Guidance for application near aquatic systems**
Triclopyr	Aquatic formulation being developed.	Ester formulation is toxic. Acid and salt formulation is lightly toxic.	The hydrophobic nature of the ester formulation allows it to be readily absorbed through fish tissues where it is converted to triclopyr acid which can be accumulated to a toxic level. However, if applied properly, triclopyr would not be found in concentrations adequate to harm aquatic organisms.	Salt formulation has half-life of several hours; ester formulation takes longer to degrade.	30 days	Ester formulation has low mobility; salt formulation has higher mobility. Yet, both are rapidly degraded to triclopyr acid, which has an intermediate adsorption capacity, thus limiting mobility.	Do not apply acid and salt formulations directly to open water, however they may be safely applied around aquatic resources. Once it is registered for aquatic use, the aquatic formulation will be safe to apply to aquatic resources. Strong preference will be given to other herbicides over the triclopyr ester formulation for application within 100 feet of aquatic resources.
Clopyralid	No	Low toxicity to aquatic animals.	Does not bioaccumulate in fish tissues.	8 to 40 days.	40 days.	Does not bind strongly to soils. During the first few weeks, there is a strong potential for leaching and possible contamination of ground-water, but adsorption may increase over time.	Preference will be given to other herbicides over clopyralid for application within 100 feet of aquatic resources.
Imazapic	No	According to some studies moderate toxicity. But, in an aqueous solution it is relatively safe for aquatic animals due to its rapid degradation. Other studies indicate low toxicity.	Is rapidly excreted and does not bioaccumulate in animals.	Half-life of 1-2 days in sunlight.	Average of 120 days (can range from 31 - 233 days).	Limited horizontal mobility, but may leach vertically depending on soil type.	Do not apply directly to open water; however, minimal impacts to aquatic resources if applied around aquatic sites due to rapid degradation in water. However, preference will be given to other herbicides over imazapic for application within 100 feet of aquatic resources.

Herbicides	Characteristics						
	Registered for aquatic use	**Toxicity to fish and aquatic organisms**	**Bioaccumulation**	**Half-life in water**	**Half-life in soil**	**Mobility in soil**	**Guidance for application near aquatic systems**
FAS	No, but can be safely applied to floodplains and low-lying areas if water is not present.	Low toxicity.	No evidence that FAS bioaccumulates in fish.	Highly water soluble, but is stable & persistent once it enters aquatic systems; degraded rapidly in aquatic sediments.	Average of 8 days (can range from 1 – 2 weeks).	Rapid degradation and high binding potential with some soils; low mobility.	Do not apply directly to open water but can safely be applied around aquatic resources.

5.0 LIST OF PREPARERS

Renee Thakali, USDA Forest Service. Prairie Parklands Coordinator. Midewin National Tallgrass Prairie.

Enid Erickson, USDA Forest Service. NEPA Coordinator. Midewin National Tallgrass Prairie.

Erik Ulaszek, USDA Forest Service. Horticulturist. Midewin National Tallgrass Prairie.

Karl Forge, USDA Forest Service. Hydrologist. Midewin National Tallgrass Prairie.

Rick Short, USDA Forest Service. Landscape Architect. Midewin National Tallgrass Prairie.

Shannon Donley, Montgomery Watson Harza. Environmental Scientist. B.S. University of Kansas, Environmental Studies, 1992. M.S. University of Kansas, Ecology and Evolutionary Biology, 1999.

David Pott, Montgomery Watson Harza. Senior Project Manager and Aquatic Ecologist. B.S. Appalachian State University, Biology and Chemistry, 1979. M.S. Clemson University, Environmental Systems Engineering, 1982.

Steven Bedross, Montgomery Watson Harza. Environmental Planner and Landscape Architect. B.S. University of Michigan, Natural Resource Management, 1987. M.L.A. University of Michigan, Landscape Architecture, 1990.

Peter Ames, Montgomery Watson Harza. Principal Environmental Scientist. B.S. Harvard College, Architecture, 1958. M.S. Yale University, Zoology, 1962. Ph.D Yale University, Biology, 1965.

Randy Ziegenhorn, Visiting Assistant Professor, Department of Anthropology, University of Iowa. Visiting Lecturer, Cornell College. Operator of 1,200-acre corn and soybean farm in New Boston, Illinois. B.A. Augustana College, 1979. M.A. University of Iowa, Anthropology, 1995. Ph.D. University of Iowa, Anthropology, 1997.

Consultation with Others

William Glass, Illinois Department of Natural Resources, Division of Natural Heritage, District Natural Heritage Biologist.

6.0 REFERENCES

Albaugh, Inc. 2,4-D Amine 4 Herbicide. Product label. Ankeny, IA.

BASF Corporation. Plateau Herbicide. Product label. Research Triangle Park, NC.

BASF Corporation. 1997. Poast Plus: postemergence grass herbicide. Product label and general information.

Berkman, H.E., C.F. Rabeni, and T.P. Boyle. 1986. Biomonitors of stream quality in agricultural areas: fish versus invertebrates. Environmental Management. 10(3): 413-419.

Boulder County Parks and Open Space. 1999. Mechanical Weed Control – Mowing. www.co.boulder.co.us/openspace/nr_mechweeds.htm. Accessed 2/23/02

Carroll, C.J. and J. White. 1997. Integrated Pest Management Methods for Control of Invasive Exotic Plant Species at Midewin National Tallgrass Prairie. Urbana, Illinois.

Dow AgriSciences. Garlon 3A. Product label. Indianapolis, IN.

Dow AgriSciences. 2000. Technical information on clopyralid. Indianapolis, IN. Information packet provided from Dow AgriSciences to the Forest Service.

Dow AgriSciences. Transline Herbicide. Product label. Indianapolis, IN.

DuPont Laboratories. Krenite S Brush Control Agent. Product Label.

EXTOXNET. 1996. Extension Toxicology Network, Pesticide Information Profiles, 2,4-D. ace.ace.orst.edu/info/extoxnet/pips/2,4-D.htm. Accessed 10/19/01.

EXTOXNET, 1996. Extension Toxicology Network, Pesticide Information Profiles. Triclopyr. ace.ace.orst.edu/info/extoxnet/pips/triclopyr.htm. Accessed 01/19/02.

EXTOXNET, 2001. Extension Toxicology Network, Pesticide Information Profiles. Sethoxydim. Pmep.cce.cornell.edu/profiles/extoxnet/pyrethrins-ziram/sethoxydim-ext.htm. Accessed 09/26/01.

Felsot, A.S. 1998. Hazard Assessment of Herbicides Recommended for Use by the King County Noxious Weed Control Program. dnr.metrokc.gov/wlr/lands/weeds/herbicid.htm. Accessed 04/03/02.

Glass, W.D. 1994. A Survey of the Endangered and Threatened Plant and Animal Species of the Joliet Army Ammunition Plant and Joliet Training Area, Will County, Illinois. Division of Natural Heritage, Illinois Department of Conservation. Springfield, IL.

Harvey, G. R. and J.W. Albright. Using herbicides to establish native prairie grasses and forbs. www.soils.wisg.edu/extension/FAPM/proceedings/4C.harvey.pdf. Accessed 2/1/02.

Henry, C.J. and K. Higgens. Unknown date. Cattail Management Symposium. Effects of Rodeo herbicide on aquatic invertebrates and fathead minnows. www.npwrc.usge.gov/resource/othrdata/cattail/henry.htm. Accessed 1/14/02.

Illinois Economic and Fiscal Commission. 2001. Illinois Demographics – 2000 Census. Springfield, Illinois.

Illinois Environmental Protection Agency. 2000. 2000 Water Quality Report.

Illinois Environmental Protection Agency, Bureau of Air. 2000. Illinois Annual Air Quality Report 2000. www.epa.state.il.us/air/air-quality-report. Accessed 1//30/02.

IPM Access, Integrated Pest Management Information Service. www.efn.org/~ipmpa/index.shtml. Accessed 1/24/02.

Kansas State University, Research & Extension. 2001. Horticulture Newsletter No. 7, Herbicide Drift. www.oznet.ksu.edu/dp_hfrr/hnewslet/ksht0127.htm. Accessed 1/13/02.

Lym, R.G. 1997. Identification and control of purple loosestrife (*Lythrum salicaria* L.). North Dakota State University Extension Service. www.ext.nodak.edu/extpubs/plantsci/weeds/w1132w.htm. Accessed 1/21/02.

McEnroe, M.R. Unknown date. Cattail Management Symposium. Cattail Management: Views of the U.S. Fish and Wildlife Service. www.npwrc.usgs.gov/resource/othrdata/cattail/mcenroe.htm. Accessed 1/14/02.

Minister of Public Works and Services Canada. 1995. Great Lakes Fact Sheet: amphibians and reptiles in Great Lakes Wetlands, threats and conservation. ISBN 0-662-24131-2.

Monsanto. Rodeo Emerged Aquatic Weed and Brush Herbicide. Product label. St. Louis, MO.

Monsanto. Roundup Original Herbicide. Product label. St. Louis, MO.

Montana Weed Control Association. Date unknown. General Weed Impacts. www.mtweed.org/Impacts/General/general. Accessed 2/26/02.

Mycogen Corporation. Scythe Herbicide. Product label. San Diego, CA.

Mycogen Corporation. 1997. Pelargonic Acid: Pesticide Tolerance Petition. Submitted to the U.S. EPA. pmep.cce.cornell.edu/profiles/her…pelargonic-acid/pelargonic-acid-tol.html. Accessed 2/06/02.

North Dakota State University, Extension Service. 1997. Identification and Control of Purple Loosestrife (*Lythrum salicaria* L.). www.ext.nodak.edu/extpubs/plantsci/weeds/w1132w.htm. Accessed 2/21/02.

NIPC, Northeastern Illinois Planning Commission. 1997. Agricultural Census for NE Illinois. www.nipc.cog.il.us/agricnty.htm. Accessed 1/31/02.

NIPC, Northeastern Illinois Planning Commission. 1999. Per Capita Income for Counties in Northeastern Illinois. www.nipc.cog.il.us/income99.htm#wil. Accessed March 21, 2002.

Ohio State University, Multiflora Rose Control, Bulletin 857, Foliar Sprays. http://ohioline.osu.edu/b857/b857_3.html. Accessed 1/17/02.

Openlands. Date unknown. Streams and Watersheds of Midewin. www.openlands.org/midewin/water.html. Accessed 02/06/02.

Oregon State University Extension and Experiment Station Communications. 1999. Grapes are sensitive to herbicide drift. eesc.orst.edu/agcomwebfile/garden/Fruit/grapes.html. Accessed 02/26/02.

Pauli, B.D., J.A. Perrault, and S.L. Money. 2000. RATL: A Database of Reptile and Amphibian Toxicology Literature. Canadian Wildlife Service. Technical Report No. 357.

PBI/Gordon Corporation. Amine 400 2,4-D Weed Killer. Product label. Kansas City, KS.

Putnam, M., D. Childs, G. Ruhl, and B.R. Lerner. Unknown date. Diagnosing herbicide injury on garden and landscape plants. Purdue University, Cooperative Extension Service. www.agcom.purdue.edu/AgCom/Pubs/ID/ID-184.html. Accessed 02/05/02.

Sparling, D. Unknown date. Effects of organic contaminants on thyroid functioning in amphibians. www.cerc.usge.gov/ other_webs/endocrine/06sparling.htm. Accessed 03/26/02.

State Noxious Weed Control Board (Washington). 1999. Garlic Mustard (Alliaria petiolata). www.wa.gov/agr/weedboard/weed_info/garlic%20mustard.html. Accessed 2/23/02.

Tu, M. C. Hurd, and J.M. Randall. 2001a (April). Weed Control Methods Handbook: tools and techniques for use in natural areas. The Nature Conservancy.

Tu, M. C. Hurd, and J.M. Randall. 2001b (November). Weed Control Methods Handbook: tools and techniques for use in natural areas. The Nature Conservancy.

University of Arizona AgNIC. 2001. Managing Rangelands. Noxious Weeds: a disaster looking for a place to happen in Arizona. ag.arizona.edu/OAL/agnic/weeds/noxiousweeds1.html. Accessed 2/26/02.

UNEP World Conservation Monitoring Centre, Protected Areas Programme. Wetlands, Naval Station Marsh. www.unep-wcmc.org/sites/wetlands/navl_mar.htm. Accessed 02/21/02.

University of Nebraska, Lincoln Agricultural Research Division. 1998. Weed-beating herbicide treatment bolsters prairie planting success. Ard.unl.edu/rn/0998/flowers.html. Accessed 2/1/02.

U.S. Census Bureau. 2000 Census. State and County Quickfacts, Will County, Illinois. quickfacts.census.gov/qfd/states/17/17197.html. Accessed March 21, 2002.

U.S.D.A. Forest Service. 1996. Selected Commercial Formulations of Triclopyr – Garlon 3A and Garlon 4, Risk Assessment. Final Report. SERA TR 95-22-02-02a.

U.S.D.A. Forest Service. 1998. 2,4-Dichlorophenoxyacetic acid Formulations – Human Health and Ecological Risk Assessment. Final Report. SERA TR 95-21-09-01d.

U.S.D.A. Forest Service. 1999. Clopyralid (Transline) – Final Report. SERA TR 99-21-11/12-01d.

U.S.D.A. Forest Service. Unknown date. Imazapic (Plateau and Plateau DG) – Human Health and Ecological Risk Assessment. Final Report. Forest Service Contract No. 53-3187-5-12.

U.S.D.A. Forest Service. Unknown date. Pesticide Fact Sheet: 2,4-D. http://infoventures.com/e-hlth/pestcide/24d.html. Accessed 03/22/02.

U.S.D.A. Forest Service. Unknown date. Pesticide Fact Sheet: Clopyralid Methyl. www.fs.fed.us/foresthealth/pesticide/clopyralid.htm. Accessed 09/28/00.

U.S.D.A. Forest Service, Midewin National Tallgrass Prairie. 2001. Environmental Assessment for Continued Agricultural Land Use from 2001 through 2005. Final Report.

U.S.D.A. Forest Service, Midewin National Tallgrass Prairie. 2002. Final Land and Resource Management Plan.

U.S.D.A. Forest Service, Midewin National Tallgrass Prairie. 2002. Final Environmental Impact Statement on the Land and Resource Management Plan.

U.S.D.A. Forest Service, Pacific Northwest Region. 1997. Glyphosate: Herbicide Information Profile.

U.S.D.A. Forest Service, Pacific Northwest Region. 2001. Triclopyr: Herbicide Information Profile.

U.S. Environmental Protection Agency, Air and Radiation Division. 2002. Personal communication with Jacquiline Nwia. 01/24/02.

U.S. Environmental Protection Agency. 1998. Federal Register Document. Certain Plant Regulators, Cytokinins, Auxins, Gibberellins, Ethylene, and Pelargonic Acid Tolerance Exemptions. www.epa.gov/fedrgstr/EPA-PEST/1998 /October/Day-23/p28360.

U.S. Environmental Protection Agency, Office of Pesticide Programs. Unknown date. Part 170 – Worker Protection Standard. www.epa.gov/pesticides/safety/workers/PART170.htm. Accessed 04/12/02.

U.S. Environmental Protection Agency, Office of Pesticide Programs. 1999. Pesticide Registration. www.epa.gov/pesticides/citizens/registration.htm. Accessed 2/05/02.

U.S. Environmental Protection Agency, Office of Pesticide Programs. 2000. Biopesticide fact sheet, pelargonic acid. www.epa.gov/pesticides/biopesticides/factsheets/fs217500e.htm. Accessed 2/04/02.

U.S. Environmental Protection Agency, Office of Pesticide Programs. 2002. Registration Division Work Plan for the Registration of Conventional Pesticides. New Use Registration Candidates. www.epa.gov/opprd001/workplan/newuse.htm. Accessed 04/08/02.

U.S. Environmental Protection Agency, Office of Water. 1997. *Revision to* Rapid Bioassessment Protocols for Use in Streams and Rivers; Periphyton, Benthic Macroinvertebrates, and Fish. EPA 841-D-97-002. Washington, DC.

U.S. Environmental Protection Agency, Prevention, Pesticides and Toxic Substances. 1995. Reregistraion Eligibility Decision (RED) Fosamine ammonium. EPA 738-R-004.

U.S. Fish and Wildlife Service. 1989. Waterfowl Management Handbook, Control of *Phragmites* or Common Reed. Fish and Wildlife Leaflet 13.4.12. Washington, D.C.

Williams, D.J., M.K. Lowry, R.E. Wolf, and M.F. Bolin. Unknown date. A Reference Manual for Herbicide Use in Forest And Conservation Tree Planting and Timber Stand

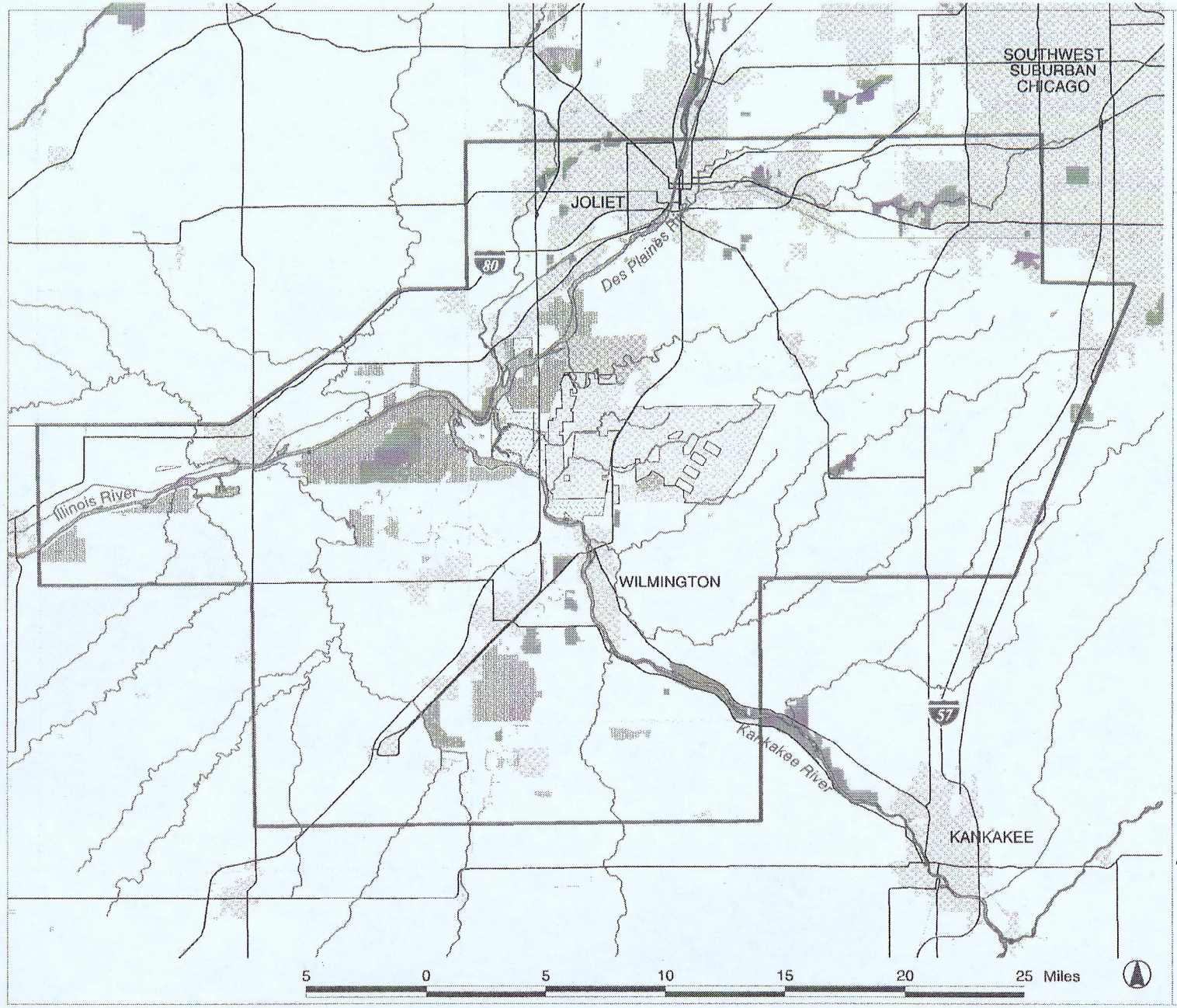
Improvement Projects in Illinois. Prepared for the Illinois Stewardship Advisory Committee.

Wisconsin Department of Natural Resources. 1999. Reed canary-grass (*Phalaris arundinacea*). www.dnr.state.we.us/org/land/er/invasive/factsheets/reed.htm. Accessed 2/21/02.

Figure 1

Midewin National Tallgrass Prairie

Midewin NTP within the Former Joliet Arsenal and the Prairie Parklands Macrosite



LEGEND

- Major Waterway
- Major Road
- Open Water
- Prairie Parklands Macrosite
- County Boundary

Land Ownership and Use

- USDA Forest Service
- National Cemetery
- Joliet Army Training Area
- Industrial Park
- Proposed Will County Landfill
- US Army
- Will Country Forest Preserve
- Illinois DNR
- State of Illinois Protected Land
- Corporation Owned
- Municipality

Location Information

The Midewin National Tallgrass Prairie is located approximately 45 miles southwest of downtown Chicago and 15 miles South of Joliet. It is situated in the Channahon, Jackson, Manhattan, Wilmington, Florence and Wilton Townships of southwest Will County, Illinois

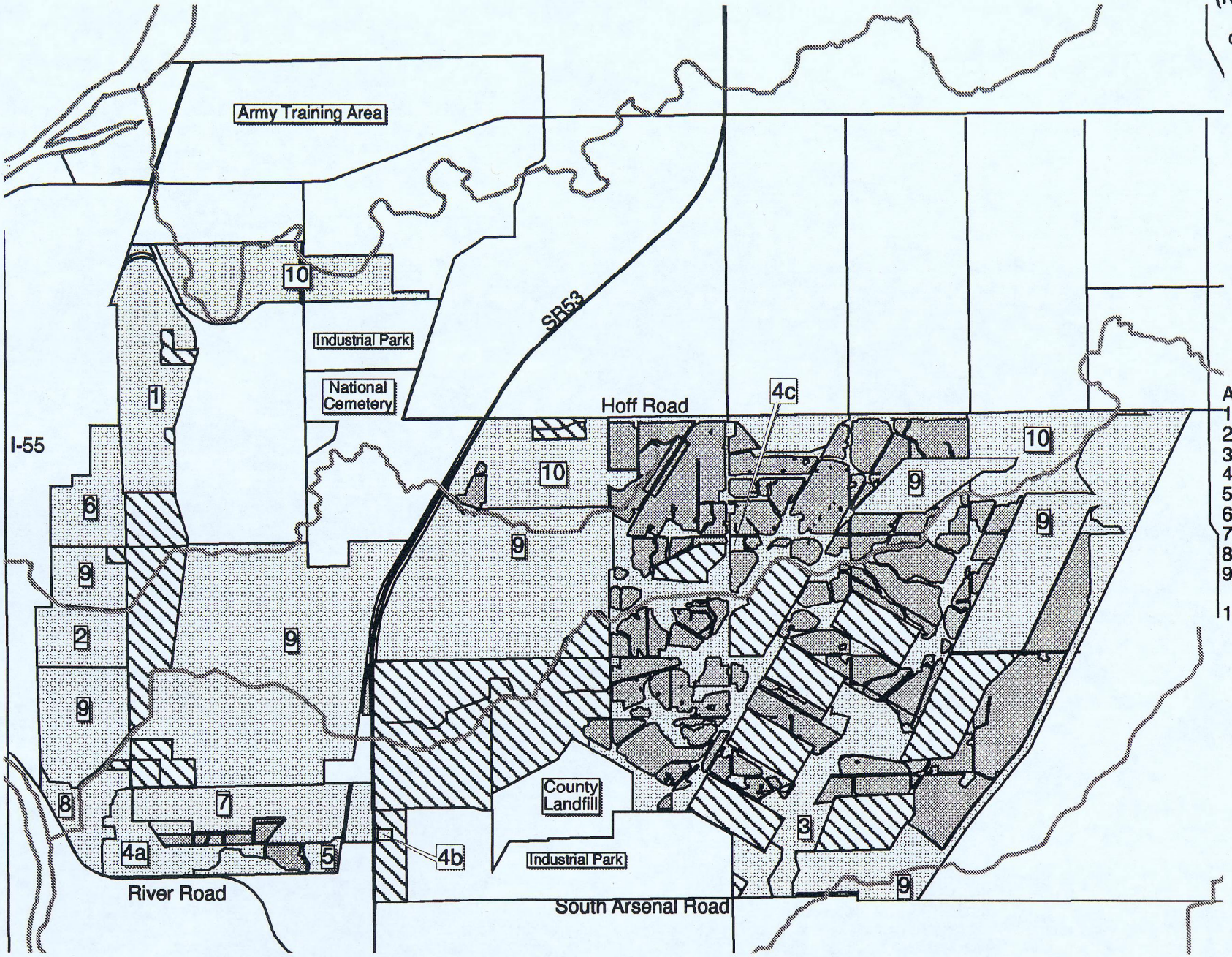
Projection UTM Meters, Zone 16, NAD83, Created 03/01, jbm

Midewin National Tallgrass Prairie
30071 South State Route 53
Wilmington, Illinois, 60481
815.423.6370
www.fs.fed.us/mntp

Figure 2

Midewin NTP Herbicide Treatment Areas FY 2002

(Note: Only areas less than 1 acre within the larger designated areas will be treated with herbicide.)



LEGEND

Treatment Areas

- Treatment Areas (1-10)
- Currently In Row Crop
- Army Area
- Adjacent Property
- Stream
- Road

Area Names

1) Drummond
2) Grant Creek Prairie Access
3) Doyle Creek Wetland
4) Seed Production Areas
5) Foxglove Prairie
6) Blodgett Rd Restoration
7) So. Patrol Rd Restoration
8) Prairie Creek Woods
9) Pasture and Agricultural Grasslands
10) Spot Treatment Areas for New Invasives

1 0 1 2 3 4 5 6 Miles

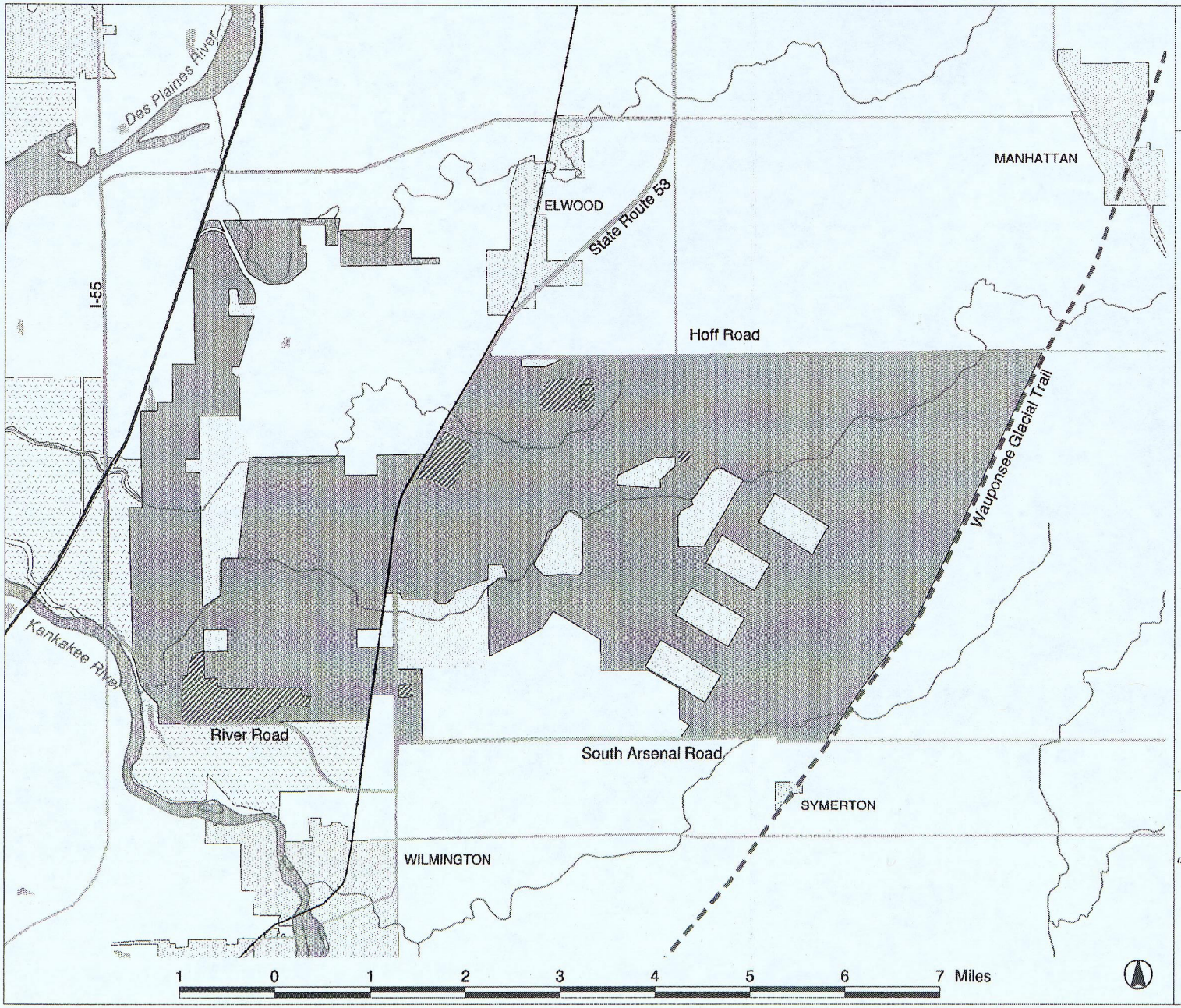


Figure 3

Midewin National Tallgrass Prairie

Management Areas

LEGEND

- Wauponsee Glacial Trail
- Major Stream
- Open Water
- Restoration (Management Area 1)
- Developed Site (Management Area 2)
- Department of the Army
- Illinois DNR
- Municipality

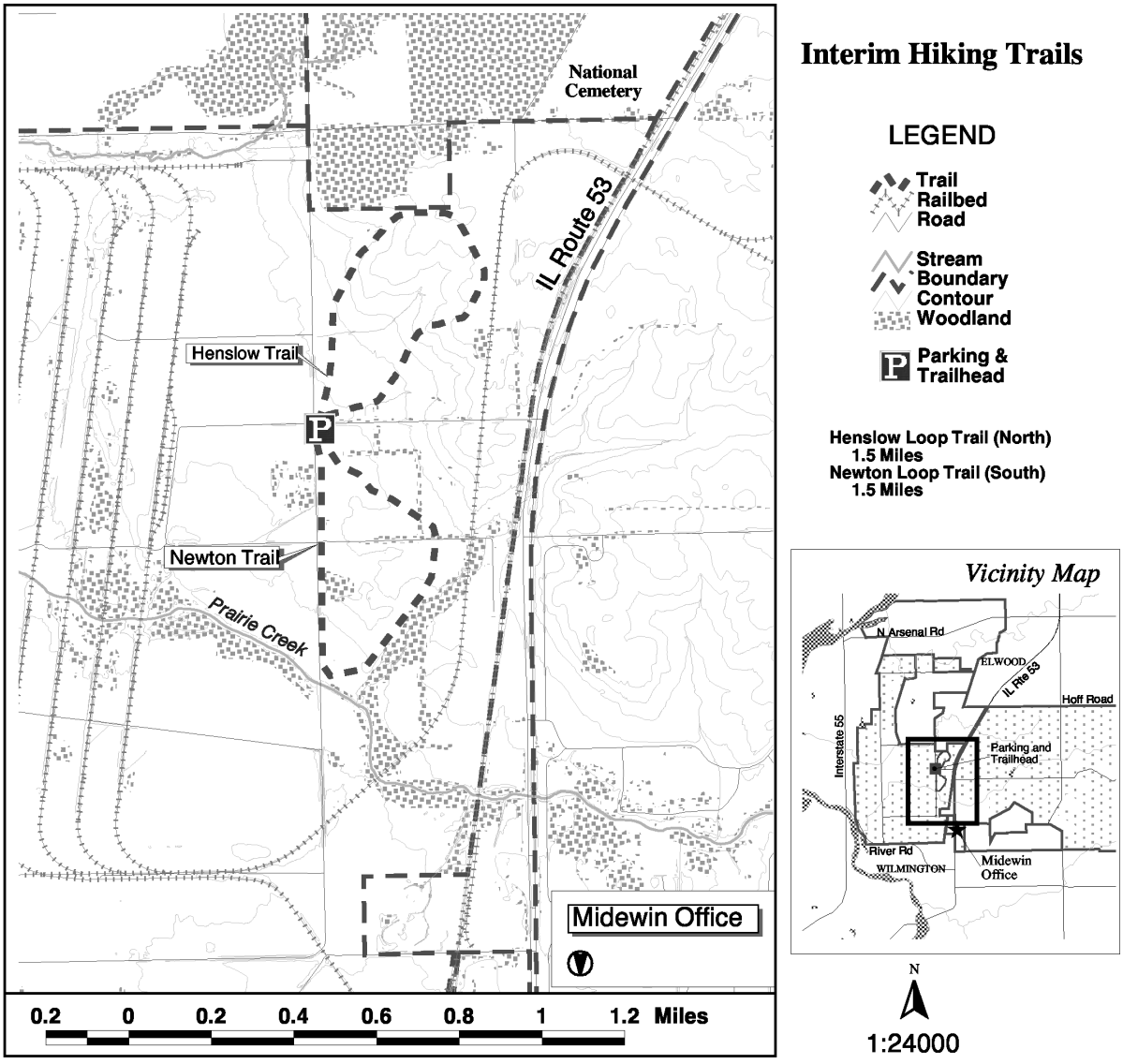
The Forest Service cannot assure the reliability or suitability of this information for a particular purpose. Original data elements were compiled from various sources. This information may be updated, corrected, or otherwise modified without notification. For additional information about this data, contact the Midewin National Tallgrass Prairie Planning Team.

Projection UTM Meters, Zone 16, NAD83, Created 03/01, jbm

Midewin National Tallgrass Prairie
30071 South State Route 53
Wilmington, Illinois, 60481
815.423.6370
www.fs.fed.us/mntp

Figure 4

Newton & Henslow Interim Hiking Trails Map



APPENDIX A

COMMENTS RECEIVED IN RESPONSE TO PUBLIC SCOPING NOTICE

Most of the public comments received during the scoping period supported the FS Proposed Action as described in the Public Scoping Notice (Alternative 1). However, several respondents felt that the Forest Service should not be limited to the six herbicides on the list (addressed under Alternative 2). Still others, while supporting herbicide use, expressed concern over the use of herbicides in areas containing threatened and endangered species, in particular the Drummond Dolomite Prairie (addressed under Alternative 3). An objection was raised about the application of herbicides on native noxious weeds, stating that only nonnative plant species should be targeted for herbicide use. In another response, it was suggested that a provision be made for broadcast spraying (Both of these comments are discussed under Alternatives and Actions Dropped From Further Analysis, p. 14).

Comments expressed concern about the need to address possible impacts to human health and natural resources, stressing proper use and storage of herbicides. These comments are addressed in the EA under mitigation and monitoring, as appropriate.

Respondent	**Comment**	**Issue/Topic that addresses this in the EA**
Agency	Seed production areas should be a higher priority for treatment.	Issue 1
Agency	Native invasives vs. Nonnative invasives – EA should state rationale why some invasive species may be desirable.	Issue 1
Agency	Develop a monitoring plan covering soil, water, vegetation, and spray drift using current spray technologies (AGDISP, GIS).	Mitigation and Monitoring; Issue 3
Agency	Develop a Pesticide Use Proposal approved by a pesticide use coordinator.	N/A. Approval for Pesticide Use needed after the final EA.
Agency	Ensure that the right chemicals have been chosen for the targets.	Issue 1

Respondent	Comment	Issue/Topic that addresses this in the EA
Individual	Benefits will outweigh any harmful effects. Methods proposed in the Scoping Letter for eliminating noxious and invasive weeds are sound.	Issue 1
Agency	Herbicide use is the most time and cost-effective alternative to control invasive species and noxious weeds.	Issue 1
Agency	If done within the guidelines established by the IDNR, it can be the least ecologically disruptive strategy.	Issue 1
Agency	Consider adding Krenite (Fosamine ammonium salt) to list of herbicides. Effective at controlling bush honeysuckle and black locust.	Issue 1
Agency	The Forest Service plan to utilize herbicides is consistent with similar practices used by other natural resource management agencies to control invasive species.	Issue 1
Agency	Herbicide application could impact Federally-listed species. The EA should identify invasive/weedy species now known to occur in the areas adjacent to the Federally-listed plants.	Issue 4
Agency	List methods and time tables for herbicide applications to areas near Federally-listed species.	Mitigation and monitoring, Issue 4
Agency	If herbicides may impact Federally-listed species, then Forest Service should assess other methods for managing undesirable species in these areas.	Mitigation and monitoring, Issue 4
Individual	Pulling weeds by hand is not an efficient use of volunteer time.	Issue 1
Individual	Pesticides can be safely used and are critical to efficient prairie restorations.	Issue 1
Individual	Ensure that trained applicators follow the guidelines of all regulatory legislation.	Mitigation and monitoring
Individual	Natural communities, along with staff, volunteers, and visitors may be affected by vapor drift.	Issue 2 and Issue 3
Individual	Herbicides may leach into ground and/or surface water.	Issue 3
Individual	Misuse in timing, application, and clean-up may be harmful to volunteers and visitors.	Issue 2, Mitigation and monitoring
Individual	Persistency and spray drift may affect volunteers.	Issue 2, Mitigation and monitoring

Respondent	Comment	Issue/Topic that addresses this in the EA
Individual	Volunteers and visitors need to be notified of spray dates, times, and locations. Areas should be marked (and dated) in the field.	Issue 2, Mitigation and monitoring
Agency	Non-native species pose more of a threat than native species; efforts should be concentrated on non-natives.	Issue 1 to some extent; see Alternatives considered and dropped from further analysis.
Agency	The overuse or misuse of herbicides on the Drummond Dolomite Prairie may affect threatened and endangered species.	Issue 4
Agency	The herbicides should be used in a safe manner so that they do not endanger sensitive plants, water resources, and humans.	Issue 2, Issue 3, and Issue 4, mitigation and monitoring
Individual	Herbicides are necessary in order to correct human errors relating to our environment.	Issue 1
Agency	Weed control without herbicides is ineffective and cost prohibitive for some species.	Issue 1
Agency	Efforts to restore animal communities at Midewin will require control of invasive plants.	Issue 1
Agency	Not all invasive plant species are non-native. Invasive native species have increased and modified the vegetation at Midewin. Control of native species should be made clear in the EA.	Issue 1
Agency	Some areas slated for herbicide use contain threatened and endangered species. State precautions taken to protect these species from herbicide damage.	Issue 4, Mitigation and monitoring
Agency	State precautions taken to prevent applied herbicides from entering streams and wetlands, seeping into groundwater, or entering neighboring property.	Issue 3, Mitigation and monitoring
Individual	The listed chemicals are safe if applied by licensed applicators with past experience and the appropriate credentials.	Mitigation and monitoring
Individual	Proper herbicide usage will enhance the flora and fauna of Midewin and should be a high priority for the Forest Service.	Issue 1
Agency	The use of herbicides is an accepted tool in an Integrated Pest Management Plan	Issue 1
Agency	The herbicides proposed for Midewin will have the least environmental impact.	Issue 1

Respondent	Comment	Issue/Topic that addresses this in the EA
Agency	The effect of herbicides on high quality areas with threatened and endangered species is a concern and needs to be analyzed.	Issue 4
Individual	The benefits of selective use of herbicides for restoring the tallgrass prairie ecosystem far outweigh the risks.	Issue 1
Individual	The use of herbicides is an essential tool for management of invasive plant species and control of noxious weeds. Volunteer time can be used more effectively with herbicides.	Issue 1
Agency	Supports the use of herbicides if all of the EPA guidelines are adhered to rigorously.	Issue 1, Mitigation and monitoring
Agency	Treated areas should be posted with signs indicating the herbicide name, date of application, the half-life, and other pertinent information.	Mitigation and monitoring
Agency	Make sure list of herbicides is on the Forest Service approved list.	Issue 1, Mitigation and monitoring
Individual	Treating the seedbeds with herbicide will enable the volunteers to be more productive.	Issue 1
Agency	The appropriate use of herbicides can be a cost-effective and environmentally protective means of controlling weeds.	Issue 1
Agency	The Forest Service should assure proper storage of herbicide containers at Midewin, including storage of herbicides in a segregated building, secondary containment in the event of spillage, posting with appropriate signage, and limiting access to authorized personnel only. Rinsate management and disposal should be part of the plan.	Mitigation and Monitoring
Agency	Review EPA's Pesticide Safety and Site Security Alert in evaluating pesticide security.	Mitigation and Monitoring
Individual	Herbicide use, as part of an integrated pest management strategy, is a necessary, cost-effective method of restoring an area the size of Midewin.	Issue 1
Individual	Consider using herbicides not only as spot treatment, but also as broadcast treatment of entire areas before introduction of native seeds.	See alternatives considered but dropped from further analysis (p. 14).
Individual	Consider expanding the list of herbicides to be used. Fosamine may be more effective than Triclopyr in some cases.	Issue 1

APPENDIX B
Noxious Weeds and Invasive Species on Midewin

Table 1: Non-native, invasive plant species at Midewin National Tallgrass Prairie that threaten restoration, management or health and safety.

Scientific name **Common Name**	**Distribution**	**Comments**
Acer platanoides Norway Maple	Present (planted) around former house sites and abandoned buildings. Seedlings and saplings from these plantings are present at two localities on Midewin.	Invades mesic woodlands and forests; potential to change structure and increase understory shade during growing season.
Agropyron (Elytrigia) repens Quack Grass	Locally common, especially on poorer soils.	Invasive and competitive into seed production beds. Not a problem in pastures or other grasslands, but has invasive potential in dolomite prairie.
Agrostis alba Redtop	Common, especially on moister soils.	Currently planted on site to expand grassland bird habitat and renovate pastures. May be invasive in prairie remnants and restoration, but can be controlled though prescribed burns.
Allanthus altissima Tree-of-Heaven	Occasional; small stands at abandoned house sites.	May be invasive in dry dolomite prairie.
Alliaria petiolata Garlic mustard	Locally abundant in native forests and woodlands along Prairie and Jackson creeks; also in successional thickets along these streams and Grant Creek.	Competes with native herbaceous understory in native woodland, forest, and savanna communities. Excludes or outcompetes most native understory herbs.
Allium vineale Field Garlic	Present only in dolomite prairie at NW boundary of Midewin.	Appears to be invading and spreading in dolomite prairie.
Arctium minus Common Burdock	Locally common throughout Midewin, especially in shaded ground in pastures or at abandoned house sites.	Large persistent herb that effectively shades out any competition. Difficult to eradicate and replace with desirable species.
Asparagus officinalis Wild Asparagus	Present in prairie remnants, roadsides, and other grasslands.	Very persistent, may become common in some prairie remnants despite management with fire.
Berberis thunbergii Japanese Barberry	Uncommon in forests, woodlands, and thickets.	Bird-dispersed shrub now increasing in northern Illinois forests and woodlands.
Bromus inermis Smooth (Hungarian) Brome Grass	Nearly ubiquitous in grasslands throughout Midewin.	Important cover in grassland bird habitat. May be difficult to control in native restoration.
Bromus spp. Winter-annual Brome Grasses	Locally common; includes *B. tectorum,* Cheatgrass, and other species (*B. japonicus, B. racemosus*)	Appears to occupy microhabitats and displace native annuals and biennials in dolomite prairie.
Carduus acanthoides Plumeless Thistle	Very local in disturbed soil; uncommon but fairly widespread in pastures and other grasslands on Midewin.	May be aggressive in early stages of prairie restoration; large stands reduce suitability of grassland habitats for certain bird species.
Carduus nutans Musk Thistle, Nodding Thistle	Uncommon but scattered in pastures, grasslands, abandoned fields, and early stages of prairie restoration.	Illinois Noxious Weed. A potential pest in pastures and grasslands.
Catalpa speciosa Northern Catalpa	Not native in Will County (native from east Central Illinois south). Planted trees persist at abandoned house sites, and often produce seedlings.	Not a severe problem, but will need to be removed as fragmentation of grassland bird habitat is reduced.
Centaurea maculosa Spotted Knapweed	Locally common on dry soils, especially along abandoned railroad lines and roadsides, but also in some pastures.	Invader of dry prairie habitats and pastures; also invades dolomite prairie on adjacent state land and has displaced native vegetation.

Scientific name **Common Name**	**Distribution**	**Comments**
Circium arvense Canada Thistle, Field Thistle	Common in roadsides, pastures, grasslands, wetlands, and degraded prairie habitats (including some dolomite prairie). May be increasing on site.	Serious problem in seed production beds and fields. Aggressive in early stages of prairie and grassland restoration. Increasing in native wetland habitats.
Cirsium vulgare Bull Thistle	Locally common in pastures.	Unsightly when present in seed production beds, pastures, or early stages of prairie restoration.
Cornus drummondii Rough-leaved Dogwood	Planted on site for wildlife benefits; Midewin is probably just beyond the NE margin of the natural range.	Potential invader of prairie habitats.
Coronilla varia Crownvetch	Locally common on Midewin, primarily in roadsides.	Invades prairie communities in Illinois; serious problem in dolomite prairie and other dry and mesic prairie habitats.
Cotoneaster multiflora Many-flowered Cotoneaster	Rare escape in NE Illinois; at one site on Midewin.	Potential invader of grasslands, forests, and woodlands.
Dipsacus lacinatus Cut-leaved Teasel	Locally common at a few localities on Midewin, mostly in roadsides.	A rapidly increasing and spreading plant throughout the Midwest. Invades grassland and native prairie habitats, often forming dense, monotypic stands.
Dipsacus sylvestris Common Teasel	Common in grasslands, prairie remnants, wetlands, and roadsides at Midewin.	Perhaps not as serious a pest as *D. laciniatus*, but does form dense stands under certain conditions.
Echinops sphaerocephalus Blue Globe Thistle	Present at one locality on Midewin; immediately adjacent to one of the few mesic prairie remnants on site.	Elsewhere in Will County has been found (large numbers) in roadsides, grasslands, and prairie remnants.
Elaeagnus umbellate Autumn-olive	Common, often abundant in roadsides, prairie remnants, and other grasslands.	Aggressive invader of grasslands and prairie remnants; threatens grassland bird habitat on Midewin.
Eriochloa villosa Chinese Cup-grass	Locally abundant in abandoned crop fields.	May become a problem in early stages of prairie/wetland restoration.
Euonymus alatus Winged Euonymus, "Burning- Bush"	A few plants persist at one abandoned house site. Common ornamental shrub in Will County, so likely to appear elsewhere on site.	High potential to invade mesic savannas, woodlands, and forests, displacing native shrubs and herbaceous understory species.
Euphorbia esula Leafy Spurge	Present on Midewin in the Grant Creek Prairie Annex, and on land held by Army.	This species is a major invader of pastures, grasslands, hayfields, and native prairie in the north-central USA.
Festuca arundinacea, F. pratensis Tall fescue, Meadow Fescue	Locally common on Midewin.	Important pasture grass, but can be invasive in some prairie habitats.
Glechoma hederacea Ground-ivy	Locally common in shaded areas, both in native forests and disturbed woodlands.	Probably not a serious threat to native woodland flora, at least compared with garlic mustard.
Hemerocallis fulva Orange Daylily	Locally common near abandoned house sites.	May persist and spread vegetatively in prairie remnants and restorations.
Hypericum perforatum European St. John's-wort	Locally common in roadsides and grasslands, also in dolomite prairie.	Potentially poisonous to livestock; does invade seed production beds. Invades dolomite prairie, including microhabitat occupied by *Dalea foliosa* (Federal Endangered)
Leonurus cardiaca Motherwort	Locally common in shaded ground, especially in pastures.	Potential problem in woodlands.
Leonurus marrubiastrum Lion's-tail	Locally common in parts of Midewin where dolomite is at or near the surface.	May become a problem in dolomite prairie habitats.

Scientific name **Common Name**	**Distribution**	**Comments**
Ligustrum vulgare Common Privet	Locally common in thickets.	May be a problem in woodlands or grasslands, although not as serious as *Lonicera* spp.
Lonicera x bella Showy Honeysuckle	Present in roadsides, thickets and old fields, but not as common as *L. maackii*.	Invades forests, woodlands, savanna, and grasslands.
Lonicera maackii Amur Honeysuckle	Locally abundant in woodlands and forests; invades open land. Large plantings done before FS presence still present on site.	Serious threat to all natural vegetation and restoration. Can survive in dense shade, and often changes vegetation structure and recruitment patterns among forest species.
Lonicera x muendeniensis Muenden Honeysuckle	Present, but rare.	Invades forests, woodlands, savanna, and grasslands.
Lonicera tatarica Tartarian Honeysuckle	Present in roadsides, prairie remnants, thickets, woodlands, and old fields, but not as common as *L. maackii*.	Invades forests, woodlands, savanna, and grasslands, including dolomite prairie.
Lotus cornicluata Bird's-foot Trefoil	Locally common in roadsides and pastures.	May become a problem in dry prairie and dolomite prairie habitats.
Lysmachia nummularia Moneywort	Locally common in moist soils.	May persist in seeps and fens.
Lythrum salicaria Purple Loosestrife	Very rare on Midewin.	Serious invader of wetlands (including wet prairie) throughout the Midwest.
Maclura pomifera Osage-orange	Originally planted as living fence; now widespread in grasslands, pastures, and floodplain forests.	Invades open grasslands. Management complicated because of use by RFSS (loggerhead shrike).
Malus prunifolia Plum-leaved Crab Apple	Planted as ornamental; occasional escape on Midewin.	Potential invader of grasslands and woodlands.
Malus pumila Domestic Apple	Scattered orchard trees and their offspring present throughout site.	Not a serious invader, but may need removal from grassland bird habitat and prairie remnants.
Malus sieboldii Japanese Crab Apple	Planted as ornamental; occasional escape on Midewin.	Potential invader of grasslands and woodlands.
Melilotus alba White Sweet Clover	Common throughout site in roadsides, old fields, prairie remnants, and on abandoned railroad beds.	Can be a serious problem in prairie remnants and restorations.
Melilotus officinalis Yellow sweet Clover	Locally common throughout site in roadsides, old fields, prairie remnants, and on abandoned railroad beds.	Can be a serious problem in prairie remnants and restorations; perhaps a threat to dolomite prairie habitat.
Morus alba White Mulberry	Common in woodlands, thickets, floodplains, fencerows, and grasslands.	Fast-growing, prolific tree that invades native vegetation.
Pastinaca sativa Wild Parsnip	Locally common in grasslands, roadsides, and prairie remnants.	Does invade prairie remnants and restorations; poses a minor health hazard (dermatitis) to public, staff, and volunteers.
Phalaris arundinacea Reed canary-grass	Locally abundant in moist grasslands, wetlands, and along ditches.	Serious invader of natural wetlands, displacing native flora. Actively invading wet dolomite prairies on site.
Phragmites australis Common Reed	Locally common in wetlands. Although some Midwestern populations appear native, most appear to be non-native strains (as on Midewin).	Invades native wetlands, including marshes, wet prairies, dolomite prairies, and sedge meadows, replacing native flora with monotypic stands.
Poa compressa Canada Bluegrass	Locally common in dry pastures, grasslands, and prairie remnants.	Has invaded dry and mesic dolomite prairie habitats on site; appears to have replaced many native species.

Scientific name **Common Name**	**Distribution**	**Comments**
Poa pratensis Kentucky Bluegrass	Common in grasslands, pastures, old fields, roadsides, and prairie remnants.	Local problem in some prairie remnants. However, important component of pasture habitats for certain grassland birds.
Populus alba White Poplar	Persists at abandoned house sites, where it forms large thickets.	May persist and spread into prairie remnants and restorations.
Rhamnus cathartica European Buckthorn	Uncommon on Midewin, but increasing; locally abundant elsewhere in Will County.	Already present in dolomite prairies and woodlands on site; likely to invade other vegetation.
Robinia pseudoacacia Black Locust	A few planted stands present on Midewin; some clonal spread. Native to eastern North America, but not in northern or central Illinois.	Can be persistent and difficult to eradicate from native vegetation (upland prairie and woodlands).
Rosa eglanteria (rubigonosa) Sweetbrier Rose	Uncommon in pastures.	Probably not a serious problem; appears to be controlled by browsing (deer and livestock).
Rosa multiflora Multiflora Rose	Common in pastures, grassland, and old fields.	Not declining, despite presence of rose rosette disease. Increasing in some grasslands, reducing suitability for certain grassland birds.
Salix alba White Willow	Occasional along streams and drainage ditches.	Not a serious management problem, but may need removal from riparian wetlands.
Saponaria officinalis Bouncing-bet	Locally common in roadsides and grasslands.	May be a local problem in dry prairie restorations.
Setaria faberi Giant Foxtail	Locally abundant in disturbed soils. Often abundant in early stages of prairie and grassland restorations.	Not a serious problem, except for seed production beds.
Solanum dulcamara Bittersweet Nightshade	Local in moist thickets.	Not a serious problem at Midewin, but elsewhere does invade fens.
Sonchus arvensis Perennial Sow-thistle	Locally common.	Illinois Noxious Weed. Not a problem in prairie restoration, but control required in seed beds and pastures.
Sorghum halapense Johnson Grass	Local in row crop fields.	Illinois Noxious Weed. Probably will not be a problem in prairie restoration, but may require control in row crop fields until conversion by habitat restoration.
Ulmus pumila Siberian Elm	Spreading from plantings at abandoned house sites.	Invades upland grasslands and prairies.
Verbascum thapsus Common Mullein	Locally common in roadsides, pastures, eroding banks, and dolomite prairies.	May be a problem in dry prairie restoration and dolomite prairie remnants.
Viburnum opulus European Highbush-Cranberry	Occasional on Midewin, in thickets.	Potential invader of woodlands and wetlands.
Vinca minor Periwinkle	At Midewin, persists at a few abandoned house sites and cemeteries.	May spread into adjacent woodlands and forests, where it can displace native herbaceous flora.

Table 2: Some native, invasive plant species at Midewin National Tallgrass Prairie that threaten restoration and management of specific habitats or health and safety.

Scientific name **Common Name**	**Distribution**	**Comments**
Acer negundo Box Elder	Locally common at abandoned house sites, in fencerows, thickets, and riparian areas.	Control required to reduce fragmentation of grassland habitats.
Acer saccharum Sugar Maple	Mesic forests and woodlands; also planted specimens near buildings and at abandoned house sites.	Increasing in forests and woodlands following fire suppression.
Acer saccharinum Silver Maple	Along streams and persisting at abandoned house sites. Also in depressions on uplands and outwash plain.	Removal of dense, monotypic stands required to restore many former open wetlands that were sedge meadows, wet prairies, and marshes.
Ambrosia spp. Ragweeds	Common throughout.	May need control in high public use areas and seed production beds because of potential health problems (allergies).
Andropogon gerardii Big Bluestem	Scattered throughout site, but only common in mesic prairie remnants.	May need to be controlled in early stages of prairie restoration.
Aster pilosus Hairy Aster	Common throughout.	May be a pest in seed production beds.
Celtis occidentalis Eastern Hackberry	Locally common at abandoned house sites, in fencerows, thickets, and riparian areas. Native in bottomland forests, woodlands, and savannas.	Some reduction required to reduce fragmentation of grassland habitats and in the process of restoring open structure to woodlands and savannas.
Conyza canadensis Horseweed	Common in disturbed soils.	Often abundant in early stages of prairie restoration, but a pest in seed production beds.
Cornus racemosa Gray Dogwood	Occasional on well-drained soils of grasslands, roadsides, and prairie remnants; also in open woodlands.	Can be an aggressive and persistent invader of native prairie remnants.
Crataegus spp. Hawthorns	Often abundant in pastures, fencerows, and forests.	Control and/or removal required to reduce fragmentation of grassland bird habitat and restore structure to prairie, woodland, and savanna remnants.
Cuscuta spp. Dodders	Occasional throughout.	Potential pest in seed production beds.
Desmanthus illinoiensis Illinois Sensitive Plant	Local and uncommon on outwash plain prairie remnants.	May need to be controlled in early stages of prairie restoration.
Elymus Canadensis Canada Wild Rye	Scattered throughout site, but only common in mesic prairie remnants.	May need to be controlled in early stages of prairie restoration.
Eupatorium serotinum Late Boneset	Common.	May need to be controlled in early stages of prairie and wetland restoration; also pest in seed production beds.
Fraxinus pennsylvanica Green Ash	Common, sometimes locally abundant in bottomland thickets and woodlands; also in moist old fields and prairie remnants.	Forms in dense, often monotypic stands in savanna, moist prairie, and wetland remnants; removal required to restore structure and hydrology.
Gleditsia triacanthos Honey Locust	Sometimes common in pastures and fencerows; native in bottomland forests and woodlands.	Reduction necessary to reduce fragmentation of grassland bird habitat and restore structure to native vegetation remnants.
Helianthus spp. Perennial sunflowers	Some species locally common on site in roadsides and prairie remnants.	May need to be controlled in early stages of prairie restoration.

Scientific name **Common Name**	**Distribution**	**Comments**
Juglans nigra Black Walnut	Local at former house sites, fencerows, and riparian areas. Native in bottomland forests, woodlands, and savannas.	Some reduction required to reduce fragmentation of grassland habitats and in the process of restoring open structure to woodlands and savannas.
Juniperus virginiana Red Cedar	Occasional in old fields and roadsides; probably not native on Midewin.	Easily controlled.
Panicum virgatum Switch Grass	Scattered throughout site, but only common in mesic prairie remnants. Some roadside populations may be derived from non-local strains.	May need to be controlled in early stages of prairie restoration. Non-local strains should be eradicated.
Populus deltoides Eastern Cottonwood	Locally common in upland depressions and riparian areas. Native in bottomland forests, woodlands, and savannas.	May need to be controlled in early stages of wetland restoration. Some removal required to restore wetland and riparian habitats.
Populus tremuloides Quaking Aspen	Rare and local on Midewin, but can be an aggressive invader of native prairies and wetlands in Will and adjacent counties.	May need to be controlled in early stages of prairie and wetland restoration.
Prunus Americana Wild Plum	Locally common in fencerows, thickets, and field edges.	Some control required to reduce fragmentation of grassland habitats and in the process of restoring open structure to woodlands and savannas.
Prunus serotina Black Cherry	Locally common at abandoned house sites, in fencerows, thickets, and riparian areas. Native in forests and woodlands.	Some reduction necessary to reduce fragmentation of grassland habitats and in the process of restoring open structure to woodlands and savannas.
Rhus spp. Sumac	Occasional on well-drained soils of grasslands, roadsides, and prairie remnants.	Can be an aggressive and persistent invader of native prairie remnants.
Ribes missouriense Missouri Gooseberry	Often locally abundant in native forests, thickets, and closed-in savannas.	Some reduction is necessary to restore structure to the understory strata of forests, woodlands, and savannas.
Rubus spp. Wild blackberries and raspberries	Often locally common in old fields, native forests, thickets, closed-in savannas, and prairie remnants.	Some reduction may be necessary to restore structure to the understory strata of forests, woodlands, and savannas.
Salix interior Sandbar Willow	Forms dense stands in and along drainage ditches, riparian areas, wet prairies, and other open wetlands.	Control required to restore wet prairie, sedge meadow, and marsh remnants.
Salix spp. Tree Willows	Locally common in upland depressions and riparian areas.	May need to be controlled in early stages of wetland restoration. Some removal required to restore wetland and riparian and habitats.
Solidago Canadensis Tall Goldenrod	Common, often locally abundant in old fields, roadsides, pastures, prairie remnants, and other grasslands.	Control may be necessary in early stages of prairie and grassland restoration.
Sorghastrum nutans Indian Grass	Scattered throughout site, but only common in mesic prairie remnants.	May need to be controlled in early stages of prairie restoration.
Symphoricarpos orbiculatus Coralberry	Scattered on Midewin, mostly in brushy pastures, but also in prairie remnants.	Control may be required in dolomite prairie.
Toxicodendron radicans Poison Ivy	Locally common in fencerows and woodlands.	Control may be required in high public use areas.
Typha spp. Cattails	Locally common in drainage ditches, wet depressions, and marshes.	May need to be controlled in early stages of wetland restoration.
Ulmus Americana (American Elm)	Locally common at abandoned house sites, in fencerows, thickets, and riparian areas. Native in bottomland forests and woodlands.	Some removal required to reduce fragmentation of grassland habitats and in the process of restoring open structure to woodlands and savannas.

Table 3: Non-native, invasive plant species at likely to appear on Midewin National Tallgrass Prairie in the next 5-20 years.

Scientific name **Common Name**	**Distribution**	**Comments**
Alnus glutinosa European Black Alder	Plants and naturalized stands present in southern Will County, including private land adjacent to Midewin	Spreads in riparian areas, forming dense stands.
Celastrus orbiculatus Asiatic Bittersweet	Not present on Midewin, but occurs in Will County and likely to appear in future	Invasive climbing vine, often strangles or shades out native trees and shrubs.
Dioscorea oppositifolia Chinese Yam	Present in southern Illinois; rapidly expanding throughout Ohio River Valley.	Forms dense tangles over herbaceous and shrubby vegetation.
Euonymus fortunei Purpleleaf Wintercreeper	Local escape from cultivation in Will County.	Invades mesic forests, forming dense stands; displaces native woodland wildflowers.
Euonymus europaeus European Spindle-tree	Local escape from cultivation.	Invades forest understory; dispersed by birds.
Euonymus hamiltonius Asiatic Spindle-tree	Local escape from cultivation, increasing in NE Illinois.	Invades savanna, forest, and woodland understory; dispersed by birds.
Heracleum mantegazzianum Giant Hogweed	Spreading rapidly throughout northeastern USA; has reached Ohio.	Potential invader of woodlands, savannas, seeps, & prairies; causes extreme dermatitis and poisoning.
Hesperis matronalis Dame's Rocket	Present on land immediately adjacent to Midewin.	Potential invader of forest, woodland, and savanna habitats.
Lespedeza cuneata Sericea Lespedeza	Not on Midewin, but one planted stand present on adjacent Army land.	Aggressive invader in prairies, glades, and warm-season pastures south of northern Illinois.
Lonicera japonica Japanese Honeysuckle	Present in Will County; much more common farther south.	Aggressive invader of native vegetation.
Microstegium vimineum Nepalese Stilt-grass	Locally abundant in Ohio River Valley; still actively spreading northwards.	Becomes abundant in riparian and bottomland habitats; spreads along streams, roads, and trails.
Miscanthus sacchariflorus Eulalia	Scattered in Will County and northern Illinois.	Strongly rhizomatous grass, but not yet a problem in prairies or other habitats.
Myriophyllum spicatum Eurasian Water-milfoil	Locally common and increasing in northern Illinois.	Potential habitat on Midewin is limited; may colonize some streams or marshes.
Polygonum perfoliatum Mile-a-minute	Restricted to northeastern USA, but rapidly expanding.	A vine that smothers underlying vegetation.
Polygonum cuspidatum Japanese Knotweed	Present along streams in northern Will County; likely to spread down watersheds onto Midewin.	Potential invader of riparian habitats.
Prunus padus European Bird Cherry	Ornamental tree, escaping in Will County.	Invades forest understory.
Rhamnus frangula Glossy Buckthorn	Occurs in Will County, including many localities around Midewin; likely to appear within 5-10 years (as of 1999).	In NE Illinois, this species is an aggressive invader of bogs, fens, sedge meadows, and wet prairies.
Viburnum Ianata Wayfaring-tree	Ornamental shrub, escaping in Will County.	Potential invader of woodlands and savannas.
Viburnum recognitum Smooth Arrow-wood	Not yet verified on Midewin, but spreading in NE Illinois. Native south and east of the prairie regions of Illinois and Indiana.	Potential invader of savannas, woodlands, forests, and upland prairies.