Wisconsin Karner Blue Butterfly
Habitat Conservation Plan and Environmental Impact Statement

# Appendix G. Effectiveness Monitoring Protocol

This appendix includes a protocol to be used for effectiveness monitoring. The protocol was developed by the HCP partners.

## Table of Contents

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## A. Introduction

This document describes the plan for statewide effectiveness monitoring of Karner blue butterflies and Karner blue butterfly habitat. The effectiveness monitoring undertaken as a component of the HCP will be conducted on those lands enrolled by HCP partners for management in regards to the butterfly under the agreements set forth through the HCP process. Effectiveness monitoring is a component, along with self monitoring and auditing, of the procedures required to gauge the success of the HCP.

## B. The HCP and Adaptive Management

This HCP will apply adaptive management to address conservation within the context of a working landscape. While this adaptive management approach offers HCP partners the flexibility needed to meet their respective goals, effectiveness monitoring is essential to adaptive management, and ultimately to support the need of the Karner blue butterfly for the dynamic landscape necessary to maintain viable populations.

## C. Objectives of Effectiveness Monitoring

The purpose of effectiveness monitoring is to provide an economical and biologically sound means of detecting statewide trends in the presence of Karner blue butterfly habitat, the presence of occupied sites, and the relative abundance of Karner blue butterflies through formal and systematic sampling. Trends in these variables profile the overall condition of the species in Wisconsin. This information will be used to assess to efficacy of the HCP and to inform adaptive management decisions.

## D. Components of Effectiveness Monitoring

**Level I Monitoring.** Sampling for Presence of Habitat. For habitat survey, the presence or absence of wild lupine will be determined and its abundance broadly quantified (see Lupine Presence/Absence Monitoring Protocol). This level of effectiveness monitoring applies only to the Shifting Mosaic Management Strategy. Habitat survey, however, will also need to be conducted on new Permanency of Habitat sites and new Shifting Mosaic sites replacing those lost to succession or forestry activities. On sites where the presence of habitat has been established, lupine surveys will need to be repeated after several years in response to habitat changes brought about by forestry activities or natural succession**.**

**Level II Monitoring.** Sampling for Presence of Butterflies. A sample of sites with lupine present will be chosen for survey to establish presence or absence of Karner blue butterflies.

**Level III Monitoring.** Relative Abundance Monitoring. A sample of sites will be chosen for counting butterflies observed along transects across the habitat patches on the site to establish a site index of the relative abundance of butterflies present.

**Habitat Evaluation.** Further habitat evaluation beyond the elements to be recorded on the relative abundance monitoring field form is useful to inform adaptive management decisions. The Bidwell habitat evaluation procedures developed for Karner blue butterfly habitat are not a required component of the effectiveness monitoring program at this time. However, habitat evaluation will be useful to partners in the self monitoring process to assess habitat alterations as a result of management or as a component of research.

## E. Site Eligibility

### Level I Monitoring

The eligible pool of survey sites for sampling presence of habitat is limited to sites that meet the following three criteria:

1. Is within the *High Potential Range* of the Karner blue butterfly

2. Meets the definition of *potential habitat*, and

3. Is *included by* Shifting Mosaic Strategy partners in the HCP.

"High Potential Range" is the region of the state containing all documented occurrences of the Karner blue butterfly, and extending beyond the documented range to include areas with similar habitat, soils, and climate, where the Karner blue butterfly is most likely to occur.

"Potential Habitat" includes sites on dry, sandy soils with dominant overstory vegetation of an age and/or character that could support Karner blue butterfly habitat.

Level I sites include forest "stands" and upland openings or existing corridors. A site is as large as possible up to approximately 40 acres, considering geographical features, and this at the discretion of the partner. If forested, the site supports trees of 0-15 years of age or if non-forested, the site may be an upland opening or existing corridor such as a fuel break or woods road. If forested and less than 15 years of age, dense stems of a regenerating stand may cause crown closure at an early age precluding the site from consideration for sampling.

Lands Included by Shifting Mosaic partners in the HCP: These are sites defined in partner Conservation Agreements as lands included in the conservation strategies "management for consideration" and/or "management to feature or enhance."

**Level II Monitoring**

The site pool is formed of those sites in the High Potential Range and included by the partners in the HCP, on which the presence of Karner blue butterfly habitat has been established. Sites are chosen from the pool of sites with lupine from the previous five[A] monitoring seasons. A site includes at least 25 plants or clumps of lupine at a density of 50 plants per acre or 25 plants per 200 m of linear distance. A linear site has no more than 200 m of contiguous non-habitat. ROW sites are limited to 250 m in length. Other sites are limited to a maximum size of approximately 40 acres.

**Level III Monitoring**

The site pool for Level III Monitoring is the group of sites selected[a] for Level II Monitoring.

## F. Sample Size

Analysis of existing Karner blue butterfly monitoring data was conducted to determine the appropriate number of sites to annually monitor in order to detect trends over time. A 10-year monitoring program of 100 to 200 stands monitored each year is likely to detect annual changes of five percent and in some cases two percent in stand occupancy. Annual percentage changes in stand occupancy differ from that of annual percent changes in stand indices; in order for stand occupancy to decrease by one stand, many individuals must have been eliminated.

For purposes of effectiveness monitoring for the HCP, the following numbers of sites will be sampled yearly:

Level I Monitoring: 200 sites

Level II. Monitoring: 200 sites (100 Shifting Mosaic, 100 Permanency of Habitat)

Level III. Monitoring: 80 sites (50 Shifting Mosaic, 30 Permanency of Habitat)

Partners following primarily the Shifting Mosaic management strategy will conduct Level I monitoring on 200 sites to determine the presence or absence of lupine. The group will sample 100 sites on which lupine is present to determine the presence or absence of the Karner blue butterfly. Fifty of those sites will also be marked for collection of Level III relative abundance monitoring data.

Partners following primarily the Permanency of Habitat management strategy will conduct Level II monitoring on 100 lupine sites for Karner blue butterfly presence/absence. Additional sites are added each year to better ensure a full data set. Each partner will monitor a minimum of five sites which will include the partner's own sites that were chosen. The remaining sites will be distributed among the Permanency of Habitat partners by cooperative agreement.

The Permanency of Habitat group has committed to monitoring 30 sites for relative abundance of the butterfly. These 30 sites plus a few additional sites for greater certainty of a full set of data, are nested within the sites chosen for presence/absence monitoring.

## G. Stratification of Sample

Selection of sampling sites will be stratified, both for analysis purposes and to distribute survey sites among partners. The purpose of stratification is to reduce the variance in the overall estimate. Stratification by ecoregion will not be used during the initial monitoring period but may be used later as the database from effectiveness monitoring is developed. For any given sample size, it will take a longer period of time to draw statistically valid conclusions by conservation strategy or ecoregion than for the statewide sample. Sampling will be stratified initially by the two management strategies, Shifting Mosaic and Permanency of Habitat.

Within the Shifting Mosaic category, sampling will be further stratified by ownership in proportion to the number of acres included by each partner in the HCP under the categories of "management with consideration" or "management to feature, protect, and enhance." Stratification by ownership in this case, may present a site distribution more representative of habitat across the Wisconsin range of the Karner blue butterfly than would strictly random sampling, given the wide range of variability in acreage included in the HCP, site size, and geographic presence of the individual partners' lands. Permanency of Habitat sample sites will be randomly selected across the partnership lands involved.

## H. Site Selection Procedures

The DNR will maintain the database from which the Shifting Mosaic group sites will be chosen. All eligible sites according to the above criteria will be submitted to the DNR and entered into the database from which the required number of sites will be chosen for each partner to monitor according to a random selection process from within each partner's pool of sites.

The DNR will also maintain the database from which the Permanency of Habitat group sites will be chosen. All eligible sites will be sent to the DNR and combined in a single pool from which the requisite number of sites will be randomly chosen. Partners will be sent up to five of their own sites that were chosen. The remaining sites will be distributed with consideration including but not exclusive of the following criteria: ownership, geographical location, type of site, site size.

# I. Monitoring Protocol

## 1. Level I. Lupine Presence/Absence Monitoring

The following protocol is taken from Appendix II of the Wildlife Management Guidelines for the Karner Blue Butterfly developed by the Wisconsin DNR Karner Blue Butterfly Technical Team, as revised with information from the Biological Subteam of the Statewide HCP (May, 1998 Revision). The protocol was developed by the HCP Monitoring Subteam in 1993.

Purpose: To find/map wild lupine (*Lupinus perennis*) patches to expedite future Karner blue butterfly (*Lycaeides melissa samuelis*) surveys.

When To Survey:

- In places where lupine flowers early (sunny areas), survey from late May to mid-June. In places where lupine flowers rarely or not at all (usually more shaded areas), surveys can be conducted from late May through July.

- Open and sunny places should be surveyed earlier in the season because lupine flowers and senesces earlier there.

- Areas with more shading and canopy cover can be surveyed later because lupine flowers and senesces later in these locations (except during hot and droughty summers).

- Lupine surveys should not be conducted after July 31.

How To Survey: An individual who is knowledgeable in the identification of lupine should conduct the surveys (lupine photos can be obtained from the DNR Bureau of Endangered Resources). Surveys for lupine can be conducted in numerous ways. The following are suggested methods to use. The method chosen will normally depend upon the amount of resources available (number of personnel) and the amount of area to be surveyed.

OPTION 1: Surveyors walk a site spaced so all areas between surveyors can be seen by at least one surveyor. Thus, each surveyor walks a "strip transect" because a strip or corridor of habitat is being surveyed. The distance between surveyors will depend upon visibility of lupine (flowering or not), density of vegetation, and the slope of the site.

OPTION 2: Surveyors walk a site spaced a pre-determined distance apart (i.e. 50 feet, 100 feet, etc.). Each surveyor will be conducting a strip transect. Depending upon the distance between surveyors and density of vegetation, not all areas will be observed by a surveyor

(a percentage of a site will be surveyed). The distance between surveyors will depend upon the amount of area to be surveyed in the time available.

OPTION 3: Random Walk Survey for a specified time (5 minutes) that produces a description of what was found and an estimated % coverage of habitat by the survey.

Mapping Lupine Patches: Boundaries of lupine patches should be mapped as accurately as possible. This will assist in conducting future Karner blue butterfly surveys.

When mapping lupine, it may be useful to characterize each site by relative abundance and pattern of lupine distribution. Options for accomplishing these are listed below but are not mandatory:

OPTION A:
- Relative Abundance (estimate)
  - A (Abundant): the dominant ground layer vegetation
  - LA (Locally Abundant): abundant in patches
  - C (Common): frequently encountered
  - O (Occasional): infrequently encountered
  - R (Rare): very few plants seen

OPTION B:
- Estimated No. of Lupine Plants or Clumps
  - 10's
  - 100's
  - 1,000's
  - 10,000+

OPTION C:
- Pattern of Lupine Distribution
  - Continuum from 1-4:

| 1 | 4 |
|---|---|
| scattered patches | uniform throughout |

An estimate on the area of lupine coverage should be made. It is important to know if there are 10,000+ lupine plants in a one acre area versus a 10 acre area.

Low Potential Survey Areas: Since it will be impossible for most partners to survey all land holdings, the following list of low potential survey areas is provided:

- wetlands, or areas flooded for most of the growing season

*- forests with dense canopy (>75%), which could be determined by aerial photo interpretation of forest stands with a continuous canopy >75%, categorized as pole or saw timber sized stands having 3-prime density class

- sites on non-sandy soils

- cultivated or otherwise developed areas supporting no native vegetation

* NOTE: Lupine may occur in forests with greater than 75% canopy especially when the forest is adjacent to a lupine patch. Lupine may not flower in such areas and thus may be difficult to detect.

Auditing: Recommend written documentation by the surveyor on who did what, when, and where. This is important since various survey methods will be used. This requires either a standardized form or standardized requirements for what information must be reported.

## 2. Level II. Butterfly Presence/Absence Monitoring

The following protocol is taken from Appendix III of the Wildlife Management Guidelines for the Karner Blue Butterfly developed by the Wisconsin DNR Karner Blue Butterfly Technical Team as revised with information from the Biological Subteam of the Wisconsin Statewide HCP (May, 1998 Revision and January, 1999 Revision). The protocol was originally developed by the HCP Monitoring Subteam for the 1995 field season.

Purpose: To determine if Karner blue butterflies occupy a particular habitat area (lupine and surrounding nectar species). The following are s*uggested minimum requirements* for conducting Karner blue butterfly (*Lycaeides melissa samuelis*) presence and/or absence surveys. For the purpose of this survey, "absence" means that Karner blue butterflies were not detected at a particular site. It is not a 100% guarantee that Karner blue butterflies do not exist at the site.

When To Survey:

- Surveys for the Karner blue butterfly can be conducted during both the first or second flight periods. The first flight normally begins in late May and ends in mid- to late June, while the second flight normally begins in mid-July and ends in mid- to late August.

- Timing of flight periods can vary by as much as 2-3 weeks from year-to-year and/or from site-to-site.

- The length of flight periods may also vary from year-to-year (2-5 weeks in length).

- If resources do not allow you to conduct surveys during both flights, priority should be placed on conducting surveys during the main second flight (see "Determination of No Karner blue butterflies" listed below).

- Only one survey is needed if Karner blue butterflies are detected during the first survey. If you do not detect Karner blue butterflies during the first survey, a second survey should be conducted. If Karner blue butterflies are not detected during the second survey, a third survey should be conducted. One of these surveys may be conducted during the first flight period. Surveys during second flight should be spaced so that there is a 3-7 day interval between them.

- Conduct surveys during optimal time and weather conditions as listed below:
    - between 8:00 a.m. and 6:00 p.m.
    - when temperatures are above $60^0$ F
    - when temperatures are between $60^0$ F and $70^0$ F surveys should only be conducted under mostly sunny skies with calm to light wind
    - when temperatures are above $70^0$ F, no restrictions on cloud cover
    - when winds are less than 20 mph
    - do not survey under drizzly or rainy conditions

How To Survey: An individual who is knowledgeable in the identification of Karner blue butterflies should conduct the surveys. It is recommended that individuals conducting surveys obtain training in identifying Karner blue butterflies offered by DNR Karner blue butterfly biologists. An alternative to this is having DNR or USFWS staff positively identify a voucher photograph. Photograph must capture underside of wing for positive identification. Identification photos of Karner blue butterflies may be obtained from the Bureau of Endangered Resources.

- The Karner blue butterfly habitat area (lupine and associated nectar species) should be identified ahead of time when possible.

- If a site is chosen for Level II Monitoring only, the surveyor(s) should walk the entire habitat area at a leisurely pace until all likely locations of Karner blue butterfly concentration areas are surveyed OR surveyors may cover the area by walking transects to look for the butterflies. The purpose of the survey is fulfilled when one Karner blue butterfly is observed (during either the first or second flight period).

- If a site is chosen for both Level II and Level III Monitoring, surveyors may conduct one of the three required Level II surveys during first flight, as above. Second flight surveys should follow the protocol for Level III monitoring. Once the first Karner blue butterfly is encountered during a second flight survey, proceed to count butterflies along the

transects, i.e., Level III Monitoring has begun.

- Karner blue butterflies observed outside the site boundary that can be positively identified as Karner blue butterflies from within the site can be counted for that site.

Intensity Of Survey:

- Approximately 10 minutes of effort per survey are recommended for each acre of habitat (i.e. lupine patches and important nectar flowers within 50 meters of the lupine patch) to determine presence/absence. If a Karner blue butterfly is quickly spotted, it is not necessary to spend 10 minutes per acre of habitat. Surveying for a longer period of time is encouraged (but not mandatory) if Karner blue butterflies are not found during the first 10 minutes of survey effort per acre of habitat.

Determination Of No Karner Blue Butterflies:

- The determination that no Karner blue butterflies are present at a site can be made once the site has been surveyed (without documenting any Karner blue butterflies) three times during one year. One of these surveys may have been made during the first flight period. Surveys should be spaced so that there is a 3-7 day interval between surveys. Once one Karner blue butterfly is observed the purpose of the survey is fulfilled and additional surveys are not required.

General Information:

- The "Determination of No Karner blue butterflies" is based primarily on surveys during the second flight since Karner blue butterfly numbers are usually greater during this flight period.

- Karner blue butterfly flight periods vary within the year from site-to-site depending on the site's phenology (i.e. "fast" sites and "slow" sites). Flight periods normally occur first on sunny open sites and later on shady sites. Spacing of the surveys is necessary to ensure that at least one survey is conducted during the peak of the main flight. A 3-7 day range is used because the duration and amount of suitable survey weather varies among years.

- The Karner blue butterfly hotline has been initiated to inform surveyors across the range of the butterfly in Wisconsin of the status of the flight period in different geographic areas. Variations between sites within an area however, must be considered by the land managers familiar with the sites to decide which may be “fast” or “slow” and plan survey work accordingly.

- Auditing: Recommend written documentation by the surveyor on who did what, when, and where, and under what field conditions (weather, lupine condition). This will require either a standardized form or standardized requirements for what information must be reported. Recommend also that the HCP Team provide written documentation of the annual Karner blue butterfly phenology.

- Time Period of Effectiveness of Results: The presence/absence survey has both a spatial and temporal component (i.e. absent here now but present here later). The question - How long does the absent status apply? - will need to be addressed.

### 3. Level III. Karner Blue Butterfly Relative Abundance Monitoring

The following protocol was developed by the HCP Monitoring Subcommittee April 3, 1998 and revised January, 1999.

Definition: This type of monitoring will result in a yearly relative abundance index for Karner blue butterflies across the Wisconsin range. Relative abundance is a term often used to mean the number of individuals of one species relative to the number of individuals of all species present. The term "relative abundance index" is defined here as a number or index of Karner blue butterflies relative to the total abundance of Karner blue butterflies present. The statewide index is a combination of the relative abundance indices from all sites sampled. These indices are not comparable between sites and should not be used to assess Karner blue butterfly relative abundance or habitat quality between one site and another.

Relative Abundance Index Measure:

The site index is measured by counting the number of butterflies observed per meter of transect covered. All butterflies identified as Karner blues, no matter what distance from the transect, will be recorded. Karner blue butterflies outside the site boundary that can be positively identified from within the site will be counted. The site index is the sum of the two counts from the two required visits.

Site Visits and Peak Flight Period:

Visit a site two times to count Karner blue butterflies during the peak second flight period with 7 or more days between visits. The DNR will maintain a regularly-updated Karner blue butterfly flight period hotline for the dissemination of information on the flight periods in the state. Calling this hotline at least every two days after the flight period begins will assure the best opportunity to be informed on the progress of the flight. The date of peak flight is estimated by observation of Karner blue butterfly numbers and the ratio of males to females observed as the flight period proceeds. Optimum timing of the two visits would occur within a period extending 4-5 days before and after the date of peak flight.

Karner Blue Butterfly Habitat Defined:

Karner blue butterfly habitat is defined as those areas likely to support Karner blue butterflies and consisting of areas of lupine and associated patches of nectar plants within 50 meters of lupine.

Site Reconnaissance:

Map habitat elements (lupine/nectar concentrations and corresponding Karner blue butterfly concentration areas) and habitat subunits (areas of varied management, ROW opening to forest edge, open prairie to semi-open savanna or barrens). Determine boundaries of subunits and site. In some cases, flagging of habitat elements is recommended early in the season to better locate lupine or feeding areas during second flight. Note: second flight nectar sources may not have been noticeable early in the season but sunny openings, road or trail edges, log piling areas, nearby old field habitats, etc. may give clues to the location of a diversity of flowering plants and thus butterflies feeding during second flight.

Weather Conditions:

Conduct surveys on warm, sunny days when butterflies are active. Avoid surveying when the following conditions are present *on site*: cloudy days with temperatures below $65^{o}$ F, mid-day hours on very hot days**,** i.e. above $85^{o}$ F. (butterflies may be so active that identification is difficult or butterflies may be very inactive), damp early mornings, days of drizzle or rain, windy days, i.e. above 18 mph. Plan ahead to take advantage of optimum weather conditions when they appear during the peak flight period to avoid resorting to surveys under poor conditions for the second counts.

Transect Method:

Straight line transects will be used running parallel across the entire Karner blue butterfly habitat of the site. A site may include more than one habitat patch which may best be addressed with separate sets of parallel transects.

Transect Placement:

Transects are placed across all cover types (shrubby, open grassy, wooded, road or trailside, etc.) within the Karner blue butterfly *habitat* on the site. Parallel transects are placed to allow an equal opportunity to observe butterflies on all portions of the habitat, in spite of any subjective determination of the observer as to "good" habitat. Parallel transects should be established across the habitat on the site until the entire habitat (or complex of habitat patches) is covered.

Weather conditions vary considerably between sites and at different times of day. Transect direction relative to the sun affecting the ability of the observer to see Karner blue butterflies and transect direction relative to the wind affecting Karner blue butterfly behavior are elements that should be considered when placing transects on the day of the count on sites where variation in direction of transects is an option (ROW transect placement in most cases must parallel the right-of-way). Other site conditions to be considered are site size, topography, and the presence of dense shrubs, surface waters, or other elements creating walking hazards on the site. The first transect at a habitat patch on the site is chosen by walking a random number of paces from the corner of the habitat patch within 20 meters of the corner and establishing the end of the transect.

Transect Spacing:

Transect spacing of 20 meters at each site will allow for a consistent index per site in spite of habitat differences. This distance is great enough to expect that all butterflies observed along one transect will not be observed along the next (butterfly movement being an uncontrollable variable) and is beyond the effective distance for identification and count of butterflies (usually assumed to be 6-8 feet).

Transect Distance:

The total transect distance will vary according to the size of the site. Larger sites will require more and/or longer transects in order to cover the entire habitat on the site. Transect spacing will remain the same.

Number of Counters at a Site:

In order to minimize double counting, flushing butterflies, and other complications introduced by multiple observers, the number of persons counting Karner blue butterflies along one transect is limited to one. A recorder may follow the person counting butterflies. Multiple counters are acceptable walking separate transects on the same site.

Certification of Butterfly Counters:

All persons collecting field data for relative abundance monitoring must have attended a training session to be conducted by certified trainers versed in monitoring protocols and experienced with Karner blue butterfly biology, behavior, and habitat requirements. One or more training sessions will be offered during the first flight period (late May-early June) each year as need dictates. The training will cover protocol procedures, Karner blue butterfly identification, issues of variability in habitat, habitat elements, Karner blue butterfly behavior, etc. It is mandatory for previously certified field personnel to undergo refresher training at least once every five years.[B] Certified trainers will be available in each of three geographic areas of the range.

Relative Abundance Monitoring Report Form:

The following information is requested of partners to be reported on the report form:

- Date, Time Began, Time Finished, Total Time Spent Counting, %Time Sun Shining.

- Air Temperature, Wind Speed, %Cloud Cover at beginning and end of counting period.

- Site Name/Site Code; Partner/Landowner Name; Observer Name; County, T/R/S, Location; Management Strategy for the Site; Site Size: Acreage or Linear Dimension, Number of Habitat Patches, Total Transect Length; Number of Butterflies Counted: males, females, (gender opt.), unknown; Second Flight Nectar Available: Type and General Abundance Estimate.

[a] Clarification A
[A] Amendment A
[B] Amendment B