APPENDIX A

SUMMARY OF POPULATION VIABILITY ASSESSMENT AND ANALYSIS

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SUMMARY OF POPULATION VIABILITY ASSESSMENT AND ANALYSIS

1. Protocols

Protocols for evaluating selected species' future population abundance and distribution under alternative management plans for Midewin National Tallgrass Prairie

This document describes the protocols used during a meeting with a panel of scientists (hereafter Expert Panel) with expertise on Regional Forester's Sensitive Species (RFSS) that inhabit Midewin National Tallgrass Prairie (Midewin). The purpose of the document is twofold. First, it informed members of the Expert Panel how the meeting was to be conducted, what information would be collected, and how the information would be used. It also provides a written record of the protocols. These protocols were adapted from similar expert panel processes that have been used in population viability assessments, including those in the Forest Ecosystem Management Assessment (FEMAT), land management planning on the Tongass National Forest in Alaska (Shaw 1999), and in the Interior Columbia River Basin Ecosystem Management Project (ICBEMP). The process documented by the ICBEMP (Quigley et al. 1997) was used as a basis for this protocol; where procedures differ, it is because of the difference in size and other local conditions between the Midewin and the ICBEMP, or because of modifications suggested by a national team of Forest Service scientists who are coordinating population viability assessments (Richard Holthausen, personal communication).

2. Background

Continued existence - Because species and their environments are dynamic, and our knowledge of future events and impacts is limited, it is not possible to say with certainty that a species will persist indefinitely. Also, it is not possible to determine a single, fixed population size above which a species is viable and below which it will be extirpated from an area. Consequently, recent viability assessments have expressed estimates of future viability as a likelihood, with associated measures of uncertainty.

Well-distributed - The term "well-distributed" is applied differently, depending on the historic population structure of the species being considered. For some species, a well-distributed pattern is one in which the species is evenly distributed across the landscape, or distributed in a metapopulation pattern where dispersal of individuals or propagules occurs among local populations that are distributed throughout the landscape. For other species, such as local endemics or those tied to naturally scarce habitats, the concept of well-distributed must be based on the species natural history and historical

distribution. For these species, it may not be possible or desirable to manage for broadly- or evenly-distributed habitat

2.1. Conservation assessments

To assist in fulfilling viability requirements, Midewin convened a previous Expert Panel to provide information used in conservation assessments for the Midewin RFSS. Conservation assessments (CAs) are documents that present biological characteristics, including status, range, life history and habitats, threats to the species from natural and human sources, management recommendations, monitoring, and research needs, of each RFSS. They are not quantitative projections of viability based on genetic or demographic models, but rather they are reasoned assessments of likely population abundance and distribution based on projected environmental conditions, with consideration of the ecological requirements of each species.

2.2. Land and Resource Management Planning

Viability assessment is a part of the formal land and resource management planning process under the NFMA. Planning also follows process requirements for disclosure and public involvement set forth by the National Environmental Policy Act (NEPA). The Midewin is currently in the process of developing its first Land and Resource Management Plan (henceforth known as the Prairie Plan).

Six possible management scenarios, called “Alternatives” were drafted; after public review and comment under NEPA, one Alternative will be selected to become the Plan and thus guide future management at Midewin. Information from the CA’s was used in developing the draft Alternatives. Alternatives include statements about goals and objectives, and standards and guidelines. Goals are concise statements that describe the desired conditions expected to be achieved some time in the future. They are generally timeless and difficult to measure. Goals describe the ends to be achieved, rather than the means of doing so. Objectives are concise, time specific statements of measurable planned steps taken to accomplish a goal. Objectives are generally achieved by implementing a project or activity.

Standards are practices that must be followed or are required limits to activities designed to achieve goals and objectives. Site-specific deviations from standards must be analyzed and documented in prairie plan amendments. Guidelines are advisable actions that should be followed to achieve prairie goals and objectives. Deviations from guidelines must be analyzed during project level analysis and documented in a project decision document, but do not require plan amendments.

These goals and objectives, together with the standards and guidelines, were evaluated for their likely future effects on populations of the Midewin RFSS

relative to each draft Alternative under consideration for the Plan. To aid in this evaluation, a panel of experts was convened and their opinions solicited.

2.3. Meeting protocols – The Expert Panel met with staff (USDA Forest Service and Illinois DNR) of Midewin National Tallgrass Prairie. The meeting was led by a facilitator. Prior to the meeting, Midewin sent a package of documents to each member of the Expert Panel consisting of:

- the draft of each CA for each Midewin RFSS, including a map showing both regional distribution and local presence at Midewin for each RFSS;
- a preliminary draft of the Land and Resource Management Plan for Midewin, including Goals and Objectives, Standards and Guidelines descriptions of desired future conditions;
- maps and descriptions of the six draft Alternatives for management of Midewin;
- maps showing potential habitat for each species or group of species under each draft Alternative, for the desired future condition that is expected to be realized in 100 yrs.;
- tabular summaries of acres of potential habitat under each draft Alternative;
- description of threats or limiting factors, mapped if possible, showing differences among draft Alternatives (where differences exist);
- panel protocols.

2.4. Collection of Expert Assessments – Based on information about the RFSS and the draft management Alternatives, panelists identified likely future conditions for populations of RFSS. The likely future conditions was selected from a set of Outcomes that provide an index of population abundance and distribution (see following section for the list of Outcome statements). Outcome determinations were made for historic and current time frames, and for future conditions 100 years hence under each draft Alternative. For each time frame and Alternative, panelists were asked to make judgments based on two spatial scales and using two different assumptions about factors that influence species (see following table). The first rating, "*Outcomes based on Midewin environmental conditions*", was based only on environmental conditions that are under the control of management, for the Midewin area. The second rating, "*Outcomes based on cumulative effects in the Central Till Plains Section*", represented the sum of all effects on species populations in the Central Till Plains Section, including air pollution, genetic factors, land use changes, and any other factor likely to affect population abundance and distribution.

Judgments to be made by Panelists for each Midewin RFSS		
Time frame	*Outcomes based on Midewin environmental conditions*	*Outcomes based on cumulative effects in Central Plains Section*
Historic condition	**X**	**X**
Current condition	**X**	**X**
100 yrs in the future for Alternative 1	**X**	**X**
100 yrs in the future for Alternative 2	**X**	**X**
100 yrs in the future for Alternative 3	**X**	**X**
100 yrs in the future for Alternative 4	**X**	**X**
100 yrs in the future for Alternative 5	**X**	**X**
100 yrs in the future for Alternative 6	**X**	**X**

Expert judgments about which Outcome(s) best describe population abundance and distribution were collected using a structured process. For each judgment, an Expert distributed 100 likelihood points across the five possible Outcomes. The individual outcomes represent points along a gradient ranging from (A) a condition which has a high likelihood of favorable population abundance and distribution, to (E) which has extremely unfavorable conditions of abundance and distribution and a high likelihood of extirpation. Any distribution of the 100 points was considered legitimate provided that all 100 points are used. Placing 100 points on a single outcome indicated great certainty in that outcome. Spreading the points among several outcomes indicated less certainty in any one of those outcomes. Complete uncertainty was represented by equal scores among all outcomes (20 points each). In addition to assigning likelihood points, panelists were asked to write their comments and rationale about reasons for their judgments.

The expert panels were held as one large group; however, not all panelists rendered judgments on all RFSS; they will only evaluated the species for which they consider themselves an expert. Panelists made their judgments independently after reviewing the information supplied by Midewin. Because of time limitations during the meeting, it was desirable for panelists to review the materials and make preliminary judgments prior to the actual meeting. Following the independent evaluations, panelists were asked to present the basis for their decisions, including identifying specific factors that led to a low likelihood assessment and how those factors might be altered to increase the likelihood of persistence. Based on information that surfaced during this discussion, panelists changed some of their ratings. Both scores were recorded. Consensus was not be an objective of this process and was not sought.

2.5. Outcome scales – Two sets of outcomes were used to assign likelihood points for judgments about abundance and distribution of populations of RFSS. Outcomes were provided by Richard Holthausen (National Wildlife Ecologist, USDA Forest Service) as adapted from ICBEMP publication (Quigley et al. 1997).

3. OUTCOMES BASED ON MIDEWIN ENVIRONMENTAL CONDITIONS

The first set of outcomes is based solely on the environmental conditions that would occur in the future under each Alternative. These outcomes were designed to provide statements about the abundance and distribution of suitable environments for each species at Midewin and to allow panelists to make inferences about the potential effects of these conditions on population abundance and distribution. Environmental outcomes, however, do not account for all factors that ultimately determine a species' realized population characteristics. Thus, environmental outcomes should be thought of as an index of the capability of the environment to support population abundance and distribution, but not as an actual prediction of population occurrence, size, density, or other demographic characteristics. For example, environmental outcomes may not account for spatially uniform and pervasive effects of interspecific competition, disease, predation, taking, pesticide effects, air pollution effects, current population status, and other effects beyond the control of managers.

> *Outcome A*. Suitable environments are broadly distributed and of high abundance across the historical range of the species. The combination of distribution and abundance of environmental conditions provides opportunity for continuous or nearly continuous intraspecific interactions for the species.
>
> *Outcome B*. Suitable environments are either broadly distributed or of high abundance across the historical range of the species, but there are gaps where suitable environments are absent or only present in low abundance. However, the disjunct areas of suitable environments are typically large enough and close enough to permit dispersal among subpopulations and potentially to allow the species to interact as a metapopulation across its historical range.
>
> *Outcome C*. Suitable environments are distributed frequently as patches and/or exist at low abundance. Gaps where suitable environments are either absent, or present in low abundance, are large enough that some subpopulations are isolated, limiting opportunity for species interactions. There is opportunity for subpopulations in most of the species range to interact as a metapopulation, but some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations. For species for which this is not the historical condition, reduction in overall species range from historical may have resulted from this isolation.
>
> *Outcome D.* Suitable environments are frequently isolated and/or exist at very low abundance. While some of the subpopulations

associated with these environments may be self-sustaining, there is limited opportunity for population interactions among many of the suitable environmental patches. For species for which this is not the historical condition, reduction in overall species range from historical may have resulted from this isolation.

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

4. OUTCOMES BASED ON CUMULATIVE EFFECTS IN CENTRAL TILL PLAINS SECTION:

The second set of outcomes is based on the cumulative effects of all influences, both at Midewin and on all other lands in the Central Till Plains Section. It includes habitat and environmental conditions and all other factors that affect species. Examples of these other influences include spatially uniform, pervasive effects of interspecific interactions, disease, predation, illegal taking, pesticide effects, air pollution effects, and population factors. In particular, low population size, which may be brought about by Allee effects (from animal biology, the tendency of breeding individuals in small, isolated populations to have difficulty finding each other) or other factors that cause populations to be much smaller than the environment might otherwise support, may be an important factor in the projection of population outcomes.

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

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

and potentially to allow the species to interact as a metapopulation across its historical range.

Outcome C. The combination of environmental and population conditions restrict the potential distribution of the species, which is characterized by patchiness and/or areas of low abundance. Gaps where the likelihood of population occurrence is low or zero, are large enough that some subpopulations are isolated, limiting opportunity for species interactions. There is opportunity for subpopulations in most of the species range to interact as a metapopulation, but some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations. For species for which this is not the historical condition, reduction in overall species range from historical may have resulted from this isolation.

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

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

Panelists were advised that some outcomes may not be applicable to all taxa. For example, many amphibians occur naturally in a localized or patchy distribution, and thus, never would occur in the conditions described as Outcome A or Outcome B or Outcome C. This point was emphasized to avoid a potential tendency to consider the “best possible” outcome for each taxon to be Outcome A.

4.1. Factors considered in judgments - As noted earlier, panelists were asked to make a judgment based on environmental conditions at Midewin and a cumulative effects judgment for the Central Till Plains Section. The Midewin

judgment, "*Outcomes based on Midewin environmental conditions*", was based on species' response to the following factors:

1) amount and distribution of environmental conditions controlled by management at Midewin, including habitat, human use levels, and infrastructure;
2) severe population decline associated with environmental conditions (see definition).

Panelists based the cumulative effects judgment, "*Outcomes based on cumulative effects in Central Till Plains Section*", on likely population response to all of the following factors:

1) current population status;
2) environmental conditions at Midewin and elsewhere in Central Till Plains Section;
3) severe population decline associated with habitat;
4) environmental stochasticity and natural catastrophes;
5) effects not controlled by management, such as global warming.

Panelists utilized the written Conservation Assessments and draft cumulative effects analysis for the Draft EIS, as well as relying on personal knowledge in making judgments.

4.2. Definitions - The following definitions were used to help assure consistent interpretations.

Effects not controlled by management: All influences on the species population that are not the direct result of resource management. Examples would include illegal taking, indirect pesticide effects, air and water pollution, and urbanization or other land use changes.

Severe population decline associated with environmental conditions**:** This factor is included to reflect any bottleneck events caused by habitat reduction that are likely to occur prior to the specified time of the judgment, and which would influence the likelihood that the species population would still respond (in a predictable way, and at the specified time of the judgment), to habitat availability.

Environmental stochasticity and natural catastrophes: This factor is included to reflect random environmental variation that would influence the likelihood of species attaining the specified outcomes. Such random variation could result from variations in climate and random effects of disturbance (such as, fire, insect activity, or wind).

Panelists' judgments considered the way that populations of a species may respond to these factors based on its life history characteristics. Life history

characteristics include demographic characteristics, responses to varying qualities of habitat for specific life functions, types and ranges of seasonal and permanent movements, genetic characteristics, and biotic interactions (such as, competition, predation, and herbivory).

4.3. Analysis of the judgments - Two primary analyses were performed on the data derived from the expert panel. First, we calculated the mean likelihood scores for all expert judgments, by Outcome, for each RFSS. For example, if there were four expert judgments for a particular RFSS, and the likelihood assessments for Outcome B for that species are: 30, 30, 60, and 40, then the mean likelihood score would be 40. These mean likelihood scores were calculated for each species-Outcome judgment, and tables displaying these species-Outcome means were developed. This information is available in the Planning Record at the Midewin office.

We also calculated a weighted mean outcome, which was used to provide a single number for comparing likelihood among draft Alternatives and time frames. The weighted mean likelihood were calculated by:

- assigning a value to each of the outcome categories (Outcome A, value = 1; Outcome B, value = 2; etc.);
- multiplying the mean likelihood of that outcome by its assigned value;
- adding these products for all outcomes;
- dividing by 100.

For instance, consider the following example:

Outcomes	**Alternative 1**	**Alternative 2**
Outcome A	0	0
Outcome B	0	0
Outcome C	40	3
Outcome D	50	63
Outcome E	10	34
TOTAL	100	100

To determine the weighted mean for Alternative 1, calculate the following:
$[(0 \times 1) + (0 \times 2) + (40 \times 3) + (50 \times 4) + (10 \times 5)]/100 = (370)/100 = 3.7$.
Implementing Alternative 1 would have a weighted mean outcome most close to Outcome D.

To determine the weighted mean for Alternative 2, calculate the following:
$[(0 \times 1) + (0 \times 2) + (3 \times 3) + (63 \times 4) + (34 \times 5)]/100 = (431)/100 = 4.3$. In this example, Alternative 2 would have a weighted mean outcome most close to Outcome D, but slightly more unfavorable than the weighted mean outcome for Alternative 1. These weighted means provide an index that allows Midewin to make comparisons among the Alternatives.

Weighted mean outcome classes were used. The five classes are:

1) Outcome A includes weighted means from 1.00 to < 1.50
2) Outcome B includes weighted means from 1.50 to < 2.50
3) Outcome C includes weighted means from 2.50 to < 3.50
4) Outcome D includes weighted means from 3.50 to < 4.50
5) Outcome E includes weighted means from 4.50 to 5.00.

We assessed uncertainty around the weighted mean outcome scores by calculating the standard deviation (S.D.) of the distribution of likelihood points among the outcome classes for each species and each draft Alternative:

$$S.\ D. = [\{\text{summation } f_i x_i^2 - [(\text{summation } f_i x_i)^2/n]\}/(n-1)]^{1/2}$$

where

f_i = likelihood in Outcome i;
i = 1, 2, 3, 4, or 5;
x_i = numerical outcome i;
n = 100 (likelihood points).

Uncertainty of the results included two components, (1) the variation of likelihood distributions among panelists and (2) the range of likelihood point outcome assessments by each panelist. Uncertainty was low if panelists provided similar ratings, and if likelihoods were assigned to one outcome. One standard deviation is considered an expected amount of uncertainty in outcome scores. The distribution of outcomes is on five discrete values, and therefore, is not continuous, and standard deviations were smaller when outcome likelihood is distributed at the extremes of the distribution (that is, Outcomes A or E).

4.4. Interpretation, Limitations, and Assumptions of the Analysis of the Panel Ratings

4.4.1. Interpretation of results - The analysis of the outcome assessments of the Expert Panel provided a simple determination of what does and does not constitute a "viable" population. There are not simple thresholds for viability, particularly when assessments are done on a broad array of taxa. Rather than providing a simple determination, the analysis described likely future conditions for populations of species and provided a comparison of those conditions to current and historic conditions.

Interpretation of the outcome assessments emphasizes a comparison of the projected future conditions under the draft Alternatives to the historic and current conditions. Projected future conditions that produce outcomes similar to historic conditions will generally be considered to be favorable. Similarly, projected future conditions that result in improvements from current conditions were considered favorable, especially where current conditions are below historic

conditions. Projected future conditions that result in declines from current conditions were viewed as unfavorable, particularly if they indicate a significant increase in the likelihood that local populations will be isolated. Any projected change that resulted in a strong likelihood of species extirpation from a large portion of its range was viewed as a serious concern.

Interpretation of results included a consideration of uncertainty. One measure of uncertainty is the standard deviation of the frequency distribution of likelihood among the outcome classes for each species.

4.4.2. Limitations of the analysis - A variety of cautions must be applied to the interpretation of this analysis. These cautions fall into four areas: (1) broad geographic and time scale of the analysis; (2) lack of site specificity in Plan prescriptions and standards and guidelines; (3) limitations on ability to infer population results from habitat and other management effects; and (4) gaps in knowledge. These are briefly discussed below.

1) The scope of this analysis covers the entire Midewin. For some species, it is possible that conditions within some smaller areas could be much better than the composite, and in others they could be worse. This could have negative effects on a species' distribution that could not be predicted from the data reviewed here.

2) The scale of resolution of the planning guidance (that is, standards and guidelines, and prescriptions) given under each of the draft Alternatives limit the reliability of the analysis. Plans are programmatic, rather than site-specific, and do not contain detailed prescriptions for management actions, or detailed information on how management actions and habitats would be distributed geographically across the landscape. As a consequence, much of this analysis was based on the intent of the draft Alternatives, rather than on specific provisions. If one of the draft Alternatives is chosen as the Plan, additional analyses and guidance will be needed to design management actions that are consistent with the intent of the draft Alternative and that would achieve the outcomes projected here.

3) The third caution relates to our ability to infer population consequences from habitat assessments and assessments of other management effects (e.g. human presence). This caution is particularly strong for species whose populations are small and/or poorly distributed across the landscape. Conclusions on trends of habitats, particularly when extended to inferring potential effects on species, must be treated as tentative working hypotheses. The lack of specific data on population size, structure, and functional and numerical responses, requires that much inference be made from changes in habitat abundance and gross distribution patterns. Actual population response might differ.

4) The final caution relates to gaps in knowledge. Many of the species assessed here are poorly studied and not well understood. Their distribution, habitat associations, biotic interactions, and demographic statuses and characteristics are not well known. Likewise, successional dynamics and system interactions are incompletely understood for many vegetation types, and natural, large-scale disturbances cannot be accurately predicted. Projection reliability is reduced by these gaps in knowledge.

4.4.3. Assumptions used in analysis - As explained in the preceding "Limitations of analysis" section, some facets of the draft Alternatives were not clear, or were not spatially explicit at this level of planning. In some situations, the Midewin Planning Team had to make reasonable assumptions about the intent of the Alternatives and the judgments. The following major assumptions were for analysis of the outcome assessments of the Expert Panel:

1) Activities scheduled for the first 10 years of plan implementation will result in trends toward the desired future condition.

2) Consideration of plant and animal species will be a key component of the ecosystem analysis process used to implement the selected Alternative. Habitat needs of species will be used to help shape specific prescriptions and the scheduling and location of activities. Such considerations will be part of all prescriptions, including those designed to accomplish restoration objectives. A key consideration of ecosystem analysis will be projected changes in the availability of specific habitats through time, all of which should increase due to restoration activities.

3) Appropriate vegetation patterning will be a key objective of restoration activities. Historic patterns of vegetative dispersion and juxtaposition will be used to establish stand and landscape objectives for vegetative restoration. Such considerations are particularly important where historic prairie, savanna, and woodland conditions included a fine-scale mix of different prairie, savanna and woodland seral stages.

4) Restoration activities will be directed at all appropriate vegetation types, with priorities based on ecosystem analysis and as specified in the Midewin Land and Resource Management Plan.

5) Restoration activities that are well studied and well understood will be pursued according to similar time lines under all draft Alternatives except for Alternative 1, which calls for no actions.

6) Conservation strategies will be applied in any Alternative.
For their assessments, the experts had preliminary versions of Alternative 1-6. It is not likely that the small adjustments made in the alternatives presented here would have made any difference in panel ratings.

5. Overview--Analysis of all Alternatives and Sensitive Species.

5.1. Outcomes For Midewin National Tallgrass Prairie

Examining the outcomes of the alternatives on each species turned up three distinct groups of sensitive species: those species where the outcomes were basically the same across all action alternatives, those species where the alternatives 5 and 6 were the most favorable and those where alternatives 2 and 3 were the most favorable. Four species fell into the group where alternatives 2 and 3 were most favorable. Sixteen species fell into the group where alternatives 5 and 6 were most favorable. Eight species fell into the group where the alternatives were all essentially the same. See the table below.

Breakdown of Sensitive Species by Most Favorable Action Alternative

Group 1 Alternatives 2 & 3	**Group 2** Alternatives 5 & 6	**Group 3** Alternatives 2-6
Short-eared Owl Bobolink Loggerhead Shrike Upland Sandpiper	Henslow' Sparrow Northern Harrier Eryngium Root-borer Blazing Star Stem Borer Red-veined Leafhopper Hairy Valerian Earleaf Foxglove Hill's Thistle Eastern White-fringed Orchid Pitcher's Stitchwort Crawe's Sedge Glade Mallow Blanding's Turtle King Rail Least Bittern Plains Leopard Frog	Leafy Prairie Clover Butler's Quillwort False Mallow Sullivant's Coneflower Cerulean Warbler American Ginseng[1] Goldenseal[1] Ellipse

[1] These two species might also fit in Group 2 (alternative 6 tends to be a little more favorable, but the remaining are alternatives are very similar.

Habitat acreages for group 3 species are identical and managed similarly through the action alternatives, hence identical rankings for each species. This group doesn't need to be analyzed further; any of the action alternatives are optimal.

Group 2 species are all related to native vegetation habitat restoration either typic prairie, dolomite prairie or wetland. The larger the amount of appropriate habitat available the more optimal the alternative for each species. Alternative 6 has the greatest amount of restoration, with alternative 5 usually equal or a very close second for various reasons usually dependent upon visitor access. Some of these species, primarily the insects and plants aren't as dependant upon large areas of habitat as the others. Large viable populations (possibly in the thousands or larger) of these species can be more readily maintained on smaller areas. Henslow's sparrow and the northern harrier are area sensitive and need

large areas (550 acres for Henslow's sparrow) to even maintain small viable populations. In the case of northern harrier, Midewin could probably only support 2-3 pairs. Henslow's sparrow population that could be supported on Midewin might number in the hundreds. The wetland species fall somewhere in between, they need a number of wetlands, typically a complex of wetland and uplands.

Group 1 species are all dependent upon the availability of grassland (non-native) habitat. Alternative 2 has the largest amount of grassland habitat. These species are area sensitive and need large areas to even maintain small viable populations similarly to the grassland birds in group 2. For example, upland sandpipers' habitat is best managed in blocks of 1,235 acres of unfragmented habitat.

Groups 1 and 2 present a problem, choosing an alternative that is most favorable for one group will likely be least favorable for the other group. Although there are fewer species affected by making an either or decision in group 1, the species in group 1 are probably most area sensitive. The only way around this dilemma is to find an alternative which will provide a compromise where both groups can be maintain viable populations although it won't be the most ideal alternative for any of the species in group 1 or group 2.

Alternative 4, based upon the expert panel ratings and opinions of the biologists at Midewin seems to be the best compromise to provide viable populations for all the sensitive species that would be capable of sustaining viability at Midewin. Some species like the Cerulean Warbler, will never have a viable population at Midewin, there just isn't enough habitat.

5.2. Outcomes For Central Till Plains Section

Examining the outcomes of the alternatives on each species again turned up three distinct groups of sensitive species: those species where the outcomes were basically the same across all action alternatives, those species where the alternatives 5 and 6 were the most favorable and those where alternatives 2 and 3 were the most favorable. Some of the species have changed category. See the table below.

Group 1 Alternatives 2 & 3	**Group 2** Alternatives 5 & 6	**Group 3** Alternatives 2-6
Loggerhead Shrike Upland Sandpiper Bobolink	Leafy Prairie Clover False Mallow Earleaf Foxglove Hill's Thistle Eastern Prairie White-fringed Orchid American Ginseng Goldenseal Blanding's Turtle King Rail Plains Leopard Frog Henslow's Sparrow Northern Harrier	Butler's Quillwort Pitcher's Stichwort Crawe's Sedge Sullivant's Coneflower Hairy Valerian Glade Mallow Cerulean Warbler Least Bittern Short-eared Owl Red-veined Leafhopper *Eryngium* Root-borer Blazing Star Stem-borer Ellipse

The panelists with only one slight exception felt Midewin would make little difference within the Central Till Plains Section. So for the most part there would be no difference between the alternatives. The panelists felt there might be some positive impact from Midewin with the loggerhead shrike. The biologists at Midewin take a little more optimistic view and think Midewin might make a difference because of the large size of the restoration work. Based on the groupings, alternative 4 continues to be a good compromise.

6. SUMMARY OF EXPERT PANEL OUTCOME ASSESSMENT BY SPECIES

6.1. Plants Restricted to Dolomite Prairie

Each of these four species, leafy prairie clover (*Dalea foliosa*), Butler's quillwort (*Isoëtes butleri*), false mallow (*Malvastrum hispidum*) and Pitcher's Stitchwort (*Minuartia patula*) are restricted to dolomite prairie communities within the area of analysis and Midewin.

Dolomite prairie restricted plants are restricted to a special prairie subtype associated with dolomite bedrock. These dolomite species have declined in numbers and are under various threats.

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

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

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

False Mallow
False mallow is a summer annual herb of glades, dolomite prairies, limestone barrens, and other thin-soiled prairie habitats (Herkert 1991; Steyermark 1963; USDA Forest Service 2000d). Grazing has been identified as a specific threat to this plant because of it palatability. Conversely, grazing ungulates may break up the soil, providing habitat for new seedlings (USDA Forest Service 2000d).

Nutrient addition from manure associated with grazing has also been identified as a potential threat to False Mallow (USDA Forest Service 2000d).

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

6.1.1. EXPERT PANEL OUTCOMES

Leafy prairie clover
Panel ratings indicated that the historic condition at Midewin was most likely in Outcome D, with some likelihood points placed in Outcomes C and E. They noted that the restricted habitat (dolomite prairie) likely limited population sizes, and that Leafy Prairie-clover is thought to have always been patchy even within suitable dolomite prairie habitat. One panelist thought that the species may have been more vulnerable in the past, while others believed that it would have been more abundant than it is currently due to the comparatively large area of dolomite on the site. Historically, it would not have had to compete with non-native grasses, and may have been able to interact with other populations to a limited extent.

Currently, and for Alternative 1, most panelists rated Outcome E as the probable condition based on habitat loss and degradation, effects of invasive species, and herbivory. The population is presently restricted to one dolomite patch, and panelists noted a strong potential for extirpation when a population is restricted to one patch. The Leafy Prairie-clover was described as "barely hanging on", and panelists thought that without active management (Alternative 1) it was likely to be extirpated from Midewin.

Ratings for Alternatives 2-6 were very similar, with scores placed mostly in Outcomes D and E. The reason for the similar ratings of all Alternatives is that the amount of dolomite prairie does not change among them. Some panelists gave slightly higher ratings to Alternatives with more wet prairie and sedge meadow because these areas provide potential for a little more habitat that could be re-colonized. One panelist commented that Alternative 6 provided slightly improved conditions for Leafy Prairie-clover due to the lack of trails. Panelists thought that active management could result in establishment of several small populations. One panelist thought that the Alternatives provided habitat at historic levels, and that Leafy Prairie-clover could become relatively common on the dolomite prairie sites. Panelists commented that it is a difficult plant to reintroduce, and invasive non-native species are highly competitive in the disturbed conditions that exist at Drummond Prairie. One panelist recommended

that recreational activities should be kept away from the dolomite prairies, that grazing and mowing should be avoided, and that brush piles should not be burned on-site because it creates open ground to be colonized by invasive non-native plant species.

Alternative 1 the no-action alternative ranked lower than the action alternatives in likelihood because of habitat loss, habitat degradation, invasive species, herbivory and because it was restricted to one patch which would increase the chances of extirpation.

Butler's Quillwort

Panelists ratings indicated that the historic condition at Midewin was most likely in Outcome D, with some likelihood points placed in Outcome E and a few in Outcome C. They described the historic condition of populations as small and isolated due to the species restricted habitat requirements (dolomite prairie) and naturally patchy distribution. The species was thought to have been rare historically in Illinois.

Currently, and for Alternative 1, most panelists rated Outcome E as the probable condition due to habitat loss and degradation, and the effects of invasive non-native species. They described the plant as "very rare", and the Midewin population as too small to be likely to persist. They noted that it could be destroyed by drought or by invasive non-native species. Alternative 1 was thought to be even worse than the current condition; panelists believed that the population would decline even further without active management of the habitat. One expert thought extirpation would be likely.

Alternatives 2-6 were rated as providing more favorable conditions than at present or under Alternative 1, and scores approached those of historic conditions. However, since this plant was believed to have been quite rare historically, the overall scores were very low, placed mostly in Outcomes D and E. Ratings for Alternatives 2-6 were exactly the same, apparently because the alternatives call for similar amounts of dolomite prairie habitat. One comment indicated that Alternative 6 provided slightly more favorable conditions because the hiking trail was located further away from the dolomite prairie, which might slow the spread of non-native plants into the area; however, this observation was not reflected in the final scores.

False Mallow

The panelist's scores indicated that the historic condition at Midewin was most likely in Outcome C, with a relatively large point distribution in Outcome D. Panelists commented that this species is not as patchy as the others in the Dolomite Prairie-Restricted group, and the individual populations can be larger. One panelist noted that in the past, it was probably more common because there was less disturbance, and less competition from exotic species.

Alternative 1 was thought to be worse than the current condition; most likelihood points were placed in Outcome D, although a large proportion were placed in Outcome E and a smaller amount in C. Panelists believed that the population would decline over time primarily due to the effects of invading exotic species. However, the fact that it produces seeds that remain viable for 50 years was a positive factor in the ratings.

Alternatives 2-6 were rated as providing more favorable conditions than at present or under Alternative 1; likelihood points were still mostly distributed in Outcome D, but with a higher proportion in Outcome C. Panelists commented that the reintroduction potential is good. Ratings for Alternatives 2-6 were identical, apparently because the alternatives call for similar amounts of dolomite prairie habitat. One panelist commented that Alternative 6 provided for better survival because of restrictions on hiking; however, this observation was not reflected in the panelist's scoring.

Pitcher's Stitchwort

Panelists ratings indicated that the historic condition at Midewin was most likely in Outcome D, with some likelihood points placed in Outcome E and a few in Outcome C. Panelist's discussions reflected different views of its historic abundance; one said that it was really patchy, isolated, and uncommon, with large population fluctuations between years. Another panelist thought it had some widespread big populations historically and was even somewhat weedy in places, based on its tolerance of disturbance. This panelist also noted having seen it on areas with greater soil depth over dolomite, and thought it to be less picky about habitat than some other dolomite species. The third expert considered its restriction to the specific microhabitat of dolomite prairie and thought that would limit distribution.

Currently, Pitcher's Stitchwort was rated as Outcome E, but with many likelihood points distributed in Outcome D. Comments indicated that the current populations at Midewin are extremely isolated and small. Alternative 1 was rated even lower in Outcome E, based on the perception that non-native plants would gradually engulf the population.

Alternatives 2-6 were rated as providing improved conditions over the current condition and Alternative 1. Panel comments again indicated differences of opinion about the degree of habitat specificity for Pitcher's Stitchwort. One thought that soil depth wasn't critical, but that moisture and competition from non-native grasses, especially *Poa,* could limit habitat suitability for the Pitcher's Stitchwort. One panelist commented that the actual habitat would be less than indicated by the mapped area of dolomite prairie, because the species is patchy within suitable habitat. Another panelist thought that it's not that sensitive, it has a huge seed bank and population numbers will change year by year. A panelist described a population they had observed over 10 years, and noted that when the habitat changes to *Poa,* the Pitcher's Stitchwort seems to not have much of a

chance unless you reintroduce disturbance to give it a competitive advantage. Water, freezing/thawing that brings up bulbs, animals, and fire are examples of these disturbances. This panelist thought fire might benefit it. A panelist observed that a gravel road, made from dolomite, has occurrences of Pitcher's Stitchwort along the roadside.

Panel ratings for Alternatives 2-5 were very similar, falling between Outcomes D and E, while Alternative 6 received slightly more favorable ratings. One expert felt that grazing was a negative factor that would compact and degrade habitat, and gave less favorable scores to Alternatives that called for grazing in areas with dolomitic soils. Another thought that grazing could reduce competition and enhance habitat suitability; panelists did not agree as to whether grazing was a positive or negative factor overall. All three panelists were concerned about trails acting as corridors for invasions by exotic plants, and rated Alternative 6 more favorably because of the lack of trails near dolomite prairie.

6.1.2. CUMULATIVE EFFECTS

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

The expert panel only ranked the species in the Central Till Plains Section. The analysis was expanded to include the other portions of the lower Des Plaines valley following the panel based on recommendations from the panel. The ranking probably wouldn't have changed much, the action alternatives might have ranked slightly lower, but still would have been higher than the no action alternative.

Leafy Prairie Clover
For the Central Till Plain Section, the five panelists rated the historic condition in Outcomes C, D, and E, with most likelihood points distributed in D and E. Four panelists provided comments about their ratings for the Central Till Plain area. They thought that some historic populations in the Section were likely to have been larger than the one at Midewin, but that because dolomite prairie is so rare within the Section, the Leafy Prairie-clover would have always been rare and patchy, with limited opportunities for interaction.

Panelists were in considerable agreement that the current condition was Outcome E and that Alternative 1 was projected to be even worse. Management under any of Alternatives 2-6 at Midewin was projected to make a slight impact at the Section level. One panelist expressed concern about the long-term possible

effects of global climate change and hydrologic impacts. Ratings for Alternatives 2-6 were very similar, again because the amount of dolomite prairie is the same in all Alternatives; slightly more favorable conditions were projected for the higher numbered Alternatives based on increased amounts of wet prairie restoration and lack of trails in Alternative 6.

Butler's Quillwort
Panelists were in agreement that the current condition is Outcome E and that conditions under Alternative 1 would likely deteriorate even further, essentially eliminating suitable habitat at Midewin.

Management under any of Alternatives 2-6 at Midewin was projected to make a slight difference to outcomes for the Section level. The population at Midewin is already significant at the Section level, and the increases in habitat area called for in Alternatives 2-6 will add a significant amount of habitat within the Section. Ratings for Alternatives 2-6 were identical, again because the amount of dolomite prairie is the same in all Alternatives. One panelist commented that trails may encourage the spread of exotic species, but this concern was not reflected in ratings of Alternatives.

False Mallow
One panelist provided ratings and comments for the Central Till Plains Section. The panelist scored the historic condition as Outcome C. Currently, the False Mallow was thought to be at Outcome D for the Section. Alternative 1 was projected to provide less favorable conditions than currently, with an equal likelihood for Outcomes D and E. Alternatives 2-6 were thought to provide improved conditions as compared with Alternative 1, indicating that management at Midewin would likely affect the status of False Mallow within the Section. However, the Alternatives were rated as less favorable than current conditions, indicating a general deterioration of habitat within the Section. The panelist commented that Midewin is a significant population within the Section, although not the largest one, and that management at Midewin could affect the region. Again, a concern about trails was expressed and the panelist commented that Alternative 6 would be more favorable due to the lack of trails near dolomite, with effects possible even at the Section level. Trail locations provided the rationale for rating Alternative 6 slightly higher than Alternatives 2-5.

Pitcher's Stitchwort
The panelists scores indicates they believed the historic condition to be between Outcomes D and E, slightly lower than the Midewin score. The panelists disagreed on whether the Outcome was more likely D or E, with one panelist placing all the likelihood points on Outcome E and another distributing them among Outcomes B, C, D, and E. One panelist reasoned that the species was highly restricted by habitat, patchy in space and time, had wide fluctuations in numbers between years, and competes poorly with grasses. Another noted that although the species historically occurred only on areas of dolomite, it wasn't

"under attack" from exotic species and habitat loss as it is presently, and would have been better off in historic times. To illustrate its adaptability to disturbance, the panelist noted that Pitcher's Stitchwort is found in gravel quarries.

Panelists were in good agreement that the current condition, and the projected condition under Alternative 1, is Outcome E for the Section. They noted that the current condition is one of extremely isolated populations in microhabitats. Without active management, they envisioned a steady decline of populations due to habitat loss and competition from exotics.

Management under any of Alternatives 2-6 at Midewin was projected to make a very slight difference to Outcomes for the Section level as compared with Alternative 1, although only Alternative 6 received a more favorable average score than was assigned for current conditions. Panelists thought that the species had a better chance of survival overall with management of the populations at Midewin. A panelist noted that populations outside Midewin, without active management, are not doing very well. Alternative 6 was rated more favorably because it lacks trails near dolomite prairie, and trails may act as corridors for invasion of competing non-native plants. A panelist thought that global climate change, with possible changes in rainfall, could positively impact the Pitcher's Stitchwort by creating more habitat. One panelist partially based their rating on the assumption that seed would be introduced to areas of suitable habitat as part of the restoration.

6.2. Plants Associated with Dolomite Prairie

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

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

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

6.2.1. EXPERT PANEL OUTCOMES

Crawe's Sedge
Panel ratings indicated that the historic condition for Crawe's Sedge at Midewin was most likely in Outcome C, with a large proportion of likelihood points also distributed in Outcome D and a few in Outcomes A and B. Panelists described the historic condition for the species as having widespread, somewhat isolated populations. The dolomite habitat was described as rare, but some panelists thought the species would have been quite common within that habitat based on observations of current populations where Crawe's Sedge can be the dominant ground cover. They also thought that although dolomite exposures are rare, there is a relatively large amount at Midewin as compared to its occurrence elsewhere. Other panelists thought of this species as being patchy and somewhat isolated, occupying specific microhabitats that are only a small portion of dolomite habitat.

Currently, and for Alternative 1, panelists rated Outcome E as the probable condition, with some likelihood points distributed in Outcome D. Panelists commented that there are currently only two small patches of Crawe's Sedge at Midewin, that little habitat remains, it is rare and highly local in dry dolomite prairie, and may not readily disperse by seed. Alternative 1 was thought to be very similar to the current condition. One panelist thought that the small amount of wetland restoration currently in progress would be a benefit, while another

thought that the lack of fire would be a negative effect. One thought that the situation for Crawe's Sedge would remain much like the current condition, while another thought that the existing populations would decline and possibly disappear in 100 years.

Alternatives 2-6 were rated as providing more favorable conditions than at present or under Alternative 1, and scores for Alternative 6 were similar to the rating for historic conditions. Average ratings for Alternative 2, 3 and 5 were in Outcome D, and for Alternatives 4 and 6 were in Outcome C, but point distributions were spread among many Outcomes. Panelists noted that for Alternatives 2-6, an increasing amount of additional habitat would be restored and the species reintroduced. Some thought that grazing in Alternatives 2, 4, and 6 would be a benefit and rated these Alternatives higher. Panelists noted that Crawe's Sedge could be outcompeted by grasses, so care is needed in developing the proportion of grasses to be included in seeding mixes. They also suggested that there is a need to develop sexual propagation methods; if only vegetative propagation is used, then off-site populations should be used as sources for restoration stock.

Sullivant's coneflower

The historic condition at Midewin was rated as Outcome C, with a small proportion of likelihood points also distributed in Outcomes A and B. Panelists described the historic condition for the species as scattered, but common or dominant where habitat existed, with many more patches than currently exist. One panelist commented that its apparent association with dolomite may be incidental, and that it may have formerly been more widespread in adjacent areas with deeper soils.

Currently, and for Alternative 1, panelists rated Sullivant's Coneflower as still being in Outcome C on average, but with a slightly less favorable point distribution that included some likelihood of Outcome D. Panelists thought that the species was still in relatively good shape locally, scattered throughout the Midewin area. Under Alternative 1, ratings were nearly the same with only a few more likelihood points distributed in Outcome D. One panelist thought that invasive species would not affect Sullivant's Coneflower that much because it appears to be holding its own against them at present. The other panelist thought that without active management including fire and control of competing vegetation, populations would be at "serious risk".

Alternatives 2-6 were rated as providing much more favorable conditions than at present or under Alternative 1; ratings averaged in Outcome B. Likelihood points were distributed in Outcomes A, B, and C, with only a few points in Outcome D. Projected conditions exceeded those of historic times in providing suitable habitat and other environmental conditions for Sullivant's Coneflower. The Alternatives 2-6 all received the same rating; panelists believed there was no difference among them and that they were all equally beneficial to Sullivant's Coneflower.

They thought that with prescribed fire and controlled grazing, the species would expand into old fields as well as dolomite areas. It is currently found along roadways, and apparently benefits from some disturbance. One panelist thought the species does not reproduce by seed as well as by rhizomes, and thought that it should be reintroduced into suitable habitat using both seed and vegetative means.

6.2.2. CUMULATIVE EFFECTS

Crawe's Sedge.
The historic condition within the Central Till Plains Section was rated as Outcome C the same as Midewin; however, one panelist commented that habitat was less common in the Section than at Midewin while another thought it was more common. Another panelist noted that the distribution would have been patchy within habitat that was locally common to occasional.

The current condition for Crawe's Sedge in the Section was rated in Outcome D, with a large likelihood point distribution in Outcome E. The ratings indicated slightly more favorable conditions exist in the Section than at Midewin. Panelists noted that there is an increasing, serious isolation of most populations, and that highly localized colonies existed in both degraded and suitable habitat remnants. Conditions under Alternatives 1 and 2 were projected to be the same as the current condition for this species within the Section. Panelists commented that Crawe's Sedge sites within the Section require management to persist, and were not certain that this management would occur. They predicted increasing population declines, and possible extirpation.

Averaged likelihood scores indicate that at the Section level, the species would remain at Outcome D under Alternatives 3-6, although conditions were projected to be slightly more favorable than at present. Panelists disagreed somewhat about likely effects at the Section level, and distributed their scores among Outcomes C, D, and E. One thought that increasing the size of the Midewin population would not increase genetic diversity of the species within the Section. The other two panelists commented that habitat management at Midewin would result in a slightly improved condition for the species within the Section, and that the dolomite prairie at Midewin is significant within the Section.

Sullivant's Coneflower.
The current condition of Sullivant's Coneflower in the Central Till Plains Section was rated in Outcome C, almost the same as for Midewin. Panelists thought that Sullivant's Coneflower was historically more widespread and patches were more abundant than at present.

Currently, populations are considerably reduced in number within the Section, increasingly isolated, and in some danger overall. Average ratings were in

Outcome D, with point distributions among Outcomes B, C, D, and E. Panelists noted that Midewin supports one of the healthiest populations in the Section. Conditions under Alternative 1 were projected to be less favorable. Outcome ratings still averaged in Outcome D, but additional likelihood points were distributed in Outcome E. Panelists commented that without active management, populations would continue to decline and the smaller ones would disappear.

Alternatives 2-6 all received the same rating at the Section level. Likelihood points were mostly distributed in Outcomes D and E, with some points in Outcomes B and C. Averaged scores indicate that conditions overall would be less favorable for this species than they are currently, and only very slightly improved over Alternative 1. These results indicate that management at Midewin would not likely make much difference to the species at the Section scale. One panelist provided comments inconsistent with the ratings, stating that “with management and introduction at Midewin, the variety could be more secure through [the] region as a whole”, and “Midewin would have a big impact on long-term survival if this population is protected and increased, [while] outside populations may nearly disappear”.

6.3. Plants of Typic Prairie

Typic prairie restricted plants are restricted to typic prairie associated with deep loamy soils. These typic prairie species have declined in numbers.

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

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

Hill's Thistle
Hill's thistle is a relatively-short-lived perennial herb; many plants die after flowering and seed set (USDA Forest Service 2000j). Successful recruitment of seedlings requires some periodic disturbance of grasslands by fire, animal burrowing, grazing, mowing (Ostlie and Bender 1990; The Nature Conservancy 1999). Sufficient area is required for long-term of persistence of populations, because of the interaction between population dynamics and disturbance (USDA Forest Service 2000j). This prairie thistle occurs in a diversity of well-drained grasslands, including dolomite prairie, hill prairie, mesic prairie, gravel prairie, alvars, and pastures (Swink and Wilhelm 1994; The Nature Consevancy 1999).

Eastern Prairie White-fringed Orchid
Eastern prairie white-fringed orchid is a perennial monocot, growing from a compact tuber; evidence suggests that individual plants are dependent on a

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

6.3.1. EXPERT PANEL OUTCOMES

Hairy Valerian
Hairy Valerian was evaluated by one expert. The panelist rated the historic condition for Midewin as Outcome C and the current condition as Outcome D. Alternatives 2-6 were rated as providing similar conditions as the current condition, Outcome D. The panelist's comments indicated that increasing amounts of prairie restoration, and restoration of hydrologic function, would likely allow the Hairy Valerian to increase. A greater likelihood of approaching historic conditions at Midewin was projected in the higher numbered Alternatives.

Earleaf Foxglove
Panel ratings indicated that the historic condition at Midewin was most likely Outcome C, with some likelihood points placed in Outcome B and Outcome D. The current condition was rated as Outcome E. Alternative 2 was rated as Outcome D while the remaining rated as Outcome C.

Alternatives 2 and 3 were thought to create conditions somewhat more favorable at Midewin. As additional acreage was restored to wet mesic prairie, conditions would become more favorable and the species more widespread, and insect pollination could permit some gene flow. Fire in these Alternatives was thought likely to benefit the species; some thought grazing and/or mowing were positive factors while others considered it a negative factor. Trails were cited as a possible damaging impact.

Alternatives 4-6, which provide for increasingly more prairie restoration and more contiguous patches, were rated as providing conditions more favorable for Earleaf Foxglove, especially when fire was included. Again, opinions about the effects of grazing and mowing varied, with some panelists noting it as beneficial

and others as harmful. One panelist noted that Alternatives 5 and 6 do not add much useable habitat for Earleaf Foxglove beyond what is projected for Alternative 4; another panelist thought Alternatives 5 and 6 to be more favorable because of management that includes fire.

Hill's Thistle

There was considerable disagreement among the panelists about the historic condition at Midewin. One panelist believed that Hill's thistle was not at Midewin during historic times, while another thought it was widespread. Others characterized it as "not common", or "patchy within habitat, likely requiring natural disturbance." All panelists agreed that it is not currently at Midewin, which led to ratings in Outcome E for current conditions and Alternative 1.

The panel ratings for action alternatives were very similar, falling in Outcome C although there was some variation apparently because panelists rated alternatives differently depending on how they believed grazing would affect the species. The panelists felt under Alternatives 2, 4, and 6, which include grazing, the population near Midewin was projected to spread, possibly reaching levels greater than in historic times. Alternatives with the greatest amount of grazing were thought to provide the best habitat, and Alternative 4 received the most favorable averaged score. Some panelists thought the species would find better habitat in non-native pastured grasslands than in restored prairie because of reduced grass competition and greater amount of bare soil for germination and recruitment. Alternatives 3 and 5, which called for less or no grazing, were thought to be less advantageous for Hill's Thistle populations. Some panelists were concerned about the effect of trails in Alternatives 2 and 3. Another noted the need for active reintroduction to establish Hill's Thistle on Midewin. There seemed to have been some confusion amongst the panelists in regard to grazing. All the action alternatives call for the use of grazing as a management tool, apparently the panelists were just considering potential grazing by bison.

Eastern Prairie White-fringed Orchid

Panelists were confused about how to rate the historic condition for Midewin, as they don't have direct evidence that it ever existed on the site. One thought it was "probably rather common in mesic to wet-mesic prairie", but this could not be verified. Panelists thought there was so much uncertainty about its historic conditions that we probably could not use the historic rating as a comparison with current or projected future conditions.

All panelists agreed that the species is not currently at Midewin, which led to ratings mostly in Outcome E for current conditions and Alternative 1, which would provide no increase in suitable habitat.

Regarding Alternatives 2-6, experts agreed that increased habitat could provide for a significant population at Midewin, the rating indicated Outcome D in all cases. The higher numbered Alternatives were ranked more favorably because

they call for increased amounts of restored habitat; the restoration of hydrology was noted as key to providing suitable habitat. However, one panelist thought that 100 years was not a sufficient time frame for restoration of hydrologic conditions, as well as ensuring the availability of the obligate insect pollinator and the mycorrhizal associate. Several panelists thought that species would have to be reintroduced, that it would not move onto the Midewin property by itself. They described the difficulty of establishing new populations; in one instance, millions of seeds were dispersed but resulted in only a few individuals.

6.3.2. CUMULATIVE EFFECTS

Hairy Valerian
The panelists gave a historic rating of Outcome C and the current at Outcome D. There was no projected difference among ratings of Alternatives 1-6 for the Central Till Plain Section all rated as Outcome D. This would indicate that management at Midewin will not affect the outcome for this species at the broader spatial scale.

Earleaf Foxglove
The panelists gave a historic rating of Outcome C and the current at Outcome E. Comments indicated that historically, Earleaf Foxglove was thought to be relatively widespread throughout the Central Till Plains Section, but patchily distributed, associated with disturbed areas created by fire and possibly grazing. Panelists disagreed about its relative abundance, one characterizing it as rather common and another expressing doubt that it had typically occurred in large numbers.

The panelists felt there are currently 20-30 populations in the Central Till Plains Section; they are likely reproductively isolated. Alternatives 2-4 were rated slightly higher than current conditions due to potentially expanded habitat at Midewin (Outcome E), and Alternatives 5 and 6 were rated slightly higher than Alternatives 2-4 at Outcome D. Thus, Midewin was thought to make a slight difference to the potential outcome for the species within the Central Till Plains Section.

Hill's Thistle
The panelist's scores indicate they believe the historic condition to be Outcome C and the current condition as Outcome D. Comments indicated that historically, Hill's Thistle may have been a species associated with buffalo wallows, widespread but scattered at the broad spatial scale. Currently, extensive habitat destruction has led to isolation of this species. Panelists thought that grazing management at Midewin would make a slight improvement in conditions for this species within the Central Till Plain Section; ratings indicated that they found no real differences among Alternatives 1-6, each was rated as Outcome D. This

would indicate they felt Midewin would have little impact on Hill's thistle within the Central Till Plains Section.

Eastern Prairie White-fringed Orchid

Comments by the experts indicated differences of opinion about the historic condition. One panelist thought that historically the species may be been frequent in mesic and wet-mesic prairies, while another remarked that it would have been primarily scattered, and locally occasional. Outcome C was the most frequent choice, but Outcome B and D were also frequent choices for the historic conditions.

The panelist felt Outcome E was the current condition. Currently, extensive habitat destruction in the form of wetland drainage has led to drastic reductions in the species' populations, with only a few viable populations left. Alternative 1 was not thought to help the situation.

Alternatives 2-6 were thought to have a significant impact to the species in the Central Till Plain Section, and in combination with adjacent restoration, could form a regional metapopulation. Alternative 2 was rated as Outcome E, while the remaining alternatives were rated as Outcome D. Alternatives 5 and 6 were rated as being slightly more favorable on average than Alternatives 2-4. One panelist commented that Eastern Prairie White-fringed Orchid is very rare throughout the range and Midewin can make a great contribution. Another expert mentioned the reintroductions taking place at other sites, so that the situation for the species is likely to improve within the Central Till Plain Section even without the contribution from Midewin.

6.4. Glade Mallow (Riparian Plants)

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

At present this species is not present in undisturbed prairie remnants, but instead can be found associated with a variety of successional habitats associated with floodplains and stream terraces. Open areas with little or no shade are required for vigorous growth and prolific flowering (Robertson and Phillippe 1992). Certain disturbances (perhaps including fire) may be required to maintain habitat (prevent woody encroachment) (Robertson and Phillippe 1992).

6.4.1. EXPERT PANEL OUTCOMES

Panel ratings indicated that the historic condition at Midewin was most likely in Outcome C, but many of the likelihood points were placed in Outcome D and a few in Outcome B. Panelists commented that it was difficult to judge the amount of habitat historically for Glade Mallow. Some thought it to have been occasional to locally common in riparian terrace habitat in full to partial sun; others thought that it was widespread based on its current occurrence in degraded habitats.

Experts rated current conditions and Alternative 1 as borderline between Outcome D and Outcome E, with a few likelihood points distributed in Outcome C. They commented that currently the populations are quite localized, limited to ditches and isolated patches. One panelist noted that the members of this species are long-lived, and that it would persist for years till disturbance permits flowering. Panelists thought that under Alternative 1, the populations at Midewin would either decline or remain the same as at present. One panelist thought that deer browsing would eliminate the populations over time.

Ratings for Alternatives 2 and 3 were more favorable, and Alternatives 4-6 were more favorable yet, closely approaching historic condition ratings. Scores were placed mostly in Outcomes C and D, with a few likelihood points distributed in the other Outcomes. Panelists noted that when the Glade Mallow is transplanted to a garden setting, it could become abundant and even weed-like, through vegetative propagation. Most panelists based their ratings on the rationale that as potential habitat increases, populations are likely to increase; thus, Alternatives 4-6 were rated more favorably. Alternatives 4-6 call for similar amounts of habitat, and were ranked about the same.

6.4.2. CUMULATIVE EFFECTS

Historically for the Central Till Plain Section, the panelists rated most scores at Outcome C, with a some likelihood points distributed in B and D, and a few in E. They commented that the Glade Mallow would have been widely distributed, frequent in open floodplain terraces, and quite common due to its ability to utilize a variety of habitats. They thought that flood disturbance caused by seasonal rains would have benefited the species.

Panel ratings indicated that the current condition for the Section is Outcome D on average, but more likelihood points were distributed in Outcome E, and a few were placed in Outcome C. They commented that populations are very isolated at present, and the large populations are mostly gone. Ratings for Alternative 1 were only slightly less favorable; they averaged into Outcome E, but nearly half the points were distributed in Outcome D. Alternatives 2 was ranked the same as Alternative 1, but Alternatives 3-6 were rated as providing minimally improved conditions for the Section due to expansion of habitat at Midewin.

6.5. Woodland Plants and Birds

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

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

Goldenseal
Goldenseal is a long-lived, rhizomatou, herbaceous perennial that blooms from April to May. The rhizomes are harvested because of supposed medicinal properties. This species can be found in moist upland forests and woodlands. Goldenseal is usually found in understories of approximately 40% to 80% shade.

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

6.5.1. EXPERT PANEL OUTCOMES

American Ginseng
Panelists ratings indicated that the historic condition at Midewin was most likely in Outcome D, with a smaller proportion of points in Outcomes C and E and a few in B. Comments indicated that the situation for American Ginseng was very similar to that for Goldenseal; habitat was never common at Midewin, it was always patchily distributed, and thus the species would also have been rare and patchy, with little interaction among populations.

Panelists rated current conditions and Alternative 1 as being dominantly in Outcome E, with some likelihood points distributed in Outcome D and a few in C. They commented about the small size and fragmented condition of the existing population, which they thought is not currently interacting and is not viable. Under Alternative 1, one panelist thought that there would be no change from the

current condition, while others thought that the habitat would be eliminated and illegal collections would eliminate American Ginseng from Midewin.

Ratings for Alternatives 2-6 were slightly more favorable; although scores were still mostly in Outcome E, there were more likelihood points distributed in Outcome D. Panelists thought that with protection and management, there was some limited chance of persistence. If populations and habitats were added, with additional genotypes, genetic heterozygosity could be increased. Panelists expressed concern about trails and humans near the population, noting the likelihood of illegal collection. Some panelists rated Alternatives 2 and 3 less favorably because of trail proximity and the location of the Learning Center. Another panelist suggested seasonal trail closures for Alternatives 4-6.
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Goldenseal

Panelists ratings indicated that the historic condition at Midewin was most likely in Outcome D, but many of the likelihood points were placed in Outcomes C and E, and a few in Outcome B. Panelists commented that Goldenseal was likely uncommon in the historic landscape at Midewin, because habitat was unsuitable. Much of Midewin was prairie, and the forested portion likely burned frequently. Panelists thought that historically, Goldenseal was probably isolated like it is now. Forest habitats were scattered, so populations were likely somewhat fragmented and may not have interacted that much. One panelist noted that goldenseal was probably present in any suitable habitat.

Panelists rated current conditions and Alternative 1 as being in Outcome E, with some likelihood points distributed in Outcome D. They noted the small size and fragmented condition of current populations, and expected a continued decline due to habitat loss. One panelist thought that there were only two genets left at Midewin, and that under Alternative 1 they would go extinct.

Ratings for Alternatives 2 and 3 were slightly more favorable, with scores placed mostly in Outcomes D and E. Alternatives 4-6 were rated mostly in Outcome D, with some scores distributed in Outcome E and a few in Outcome C. Panelists thought that even with protection and management, the possibility of illegal collection could eliminate the population. Several panelists rated all the Alternatives the same, because the amount of potential forest and woodland habitat is relatively limited. Other panelists rated Alternatives with more recreational activities, especially those with recreation facilities close to the population, less favorably. These Alternatives were thought likely to result in increased illegal collection of Goldenseal. Most panelists assumed that restoration activities would include adding more genotypes to the population.

Cerulean Warbler

Panel ratings indicated that the historic condition at Midewin was most likely in Outcome D, with a relatively high proportion of likelihood points in Outcomes C and E. Panelists commented that Cerulean Warbler populations at Midewin were

probably always isolated and relatively rare in the small patches of forest. One panelist thought that riparian forest had been more common historically, and would have supported a few more individuals.

Panelists rated current conditions and Alternative 1 as being very low in Outcome E, with a few likelihood points distributed in Outcome D. They commented that the current breeding population is extremely rare and perhaps is locally extirpated. One panelist noted that under Alternative 1, if maples replaced oaks, the species would likely decline further.

Ratings for Alternatives 2-6 were slightly more favorable than for Alternative 1. Scores were still distributed mostly in Outcome E, but more likelihood points were placed in Outcome D. Panelists commented that the increased acreage of forest habitat could increase numbers of individuals somewhat, but they would still be isolated. All the Alternatives were rated the same, because they call for the same amount of habitat.

6.5.2. CUMULATIVE EFFECTS

American Ginseng
The panelists rated the historic condition as most likely in Outcome C, with some likelihood points distributed in B and D, and a few in E. Five panelists provided comments about their ratings, noting that American Ginseng had been locally common in rich upland forest habitat, on cool slopes. Forest habitat historically was more continuous than at present. One panelist noted that harvesting had already begun by the year 1800 or earlier.

Panelists rated current conditions in the Section as mostly in Outcome D, with a fairly large proportion of likelihood points in Outcome E and a few in C. They commented that commercial over-harvesting of American Ginseng has resulted in isolated populations with little potential for interaction. The species has also suffered from habitat loss and degradation.

Management under any of the Alternatives at Midewin was thought not to affect the status of American Ginseng in the Section to any great extent. Four of the six panelists gave the same ratings to Alternatives 1-6, while the other two panelists' ratings indicate slightly more favorable conditions under Alternatives 2-6. One panelist reasoned that as populations decline elsewhere in the Section, the Midewin population could become the only one in the area, which would increase its importance.

Goldenseal
For the Central Till Plains Section, six panelists rated the historic condition as mostly in Outcomes C and D, with a few likelihood points distributed in B and E. Most panelists believed that Goldenseal had historically been more common in

the Section than at Midewin, but was still restricted to mesic forest patches. Since the Section was predominantly prairie, the forest patches were not common, but where they existed, Goldenseal could have been locally abundant in large clonal populations.

Panel ratings indicated that the current condition was mostly in Outcome E, with a fairly large point distribution in Outcome D. They commented that populations are fewer and more isolated; forests have been lost and degraded, and over-harvesting of Goldenseal has reduced population sizes. Conditions under all the Alternatives were projected to be even less favorable, indicating the generally poor outlook for the species over the next 100 years.

Cerulean Warbler

For the Central Till Plain Section, the average of the panelists' ratings for historic conditions is in Outcome D; however, the largest proportion of likelihood points is distributed in Outcome C, with fairly large distributions in Outcomes D and E, and a few in B. Panelists noted that Cerulean Warblers were probably of low abundance within the Section, restricted to prairie groves and riparian zones, but that these habitats were more extensive historically. Also, because of their mobility, Cerulean Warblers may have been able to interact even at low abundance. Still, the Section was probably historically a sink area for populations.

Panelists rated current conditions in the Section as mostly in Outcome D, with a large proportion of likelihood points in Outcome E and a few in C. They noted that habitat is greatly reduced from historic conditions, and is more fragmented and isolated. There are presently few to no breeding birds. One panelist commented that there is some habitat along rivers, and maybe slightly more forest elsewhere than existed historically.

Management under any of Alternatives 2-6 at Midewin was rated as providing only the slightest benefit to Cerulean Warblers in the Section. Panelists commented that the increased forest acreage at Midewin would provide a very small benefit, but the area is so small that the effect at the regional scale would be insignificant. Two panelists noted that within the Section, increased suburban sprawl and loss of oak forest patches led to a poor outlook for the Cerulean Warber. Ratings for the Section were the same for all of Alternatives 2-6 at Midewin, as they provide the same amount of habitat.

6.6. Wetland Animals

Each of these four animal species, Blanding's turtle (*Emydoidea blandingii*), King *Rail (Rallus elegans*), Least Bittern (*Ixobrychus exilis*) and plains leopard frog (*Rana blairi*) are dependant upon wetlands at least for a portion of their life history. These wetland species have declined in numbers or are uncommon within the analysis area.

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

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

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

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

6.6.1. EXPERT PANEL OUTCOMES

Blanding's Turtle
Panel ratings indicated that the historic condition at Midewin was most likely in Outcome B, with a few likelihood points distributed in Outcomes A and C. Panelists provided comments, noting that historically there was probably a mosaic of well-connected suitable habitat at Midewin before hydrologic alteration and road construction, and that Blanding's Turtles were probably somewhat homogenously distributed throughout the site.

Panelists rated current conditions and Alternative 1 in Outcome D, with a fairly large point distribution in Outcome E and a few likelihood points in Outcomes B and C. Comments indicated that currently populations have declined due to habitat losses, and the restricted size of wetlands now limits the species to small portions of the site. The situation was expected to stay about the same under Alternative 1.

Ratings for Alternatives 2-6 were in Outcome C. Alternatives 2 and 3 had similar point distributions, with most likelihood points placed in Outcome C, a large proportion in Outcome D, and a few points in Outcome B. Alternatives 4-6 were more favorable than Alternatives 2 and 3, with scores distributed nearly equally in Outcomes B and C, and a few scores in Outcomes A and D. Alternative 6 was rated as the most favorable for Blanding's Turtle. One panelist commented that for Alternatives 2 and 3, although wetland habitat is increased, the soils at those locations would be too dry and hard for the turtle to dig nests. Alternatives 4-6 increased habitat further, but soils were still thought to be too hard for ideal nesting habitat. The other panelist was concerned about human traffic in key areas under Alternatives 4 and 5, and thought that roads would limit population expansion. Alternative 6 was identified as providing conditions most like those of historic times.

King Rail

The panelists rated historic condition at Midewin as Outcome B on average, with some likelihood points distributed in Outcomes A and C. Panelists noted that Midewin may have had above-average habitat conditions as compared with the Central Till Plain, and that King Rails were historically much more common and more evenly distributed throughout the site.

Panelists rated current conditions and Alternative 1 in Outcome E, with some likelihood points in Outcome D. Panelists comments indicated that currently this species is rare; there are only a few pairs at Midewin and there is no conclusive evidence of breeding, although probably a few pairs may attempt nesting each year. Ratings for Alternative 1 were similar to those for the current condition, averaging in Outcome E with some distribution in Outcome D. One panelist commented that because some wetland restoration is already underway, the situation would improve slightly, but scores did not reflect this projection.

Ratings for Alternatives 2-6 were based primarily on the amount of projected habitat restoration, and ratings were accordingly more favorable for higher numbered Alternatives. Scores averaged in Outcome D for Alternatives 2 and 3, with nearly equal proportions of point distributions in Outcome C, and a few points in Outcomes B and E. Scores averaged in Outcome C for Alternatives 4-6, with a substantial proportion of points in Outcomes B and D, and a few in Outcomes A and E. Most panelists thought that the restoration of suitable habitat would lead to an increase in pairs of birds. Another panelist thought that

wetland habitat varies a lot depending on rainfall, and that local breeding populations vary from year to year as a result. Birds may move from areas with lower-than-average rainfall to areas with abundant rainfall to find suitable wetland conditions. Panelists also thought that an isolation distance from nests was appropriate, and that 100 to 200 meters would be sufficient.

Least Bittern

The panelists rated historic conditions at Midewin as Outcome C on average, with a large point distribution in Outcomes B and D and a few points in Outcomes A and E. Panelists thought that historically, Midewin had more wetlands and that Least Bittern distributions would have been patchy but within a good matrix. One panelist noted that larger marshes may never have been common at Midewin, and that Least Bitterns would not have been very abundant.

Panelists rated current conditions and Alternative 1 in Outcome E, with some likelihood points in Outcome D. Panelists noted that wetlands have been drained and remaining ones are isolated, so little habitat is available. One panelist thought that the species is more common at Midewin than is realized. Under Alternative 1, panelists commented that habitat quality would diminish, the matrix would shrink, and the wetland currently being restored would degrade in the long term. They noted that encroachment by willows is a problem in isolated colonies, and low water levels contribute to predation, so management is needed to control these situations and maintain habitat for Least Bittern.

Ratings for Alternatives 2-6 all averaged in Outcome D, although scores were slightly more favorable for the higher numbered Alternatives. Point distributions for Alternatives 2 and 3 were mostly in Outcomes D and E, with a few likelihood points in Outcome C. For Alternatives 4-6, most likelihood points were placed in Outcome D, with a sizeable proportion in Outcomes C and E and a few points in Outcome B. Ratings were based primarily on the amount of wetland restoration that would occur under different Alternatives. At least one panelist rated Alternatives 2 and 3 less favorably than Alternatives 4-6 because the increased grassland acreage would not benefit Least Bittern. Ratings did not approach historic conditions because marsh habitat restoration projections are relatively small under all Alternatives, and small marshes would not develop the deeper areas with interspersion of water and vegetation that is favored by Least Bitterns. Panelists further commented that an isolation distance from nests was appropriate, and that 100 to 200 meters would be sufficient.

Plains Leopard Frog

The panelists rated historic conditions at Midewin in Outcome B on the average, with a large point distribution in Outcome C and a few points in Outcomes A and D. Panel comments indicated that historically there was probably a mosaic of well-connected suitable habitat widespread at Midewin and the Plains Leopard Frog was broadly to frequently distributed along shallow wetlands in the area.

Panelists rated current conditions and Alternative 1 in Outcome D, with a fairly large point distribution in Outcome E and a few likelihood points in Outcomes B and C. Comments indicated that currently, habitats have declined and are now very restricted and isolated. The situation was expected to stay about the same under Alternative 1, although the wetland currently being restored was expected to provide a minimal improvement.

Average ratings for Alternatives 2 and 3 were in Outcome D, with a large point distribution in Outcome C and a few points in Outcomes B and E. Alternatives 4-6 had average ratings in Outcome C, with a sizeable point distribution in Outcome D and a few points in Outcomes B and E. Ratings were primarily based on the amount of habitat restoration that each Alternative called for. Thus, Alternatives 2 and 3 were seen as increasing potential habitat, but the habitat would still be isolated. Alternatives 4-6 were rated higher because they have more wetland restoration, with Alternative 6 viewed as the most favorable for this species. Panelists noted that the Plains Leopard Frog can use morainal soils and does not require sandy sites for reproduction, as does Blanding's Turtle. Concerns were expressed about the industrial park blocking movements, and about roadkill on Highway 53; culverts were suggested as a possible way to allow frogs to cross under the highway. A panelist noted that the presence of roads and other permanent fragmentary features would prevent the species from reaching historic levels at Midewin.

6.6.2. CUMULATIVE EFFECTS

Blanding's Turtle

For the Central Till Plains Section, the panelists rated historic conditions mostly in Outcome B, with some likelihood points distributed in Outcome C, and a few in Outcome A. One panelist noted that Blanding's Turtles were likely to have been well distributed across the Section, but not so well-distributed as on Midewin. The other panelist thought that the distribution of wetlands may have been a limiting factor, and that Blanding's Turtles occurred at high densities in localized patches of suitable habitat.

Panel ratings indicated that the current condition for the Section is Outcome D on average, with some likelihood points distributed in Outcome E and a few in Outcome C. The panelists thought that the current populations are very isolated, and that wetland and wet prairie habitat is greatly reduced from historic times. Ratings for Alternative 1 were the same as for current conditions; the panelists felt that there would be little change under that Alternative. Alternatives 2-6 were rated as being increasingly more favorable for populations of Blanding's Turtle in the Section, indicating that management at Midewin is significant, although minimally, for this species at a broader spatial scale. One panelist commented that Alternatives 4-6 could potentially allow the Midewin population to increase enough to become a fairly important remnant within the Section. Alternative 6,

with links to other nearby populations, could increase significance of the metapopulation of which Midewin is part.

King Rail
For the Central Till Plain Section, historic conditions were rated in Outcome B on average, with some likelihood points distributed in Outcomes A and C. One panelist thought that King Rails were likely to have been moderately abundant in areas with small to large marshes and sedge meadows in a prairie complex. Another panelist thought that the species would have been present at low densities and in a rather patchy distribution within suitable habitat.

Panel ratings indicated that the current condition for the Section is extremely poor, with nearly all likelihood points distributed in Outcome E and a few in Outcome D. Comments indicated that the species is very rare, with only a few breeding pairs in the entire Section and these very isolated. Habitat losses were described as having been very serious. Ratings for Alternative 1 were nearly the same as for current conditions; the panelists did not foresee any improvement given continued wetland habitat losses. Alternatives 2 and 3 were rated as similar to current conditions, while Alternatives 4-6 were rated slightly more favorably for populations of King Rail in the Section. These scores indicate that management at Midewin makes little difference to the status of this species at a broader spatial scale. Panelists commented that no amount of restoration at Midewin is likely to affect the species status in the Section, and that while Midewin could become an important site and possibly the most important one in Illinois, the scope is still limited.

Least Bittern
For the Central Till Plain Section, historic condition scores averaged in Outcome C, with a sizeable proportion of likelihood points in Outcome B and a few in Outcomes A, D, and E. Panelists noted that habitat in this Section is more isolated than in other parts of Least Bittern's range. The species prefers large, deep marshes of over 500 acres in size; these are not common in the Section, which would have resulted in a sporadic distribution. Another panelist thought that the distribution within the Section would have been similar to the distribution at Midewin.

Panel average ratings indicated that the current condition for the Section is in Outcome E, with some points distributed in Outcome D and a few in Outcome C. Comments indicated that populations of Least Bittern are in even worse condition within the Section than at Midewin. There is little habitat available; populations are very spotty and have low abundance, and will likely continue to decline.

Ratings for all the Alternatives, 1-6, were very similar to ratings for current conditions, all averaging in Outcome E. For the higher numbered Alternatives, the scores were minimally higher, with a few more points distributed in Outcomes C and D rather than in Outcome E. The scores and comments indicate that

management at Midewin makes almost no difference to the status of this species at a broader spatial scale. One panelist commented that management at Midewin did not resolve the isolation of habitat within the Section. Another noted that few larger marshes would be restored at Midewin, so impacts at the Section level would be limited.

Plains Leopard Frog

For the Central Till Plain Section, the panelists' averaged ranks placed historic conditions mostly in Outcome C, with a sizeable point distribution in Outcome B and a few points in Outcome D. One panelist noted that historically, a mosaic of wetlands existed in the Section, suggesting a broad or somewhat restricted abundance of Plains Leopard Frogs. The other panelist described a widespread but fragmented distribution.

Panel ratings indicated that the current condition for the Section is Outcome D on average, with some likelihood points distributed in Outcomes C and E and a few in Outcome B. The panelists thought that the current populations are very isolated, and that habitat is greatly reduced and fragmented as compared with historic times. Plains Leopard Frogs are now uncommon in the Section. Ratings for Alternatives 1-6 showed gradual but only slight improvement over current conditions, averaging in Outcome D with some likelihood points distributed in Outcomes C and E and a few in Outcome B. One panelist commented that there would be only a small effect on this species at the Section level due to management at Midewin. The other panelist thought that under Alternative 6 the population at Midewin could become locally significant.

6.7. Short-stature Grassland Birds

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

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

Loggerhead Shrike.
The Loggerhead Shrike is a predatory songbird slightly smaller than the American Robin (*Turdus migratorius*). Loggerhead shrikes prefer short grasses with some scattered trees. The following habitat requirements are based on Brooks and Temple (1990). Loggerhead shrikes require a territory of at least 25 acres which consists of at least a 90% herbaceous ground cover. Potential foraging habitat (i.e. pasture, upland prairie, grassland and hay land) should cover 80% or more of each potential shrike territory. Each potential shrike territory should consist of 18% or greater cover of a usable foraging habitat (i.e. potential foraging habitat that is with 59 feet of an elevated hunting perch. Each potential shrike territory should contain at least 10 nesting trees or shrubs in the range of 5 to 30 feet.

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

6.7.1. EXPERT PANEL OUTCOMES

Loggerhead Shrike
The panel rated historic conditions at Midewin as Outcome B on average, with a sizeable point distribution in Outcome C and a few points in Outcome A.

Panelists thought that the historic distribution of Loggerhead Shrikes was widespread but patchy, with low to moderate abundance. One panelist commented that grazing, barbed wire fencing, and other human influences may have artificially increased this species at Midewin.

The expert panel rated current conditions in Outcome D, but the majority of likelihood points were distributed in Outcome E and some were placed in Outcome C. Comments indicated that the Midewin population is restricted and may be declining due to reductions in grazing. Ratings for Alternative 1 averaged in Outcome E with some likelihood points distributed in Outcome D. Panelists thought that non-native shrub encroachment would degrade habitat.

Ratings for Alternatives 2-6 were still average as Outcome D, but scores indicated some improvement in conditions as compared with the current situation. Scores did not approach the level of historic ratings. Scores were very widely distributed among Outcomes, with a sizeable distribution of points in Outcomes C, D, and E, and a few points in Outcome B. Ratings for Alternatives 2 and 3 were the most favorable on average, with Alternative 4 receiving an intermediate rating and Alternatives 5 and 6 receiving a less favorable rating. Panelists again rated the Alternatives primarily on the amount of habitat they were projected to provide. One panelist noted that the species is relying heavily on the non-native Osage orange rather than the native hawthorns, and the effects of this replacement are unknown. Panelists disagreed about Loggerhead Shrikes usage of available habitat; one commented that there is plenty of habitat in northern Illinois without Shrikes in it. Some thought human presence and habitat fragmentation are not a big impact on this species. Another panelist thought short grass is very important and that grazing favors the species, while a different panelist thought heavy grazing was a threat. Panelists also differed in their perception of whether and how Loggerhead Shrikes might use restored prairie. Another concern was that severe burning might kill off too many shrubs, and a light approach was suggested.

Upland Sandpiper

The panelists rated historic conditions at Midewin as Outcome B on average, with a large proportion of likelihood points distributed in Outcome C and a few in Outcomes A and D. Panelists thought that the historic condition of Upland sandpipers was not abundant, although much more common than at present. Midewin provided large areas of preferred habitat, but nesting areas were more patchily distributed, possibly linked to relatively recent burns and areas where bison had grazed.

Panelists rated current conditions in Outcome D, with some likelihood points distributed in Outcome E and a few in Outcome C. Comments were that the Midewin population now has a patchy distribution, even though it is still the largest population in the state, and appears to be declining due to reductions in grazing. Ratings for Alternative 1 averaged in Outcome E with some likelihood

points distributed in Outcome D and a few in Outcome C. Panelists thought that non-native shrub encroachment on Upland Sandpiper habitat would cause population declines under this Alternative, and that the quality of old fields would degrade over time. They also noted that there are no nearby populations, and that the isolation and small size of the population makes it vulnerable to extirpation.

Ratings for Alternatives 2-4 averaged in Outcome C, with a sizeable distribution of points in Outcomes B and D, and a few points in Outcome E. Alternatives 5 and 6 were rated in Outcome D, with some likelihood points distributed in Outcomes C and E. Panelists rated the Alternatives on the amount of habitat provided, giving Alternatives 2 and 3 the most favorable ratings, Alternative 4 an intermediate amount, and Alternatives 5 and 6 a less favorable rating. One panelist was not optimistic about any of the scenarios, thinking that the Midewin population would still be isolated and small. Another panelist believed that the Midewin population interacts with a population further to the north. Panelists generally thought that habitat management would cause populations to increase. They noted the importance of keeping people and pets away from Upland Sandpipers due to the likelihood of nest predation, noting that they do well at hatching but survival can be a problem. They also noted the importance of perches.

6.7.2. CUMULATIVE EFFECTS

Loggerhead Shrike

For the Central Till Plains Section, historic conditions were rated in Outcome B on average, with a sizeable proportion of likelihood points in Outcome C and a few in Outcome A. Panelists commented that the species historically was likely to have had a relatively low abundance and patchy distribution due to the need for semi-frequent disturbance.

Average ratings for current conditions in the Section were in Outcome D, but points were widely distributed among Outcomes, with the largest proportion in Outcome E, some points in Outcome C, and a few points in Outcome B. Panelists noted that Loggerhead Shrikes are very isolated and rare outside Midewin; one panelist commented that it is essentially extirpated in central and northern Illinois. Ratings for Alternative 1 projected less favorable conditions for Loggerhead Shrike, averaging in Outcome E with some points distributed in Outcome D and a few in Outcome C. Comments indicated that the species is likely to continue to decline in the Section as habitat is lost, and could possibly become extirpated.

Ratings for Alternatives 2-4 indicated that conditions for the species within the Section would stay about the same as current conditions or make a marginal improvement, while Alternatives 5 and 6 would allow a slight decline. Ratings

were all averaged in Outcome E, with a wide point distribution among Outcomes B, C, D, and E. Panelists felt strongly that Midewin can play an important role in keeping the species persisting in the Section; Midewin is an island for Loggerhead Shrikes.

Upland Sandpiper

For the Central Till Plains Section, historic conditions were rated in Outcome B on average, with a sizeable proportion of likelihood points in Outcome C and a few in Outcomes A and D. Panelists commented that the Upland Sandpiper was historically widespread and common throughout its range. It may have been patchily distributed, as today it appears to prefer shorter vegetation.

Average ratings for current conditions in the Section were in Outcome D, but the largest proportion of the point distribution was in Outcome E. Panelists noted that outside Midewin, there are only scattered pairs of Upland Sandpipers and no real populations, due to significant losses of habitat through urbanization, conversion, decline of pasturing, and increased hayfield mowing.

Ratings for Alternative 1 projected slightly less favorable conditions for Upland Sandpiper, with even more point distribution concentrated in Outcome E and only a few points in Outcome C. Comments indicated that without management, the major source site for the region at Midewin would decline.

Ratings for Alternatives 2 and 3 indicated that conditions for the species within the Section would stay about the same as current conditions, while Alternatives 4-6 would allow a slight decline. Ratings were all in Outcome E, with a small point distribution in Outcomes C (for Alternatives 2-4) and D. Panelists felt strongly that management at Midewin was essential in maintaining one sizeable population in the State. However, they thought that effects at the Section level would be minimal, even if Midewin were a source population, because habitat is so scarce and is likely to degrade even further.

6.8. Bobolink (Mid-Stature Grassland Birds)

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

Bobolinks are area-sensitive grassland birds, and require grassland tracts exceeding 30-50 ha (75-123 acres) for breeding (Herkert 1997b). Bobolinks prefer grasslands with grass heights of 20-35 cm (8-14 inches), litter depth of 2-4 cm (0.8-1,6 inches), and are exceedingly sensitive to presence of woody species in open grasslands (Herkert 1997b). Heavy or moderate grazing may create grassland conditions unsuitable for bobolinks for the first breeding season following this activity; however, rank grassland with litter depths > 4 cm (> 1.6 inches) and grass heights >40 cm (16 inches) become increasing unsuitable as breeding habitat for this species (Herkert 1997b). Evidence suggests that properly timed burning and hay mowing may have similar (and positive effects), by removal of deep duff or rank vegetation and topkilling of shrubs, resulting in a more homogenous grassland (Dechant et al. 1999).

6.8.1. EXPERT PANEL OUTCOMES

The panelists rated historic condition at Midewin as Outcome B on average, with a large proportion of likelihood points distributed in Outcome A and a few in C. Panelists commented that in historic times, Bobolinks were likely common in continuous or nearly continuous distributions at Midewin.

Panelists rated current conditions in Outcome C, with some likelihood points distributed in Outcomes B and D. They commented that a gradual loss of habitat had affected the species, and though it remains fairly common it is not reaching its potential population condition in the area. Alternative 1 was projected to be in Outcome D, with a large point distribution in Outcome E and a few points in Outcomes B and C. Panel comments indicated that under Alternative 1, grassland conditions would become less favorable for Bobolinks and lead to population declines. The discussion indicated that panelists thought that without grazing, much of the land would succeed to shrubs and trees and become unsuitable for Bobolinks.

Ratings for alternatives 2 and 3 averaged in Outcome C, with a wide distribution of points that included all the Outcomes. There was considerable discussion, focused on the question of whether bobolinks currently utilized prairie restorations or would use them in the future. Some panelists thought there was little certainty of bobolinks ever using them, and that they may be different from the original prairie in ways that limit their habitat suitability. Other panelists

thought that the scale of restorations is larger than other attempts and the birds may respond differently in this case. In general, Alternative 2 was seen as the most advantageous for Bobolinks due to the larger acreage managed for agricultural grassland and lesser levels of disturbance. Alternative 4 was rated in Outcome D on average, with a large point distribution in Outcome C and a few points in Outcomes B and E. This Alternative calls for less agricultural grassland habitat than Alternatives 2 and 3, although one panelist thought the wet prairie restoration might provide a small amount of habitat.

Ratings for Alternatives 5 and 6 were less favorable than for the other Alternatives, in Outcome D with a sizeable likelihood point distribution in Outcome E and a few points in Outcome C. Panelists noted that these Alternatives had no prime habitat, and that success for Bobolinks in these Alternatives depended entirely on their ability to use prairie restorations, which was seen as uncertain. One panelist expressed concerns about edge effects, and thought that Bobolinks tended to avoid roads.

6.8.2. CUMULATIVE EFFECTS

Panelists rated current conditions for the Section in Outcome D, with a large point distribution in Outcome C, some points in Outcome E, and a few points in Outcome B. Panelists commented that the current distribution is very patchy and isolated, and even absent over large areas. The birds are still found in a quite number of locations but all the populations are small. Ratings for Alternative 1 projected less favorable conditions for Bobolink, in Outcome E with a sizeable point distribution in Outcomes C and D. Comments indicated that without management the region would lose an important site for these species at Midewin.

Ratings for Alternatives 2 and 3 indicated an improvement for the species at the Section level, indicating that management at Midewin could make a difference for the species. Panelists commented that these Alternatives provide a regional benefit by significantly enhancing the Midewin population. One panelist noted that grazing and fire regimes are critical. Alternatives 4-6 were rated as being only marginally more favorable than current conditions for Bobolinks, in Outcome D. Panelists thought that these Alternatives did not call for enough habitat management to make a difference for populations at the Section scale.

6.9. Birds of Tallgrass Prairie

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

Henslow's Sparrow
The Henslow's Sparrow is a long- distance migrant songbird that breeds in a variety of grassland habitats with tall, dense grass and herbaceous vegetation. Henslow's Sparrow has declined significantly across its range and can no longer be considered common anywhere. Preferred breeding habitat for Henslow's sparrow is relatively tall grassland, with standing herbage 40-80 cm (16-31 inches) tall and accumulated litter averaging 3-4 cm (1-1.5 inches) in depth (Herkert 1997c). If prescribed burning, hay cutting, or grazing are used as management tools, such grasslands become unsuitable for nesting by Henslow's sparrow until recovery of grass height and litter, usually one to two growing after management (Herkert 1997c). However, periodic burning may be essential, as maximum use by this species occurs two to five years after burning, with subsequent declines more than five years after burning (Herkert and Glass 1999). Henslow's sparrow is considered an area-sensitive grassland bird, susceptible to fragmentation of habitat; prime breeding habitat is contiguous grassland greater than 55 ha (135 acres) (Herkert 1997c). As invading woody plants reach 2m (6.5 feet) tall, grassland habitat becomes unsuitable for this species (Herkert 1999).

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

vegetative cover (Beck and Vogl 1972; Birney, Grant, and Baird 1976; Harty et al. 1991).

Short-eared Owl
Short-eared owls require large tracts of contiguous open habitat for foraging, but areas selected for use vary from year to year. This species is highly nomadic, and its presence or absence is often determined by prey (small rodents) population cycles (Holt and Leasure 1993). Although tall nesting cover may be a requirement for nesting sites, this species has been recorded nesting in crop stubble, shortgrass prairie, and active pastures (Holt and Leasure 1993). Because this species may begin nesting in late March, nests may be vulnerable to prescribed burns conducted in late spring. However, this species will renest if the first clutch is destroyed (Dechant et al. 2001b). Prescribed burns may also remove cover required for nesting (USDA-FS 2000o). Since breeding is largely dependent on the abundance of small mammals, factors that effect prey populations may impact this raptor; prescribed burns may cause short-term in small mammal populations, primarily by removing vegetative cover (Beck and Vogl 1972; Birney, Grant, and Baird 1976; Harty et al. 1991).

6.9.1. EXPERT PANEL OUTCOMES

Henslow's Sparrow
The panel comments indicate that historically, Midewin was tallgrass prairie with mostly suitable conditions for Henslow's Sparrow, and it is likely that Midewin supported significant populations. The populations were thought to have been broadly distributed but somewhat patchy, with considerable interaction among subpopulations. Currently, the species occupies areas at Midewin that were formerly grazed but which have now succeeded to a tall grass cover. Patches of this habitat are isolated, but the birds appear able to find and occupy suitable habitat. Populations are increasing, but are still of relatively low abundance and patchy distribution, and some but not most populations appear to interact.

Alternative 1 would do little to restore grassland bird habitat, and Henslow's Sparrow populations would likely crash due to succession resulting from lack of grassland disturbance. Alternatives 2 and 3 were thought to create conditions somewhat more favorable at Midewin, with restoration of some larger habitat patches, although there was some ambiguity about whether grassland bird habitat management would focus primarily on short grass habitat rather than the taller grasses utilized by the Henslow's Sparrow. Two of the three panelists thought that Alternatives 4-6 provide for increasingly more restoration and more contiguous patches, resulting in more favorable conditions for Henslow's Sparrow. Alternative 6 was noted to have less disturbance from trails and campgrounds. There was some concern about the location of the visitor center in Alternative 5, and a suggestion to move it to the perimeter of the property to

minimize human disturbance. The location of the visitors center was subsequently adjusted. One expert thought that Alternatives 2 and 3 provided the best habitat through grassland management, but other panelists thought that the management would favor shorter grasses that are not utilized by Henslow's Sparrow. The averaged ratings indicate that the higher numbered Alternatives provide conditions most like that of historic times, based on the amount and contiguity of tallgrass prairie restoration areas, and the lack of disturbance.

Northern Harrier

The panel commented that under historic conditions, habitat at Midewin was a large continuous prairie, and the Northern Harrier was likely to have been common and widespread within the habitat. However, populations of this species always exist at relatively low densities, and fluctuate with size of prey populations. Under current conditions, large unfragmented areas are in limited supply, and population size is limited by lack of suitable habitat.

Alternative 1 was thought likely to produce even less suitable habitat than exists presently, due to the lack of grassland management; also, this alternative would not address the fragmentation issue. Alternatives 2-6 provided larger and more continuous habitat, but the size of Midewin limits some area requirements. The larger size of unfragmented habitat blocks appeared to be the major consideration in rating the higher numbered Alternatives as closer to the historic condition. There was some disagreement among panelists as to whether the short and medium cool-season grasses maintained in Alternatives 2 and 3 would provide the best conditions for producing prey species, or whether the wetland prairie in Alternatives 5 and 6 would be equally good. Some panelists thought that prey availability might limit population sizes, but other panelists thought there would be adequate amounts of prey under any alternative. Concerns about disturbance from humans and pets traveling off trails led to less favorable ratings for Alternatives 2-5.

Short-eared Owl

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

Projections for Alternative 1 were that this scenario would not contribute to any population increase, and could possibly result in extirpation from the property. Alternatives 2 and 3 were projected to provide conditions most like the historic condition, due to the active management for short grasses. One panelist thought the restoration of wet meadow would lead to greater prey populations and thus

attract additional breeding individuals. Panelists stated that it is difficult to know how to manage for this species, because it occupies odd habitats such as former strip mines in Indiana. Concerns about human and pet disturbance were thought to be an issue for Alternatives 2-5, especially in 2 and 3. Winter roosts could be affected by hiking and cross-country skiing. Disturbance was a factor in the panel ratings.

6.9.2. CUMULATIVE EFFECTS

Henslow's Sparrow
Within the Central Till Plains, panelists noted some differences among alternatives similar to those noted for the Midewin area. One expert doubted whether the habitat contribution of Midewin would be significant at that scale, but the other two panelists thought that Midewin could make a significant contribution. One expert noted that, "Alternatives with the greatest amount of very large unfragmented habitat may be very important to maintaining regional populations. However, other sites also support good populations, so the relative importance of Midewin is less than for more restricted species (i.e. upland sandpiper, shrike)".

The panel rated the historic condition as Outcome B with come scores of Outcome A and C, while the current condition was rated as Outcome D or E. The panelists' rated action alternatives all fairly closely with alternative 5 and 6 coming out slightly higher.

Northern Harrier
There was considerable uncertainty on the part of the panelists about what future outcomes are likely to exist at Midewin under different Alternatives. Some experts commented that for a species so wide-ranging, and which occurs at such low densities despite habitat conditions, there is little difference among alternatives. Another possible explanation for the lack of consistent ratings is that panelists differed in their perception of how the species reacts to disturbance; some thought it was relatively tolerant of disturbance, while others thought it tolerated vehicle traffic well but was affected by direct interaction with humans or pets. Similarly, the ratings for current conditions at Midewin indicate uncertainty. Panelists differed in their views of how Northern Harriers utilize the current habitat.

Scores for the Central Till Plains Section are consistently clustered in Outcomes D and E for all future alternatives, indicating considerable agreement among experts as to the likely scenario for the species at this scale. Ratings for the historic condition were mostly concentrated in Outcomes A and B, indicating relatively low levels of uncertainty.

Short-eared Owl

Rating by the panelists indicates considerable uncertainty about what future outcomes are likely to exist at Midewin under different Alternatives. Some experts commented that population response may be minimal; that even with the best management, is not likely that more than a few breeding pairs could be attracted. The uncertainty in the ratings seems to be due to a scientific uncertainty as to how management affects the size of Short-eared Owl populations. Ratings for historic conditions also indicate considerable uncertainty, probably again due to scientific uncertainty about how short grass habitat occurred and was utilized within the tallgrass prairie matrix, and uncertainty about the historic size of Short-eared Owl populations.

Scores for the Central Till Plains Section are concentrated in Outcome E for all future alternatives, indicating agreement among experts as to a poor outlook for the species.

6.10. Prairie Insect Group

Each of these insects are potentially found in typic or dolomite prairie where their host plant is found. Each species has a unique host plant that it's dependent upon for food during a portion of its life cycle. Each host plant species is restricted to typic and/or dolomite prairie habitats (as described above) and dependent upon the health of the prairie community they are found in.

Red-veined Leafhopper
This flightless leafhopper is considered a prairie-restricted insect species (Panzer et al 1995; Panzer 1998). This leafhopper produces two generations annually (R. Panzer, per. comm.); the only known food plant is prairie dropseed (*Sporobolus heterolepis*). This species over-winters in the duff (grass and forb litter of prairies).

***Eryngium* Root-borer**
This moth is considered a prairie-restricted insect species (Panzer et al 1995; Panzer 1998). This species only produces one generation annually; the only known food plant is rattlesnake-master (*Eryngium yuccifolium*, a forb of prairie remnants. The larvae live in the stems and roots or the host plant, the adults are out in early fall.

Blazing Star Stem-borer
This moth is considered a prairie-restricted insect species (Panzer et al 1995; Panzer 1998). This species only produces one generation annually; the only known food plant is the dense blazing-star (*Liatris spicata*), a forb of wet prairies, fens, and dolomite prairies. The larvae live in the stems and roots or the host plant, the adults are out in early fall.

6.10.1. EXPERT PANEL OUTCOMES

Red-veined Leaphopper
Differences in ratings between this species and the other two insects in the Prairie Insect Species Group are due to the lower mobility of Red-veined Prairie Leafhopper because of its inability to fly, and differences in life history, including being bivoltine.

Historic conditions at Midewin were rated as Outcome C fairly favorable for the Red-veined Prairie Leafhopper based on the assumption that most of the site was wet-mesic prairie. However, the distribution of the insect would have been patchy within the suitable habitat, and extremely variable from year to year and even seasonally. Panelists illustrated the magnitude of fluctuations in population size by describing field sampling at the Goose Lake Prairie, where they sometimes captured no specimens and at another times found a thousand.

Panelists rated current conditions in Outcome E, noting that the Red-veined Prairie Leafhopper is a Great Lakes endemic, much less common over its historic range than the other two insects in the Prairie Insects Species Group. There is one small population at Drummond Prairie. The Midewin population is not believed to be large enough to survive over time. Panelists thought that there is probably no gene flow among existing populations. Alternative 1 was thought to lead to dwindling size or possibly extirpation of the existing population due to lack of active management.

Differences in ratings between Alternatives 2-6 were primarily based on the amount of prairie habitat to be restored, likelihood of the host plant becoming abundant within the prairie restoration, differences in levels of grazing, and fire management. An additional consideration was the possible direct competition or spread of pathogens and parasitoids from non-native leafhoppers that would likely thrive in the large acreages of non-native grassland projected by Alternative 2. Panelists were also somewhat uncertain about how much the Red-veined Prairie Leafhopper would utilize suitable habitat. One panelist thought it would be hard to establish the host plant, Prairie Dropseed, in the wetter parts of Midewin, and that it is unlikely to become abundant. Another panelist noted that differences in amounts of roads and trails between Alternatives 5 and 6 may be significant to the Red-veined Prairie Leafhopper. Overall, however, the increased acreages of prairie restoration in the higher numbered Alternatives were thought likely to contribute to increases in abundance and distribution of the species. Panel scores included the assumption that the host plant, Prairie Dropseed, would be actively planted in prairie restorations. Alternatives 5 and 6 were rated as being most favorable for the Red-veined Prairie Leafhopper, with no difference in scores between these two alternatives.

Eryngium Root-borer Moth

Panel ratings indicated that Outcome B was the historic condition at Midewin and was highly suitable for this insect, based on the reasoning that most of the site was tallgrass prairie. Currently, populations are very isolated, and the Midewin population is probably not large enough to survive over time; however, the population at Grant Creek provides a large adjacent source. Alternative 1 was thought to lead to dwindling size or possibly extirpation of the existing population due to lack of active management.

Differences in ratings between Alternatives 2-6 were primarily due to the amount of prairie habitat that would be restored, and differences in levels of grazing and fire management. Increased acreages of prairie restoration in the higher numbered alternatives were thought very likely to contribute to increases in abundance and distribution of these insects. When scoring Outcomes, panelists made the assumption that the host plant, Rattlesnake Master (*Eryngium yuccifolium*), would be actively planted in the prairie restorations; one commented that Rattlesnake Master was relatively easy to establish. They expressed differences of opinion about grazing, with one expert thinking that

grazing favors *Eryngium* Root Borer Moth and Rattlesnake Master and another stating that grazing might have a negative effect, but that there was not enough information to be certain. One panelist stated that the insect is fire-sensitive, and could be less abundant in areas managed with fire, than in grazed areas. They noted that prairie insects tend to have a patchy distribution even within suitable habitat, and that population sizes fluctuate year by year; one panelist thought the species would never be abundant even under ideal conditions. One panelist thought Outcome A was very likely to be achieved in Alternative 6, based on observations of the Goose Lake restoration, once degraded, which now has thousands of individuals. Another panelist felt that the low levels and isolation of existing populations could have a long-term effect, making it difficult for the insects to respond to improved habitat conditions.

Blazing Star Stem-borer Moth
Panel ratings were very similar to those for the *Eryngium* Root Borer Moth, and they commented that the situation was “pretty much the same” for both species. The historic condition would have been Outcome B at Midewin which indicates a high suitability for this insect, because most of the site was tallgrass prairie. Currently, populations in Illinois are very isolated, fluctuate from year to year, and the one Midewin population is probably not large enough to survive over time. The host plant, Marsh Blazing Star (*Liatrus spicata*), is present at six locations at Midewin, and there is a possibility that the insect might have additional small populations in some of these locations. Alternative 1 was thought to lead to imminent extirpation or extinction of the existing population due to lack of active management.

Differences in ratings between Alternatives 2-6 were primarily due to the amount of prairie habitat that would be restored, differences in levels of grazing by bison and elk, and fire management. Increased acreages of prairie restoration in the higher numbered Alternatives were thought very likely to contribute to increases in abundance and distribution of the insects. Panel scores included the assumption that the host plant, Marsh Blazing Star, would be actively planted in the prairie restorations. One panelist assigned lower scores to Alternatives 3 and 6 due to the insect’s fire-sensitivity, stating that they could be less abundant in burn managed areas than in grazed areas. Another panelists gave lower scores to Alternative 2 due to the inclusion of bison and elk grazing. These differences in ratings offset each other in the weighted mean scores, showing a gradual increase in favorable conditions through the higher numbered Alternatives.

6.10.2. CUMULATIVE EFFECTS

Red-veined Leafhopper
For the Central Till Plains Section, the panelists scored the historic condition in Outcome B on average, but a sizeable number of points were also placed in Outcomes C and A. Two of the panelists provided comments on their ratings.

Rationale for differences among ratings was similar to that noted for the Midewin. Panelists had different perceptions about the historic abundance of these insects based on their patchy and variable distributions within suitable habitat.

The current condition for the Section was rated as Outcome E because only one large, stable, protected site exists. One panelist commented that populations across the range of this species are so fragmented and small that extirpation seems likely. Panelists said that the insect may not be doing well on small sites of 5-10 acres, and that these populations may not be contributing to recovery of the species. For Alternative 1, the situation was projected to be slightly more favorable than current conditions, but comments are unclear as to the rationale. One panelist noted that conditions under Alternative 1 would cause the current situation to deteriorate, and another commented that extirpation seems imminent without habitat expansion. It may be that the third panelist, who did not provide comments, believed that habitat restoration elsewhere would benefit this species regardless of what occurs at Midewin in the future.

Alternatives 2-6 are expected to contribute to increased population size and distribution as prairie restoration acreages increased at Midewin. The fewer roads and trails in Alternative 6 were said to possibly benefit this flightless insect. Panelists thought that Outcome D was the likely future scenario for the Section, and that at best they could hope for a highly fragmented metapopulation with self-sustaining but isolated populations that can be maintained at high levels in protected areas. They commented that because this species is a Great Lakes endemic and much less common over its historic range than the other insects in this group, it was scored generally lower. There were only slight differences in scores among the Alternatives, showing a minor effect of management at the Midewin site on conditions in the Section.

***Eryngium* Root-borer**

In the Central Till Plains Section, the panel agreed that the historic condition was in Outcome A or B, and the current condition was Outcome E with only two stable populations. Two panelists provided comments about their ratings, noting that Alternative 1 was projected to be even less favorable than the current condition, possibly leading to extirpation without habitat expansion. Management under any of the other Alternatives at Midewin was projected to make an impact at the Section level, with the higher numbered Alternatives rated more favorably due to the expected effects of larger areas of prairie restoration and active management. There were no differences between Alternatives 5 and 6 that were thought likely to affect the *Eryngium* Root Borer Moth. They again assumed that Rattlesnake Master would be actively planted in prairie restorations.

Panelists agreed that habitat restoration would improve conditions for the *Eryngium* Root Borer Moth, but disagreed about how much these conditions would change the Outcomes. Some believed that population factors, including low abundance and isolation, would limit response to increased habitat.

Additional uncertainty was based on lack of information about the *Eryngium* Root Borer Moth's response to fire, and disagreement about the effects of grazing on the species.

Blazing Star Stem-borer
In the Central Till Plains Section, the panel agreed that the historic condition was in Outcome A or B. The current condition was rated as Outcome E with only three large, stable, protected sites, and panelists noted that extirpation seems imminent. Scores for Alternative 1 indicate slightly improved conditions for the Section, but comments are unclear as to the rationale. One expert noted that conditions under Alternative 1 would be the same as current conditions, while another may have believed that habitat restoration elsewhere would contribute to a slight improvement regardless of what occurs at Midewin in the future.

Management under any of the other Alternatives at Midewin was projected to make a slight difference to conditions for the species at the Section level, with the higher numbered Alternatives rated more favorably due to the expected effects of larger areas of prairie restoration and active management. There were no differences between Alternatives 5 and 6 that were thought likely to affect Blazing Star Stem Borer. Panelists again assumed that Marsh Blazing Star would be actively planted in prairie restorations.

6.11. Ellipse

The ellipse is a freshwater mussel found in clear, small to medium-sized streams in gravel or mixed sand and gravel, in riffles or runs with a swift to moderate current. The ellipse is dependent upon clear clean streams and will be impacted by general threats to stream water quality and habitat (i.e. point source pollution, non-point source pollution and siltation). The ellipse, like all freshwater mussels are vulnerable to extirpation from exotic species. Zebra mussels (*Dreissena polymorpha*) are a severe threat if they get into streams with the ellipse. Loss of fish host species or restriction of fish host movement by structures such as dams is a threat. Domesticated animals with access to streams can threaten mussels due to trampling.

6.11.1. EXPERT PANEL OUTCOMES

Panel average ratings indicated that the historic condition at Midewin was most likely in Outcome B, with some likelihood points in Outcome C and a few in Outcomes A and D. One expert commented that historically the Ellipse had a relatively continuous distribution and was abundant in suitable habitat, while the other two thought it was restricted to streams that had good habitat and were forested.

Panelists rated current conditions and Alternative 1 in Outcome D, with a large likelihood point distribution in Outcome C and a few points in B and E. They commented that the small population at Midewin was unlikely to persist without riparian management. They thought that the Ellipse's distribution was more limited than historically, and that differences in land use had contributed sediment and pollutants. Alternative 1 was seen as doing little to change surrounding land uses, so the population would stay the same or decline.

Alternatives 2-6 were all rated the same, being borderline between Outcome D and Outcome C on average. Point distributions were mostly in Outcomes C and D, with a few points in Outcomes B and E. This indicates only a marginal improvement over current conditions, and does not approach the historic rating. Panelists thought that the chances of improving conditions for the Ellipse were slight without restoration of riparian forest, and that the stream habitat and current population were so small that the population may not persist anyway. One panelist was concerned about possible runoff from facility development in the watershed, trail locations, and water use/impacts from the landfill and industrial park.

6.11.2. CUMULATIVE EFFECTS

For the Central Till Plains Section, the panelists rated the historic condition in Outcome C on average, with point distributions mostly in Outcomes B and C and a few points in Outcomes A and D. Panelists noted that suitable habitat existed across the Section, and the distribution of Ellipse was relatively continuous.

Ratings indicated that the current condition for Ellipse in the Section is Outcome D on average, with some point distribution in Outcomes C and E. One panelist noted that only minor populations are present in the Section, while another commented that although the current distribution is sporadic, the Ellipse is locally abundant in high quality habitat. Alternative 1 was ranked similarly to the current condition, and panel comments were essentially the same.

Two of the panelists commented that management under Alternatives 2-6 at Midewin would not change the prospects for Ellipse within the Section, as the Midewin population is likely to remain small and restricted. The other panelist remarked that Midewin management would slightly enhance conditions within the Section. Ratings were mostly in Outcome C, but points were distributed widely among Outcomes B, C, D, and E. The scores indicate that panelists thought there would be a considerable overall improvement in conditions at the Section level as a result of Midewin's management, but the scores do not correspond well with their comments.