

Appendix B.
Determination of Baseline Responsibilities:
Karner Blue Butterfly (*Lycaeides melissa samuelis*), Frosted Elfin (*Callophrys irus*),
and Persius duskywing (*Erynnis persius*)
Abundance and Habitat Monitoring Methods

I. Background and Introduction

Determining baseline responsibilities for properties enrolled in Safe Harbor Agreements (SHA) is paramount for successful implementation of the program. The following methods are recommended to determine baseline conditions of a given property prior to the owner (Cooperator) entering into a Cooperative Agreement with The Nature Conservancy (TNC) under TNC's umbrella SHA for the Karner blue butterfly (*Lycaeides melissa samuelis*), and will be useful to determine if any responsibilities exist regarding the New York State endangered Persius duskywing (*Erynnis persius*) or threatened frosted elfin butterfly (*Callophrys irus*), hereafter referred to as "butterflies," in New York State. The Nature Conservancy is responsible for establishing baseline conditions. However, the U.S. Fish and Wildlife Service (Service) and New York State Department of Environmental Conservation (State) shall assist in certain situations (see below).

Feeding

All of these butterflies are closely tied to wild blue lupine (*Lupinus perennis*).

Frosted elfin lay their eggs singly on flower buds of lupine. When the caterpillars emerge, they feed on flower parts and immature seed pods of the wild blue lupine. Certain populations of frosted elfin will also feed on wild indigo (*Baptisia australis*) and occasionally on blue false indigo (*B. australis*) and rattlebox (*Crotalaria sagittalis*). After the caterpillars finish feeding, they form a chrysalis in the soil or duff layer where they overwinter.

Persius duskywing females lay eggs singly on the undersides of lupine leaves. The larvae roll the leaves into a tube to shelter in while feeding inside. Feeding ends in July, and larvae remain in diapause until spring when they pupate (NatureServe 2009).

Karner blue butterflies lay their eggs singly on lupine plants, or occasionally on other plants or leaf litter close to lupine. Karner blue butterfly larvae feed solely on wild blue lupine leaves and stems.

Movement

Karner blue butterflies have generally been observed to conduct localized movements of approximately ≤ 200 meters (Service 2003). Therefore, the Service and State define "occupied" habitat to include all lupine patches directly observed to be occupied by the butterflies, as well as all additional lupine, whether any of the butterflies were directly observed during surveys or not,

within 200 meters of those patches. Therefore, all lupine within 200 meters of each other will be considered as one functioning patch. The definition of “occupied” habitat also may include suitable nectar plants (plants that provide nectar to small butterflies and that bloom during the first and/or second flight periods) and grassy areas (areas not regularly mowed during the growing season) that provide shelter for the butterflies within a lupine patch and extending 200 meters from the edge of a lupine patch.

The State and Service shall determine whether areas without lupine, but containing nectar within 200 meters of occupied lupine, are considered occupied. Frosted elfins appear to have even smaller home ranges than Karner blue (Williams pers. comm. 2007). There is little information on *Persius duskywing* movement or dispersal. Until more definitive studies are done, New York State considers the 200 meter rule for Karner blue occupation to serve for *Persius duskywing* and frosted elfin occupation (O’Brien, pers. comm. 2009).

All baseline habitat boundaries will be delineated using a Global Positioning System. The quantity (acreage) and quality (using TNC’s viability criteria) of baseline habitat will be recorded.

Determining Baseline and Baseline Responsibilities

- If no wild blue lupine or potential nectar plants are present, the baseline is 0 acres of butterfly habitat.
- If no wild blue lupine is present, but potential nectar plants are present and the site is greater than 200 meters from any occupied lupine sites, the baseline is 0 acres of butterfly habitat.
- If no wild blue lupine is present, but potential nectar plants are present and the site is within 200 meters of an occupied lupine site:
 - the Cooperator can assume presence of butterflies and the baseline is X acres of nectar habitat; OR
 - the Cooperator can conduct surveys of the nectar habitat to determine likely use of the area by butterflies. Please note that in some circumstances, the Service and State will assume presence of butterflies based on nectar availability and quality around the occupied lupine site. In cases where the majority of nectar for butterflies occurs within the Cooperator’s property, negative survey results would not change our assumption.
- If wild blue lupine is present and within 200 meters of an occupied lupine site, the Service and State consider the site occupied.
- If wild blue lupine is present, but greater than 200 meters from an occupied lupine site:

- the Cooperator can assume presence of butterflies and, therefore, the site will be considered occupied; OR
- the Cooperator can conduct butterfly surveys as described below.

II. Recommended Baseline Survey Methods

Butterfly surveys should be conducted in the following four-step process:

- Conduct preliminary site assessment;
- Conduct lupine and nectar surveys;
- Monitor for butterfly presence; and
- Continue monitoring for relative butterfly abundance (optional but recommended).

Site Assessment Protocols

Preliminary site assessments are needed to identify potential butterfly habitat and shall be conducted before the first butterfly survey to identify which portions of a given site should be surveyed for wild lupine, nectar plants, and the butterflies. These assessments involve conducting a general field survey of the site and broadly mapping site features including ecological communities, improved areas, and infrastructure. The map should indicate areas to be excluded and areas to be included as potential butterfly survey areas.

Lupine is generally found in more open areas; however, plants can continue to survive for periods of time in more closed-canopy situations. Therefore, all areas with well-drained, predominantly sandy, or other well-drained soils should be surveyed, except for those listed below.

Areas to exclude from future surveys include:

- Active row-cropped agricultural lands;
- Paved developed areas (buildings, roads, etc.);
- Other non-sandy or poorly drained soil areas;
- Areas regularly mowed during the growing season (lawns); or
- Areas with >50% canopy cover (only if there are no openings, trails, or paths through such areas).

Habitat may exist directly adjacent to, or outside the footprint of, the above-listed areas, and should be surveyed for lupine, nectar, and the butterflies.

Lupine and Nectar Survey Protocols

Surveys for wild lupine may be conducted prior to surveying for butterflies, in conjunction with the site assessment, to expedite butterfly surveys or you may choose to initially survey for both wild lupine and the butterflies at the same time. An individual who is knowledgeable in the

identification of lupine should conduct the surveys. We provide the following guidance on when to survey for lupine:

- 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 should be conducted from late May through mid-July.

While lupine is essential for butterfly larvae, adult butterflies rely on a variety of other plants as nectar sources. Potential nectar plants will provide nectar to small butterflies and bloom during the first and/or second flight periods. Please refer to Appendix C of the Karner Blue Butterfly Recovery Plan (Service 2003) for a list of potential nectar sources.

To adequately assess the site, both wild lupine and nectar areas should be mapped as accurately as possible. In addition, descriptions of the lupine patches (*e.g.*, estimated size and number of lupine stems within a patch) should be provided. Provide a list of the observed nectar plants and include descriptions on the map (*e.g.*, where vigorous, dense clusters of plants were observed, where nectar plants were scattered throughout, etc.).

Butterfly Survey Protocols

Frosted elfin butterflies have one brood per year and, therefore, one flight per year, from late April through May and possibly into early June. The Persius duskywing also has one brood from late April to very early June. The Karner blue butterfly has two broods and flight periods per year; the first flight normally begins in mid- to late May and ends in mid- to late June and the second flight normally begins in early to mid-July and ends in mid-August. However, the timing of all these flight periods can vary by as much as 2-3 weeks from year to year and/or site to site due to weather and microclimatic influences. The length of the flight periods may also vary from year to year (generally 2-5 weeks). Since it cannot be known when the flight periods commence until field observers begin to report sightings of the butterflies, discussions with the Service/State are necessary prior to conducting surveys for either species to refine the survey window for any particular year.

Surveys shall be conducted by TNC or an individual knowledgeable in identification of the butterflies (for Karner blue, see descriptions and photographs in the Recovery Plan for the Karner blue butterfly attached below). Identification photographs of all three butterflies can also be obtained from the State/Service. However, note that confirmation of Persius duskywing cannot be done visually at this time.

Please note that scientific collector permits are required by the State for butterfly surveys. Please allow for adequate processing time to ensure that permits are in place prior to the first flight period.

Determining Butterfly Presence: Intensive Search Method

Karner Blue and Frosted Elfin

- Survey all potential habitat areas for the butterflies. This includes all lupine patches as well as nectar and grassy areas that may provide adult food and/or shelter for butterflies.
 - All of the lupine, nectar, and nearby grass habitat should be carefully searched by slowly walking over it, gently prodding vegetation with a butterfly net or meter stick, and/or stopping frequently and scanning the area for movement. The search should criss-cross all of the potential habitat area until the surveyor can be confident that all potential habitats have been searched. If more than five individuals are found, a zigzag transect may be done in later surveys to establish relative butterfly abundance (see Zigzag Transect Methods below).
- To determine butterfly presence, conduct a minimum of 5 surveys per Karner blue butterfly flight period with a total of 10 surveys needed to establish baseline conditions for the Karner blue butterfly (weather permitting) (call the State to confirm the start and finish of flight periods at nearby locations). Please Note: At least 2 of the surveys should be conducted during the last two weeks of May to overlap with the frosted elfin flight period. The remaining 3 first flight surveys must occur in early June (as stated above, coordinate with Service/State regarding survey windows).
- Conduct all 5 first flight period surveys until both species of butterfly are observed (or all surveys complete).
- If neither species are observed during the first flight, continue with second flight surveys until Karner blue butterflies are observed (or all 5 second flight surveys are complete).
- We recommend conducting all 10 surveys, even if butterfly presence is documented during an earlier survey, to document the use of nectar areas and get the best possible peak count of butterflies within each flight period. This will assist the Service/State with determining an initial index count of butterflies within the site that can be monitored over time to determine the effects of the management actions.
- Visits should be spaced every 2-5 days.
- Conduct surveys during optimal time and weather conditions as listed below:
 - between 8:00 a.m. and 6:00 p.m.
 - when temperatures are 65-95°F
 - when temperatures are between 65-70°F, surveys should only be conducted under mostly sunny skies with calm to light wind
 - when temperatures are above 70°F, no restrictions on cloud cover

- when eye-level winds are less than 20 mph
- Additional weather notes:
 - do not survey under drizzly or rainy conditions; however, surveys can continue through very light rain if the sun is shining and the temperature is 75°F or higher. Please Note: No more than 1 site visit per flight period should occur under these conditions.
 - delay surveying after heavy rain until the vegetation and the butterflies have had a chance to dry.
 - if suboptimal weather conditions continue for extended periods, contact the Service/State for guidance.
- Time Keeping
 - Record the duration of each survey. For sites with more than one transect, record duration of each transect and provide a total time (and total butterflies) as a separate data sheet entry. Duration must be recorded to the second. Do not round off minutes! Record time of day in military time. Record the time of day you visit the site even if you use a stop watch to time the duration. If you are not using a stopwatch, record your start time and end times in military time and include the second (e.g. 1417:00 - 1418:23). It helps to start at 00 seconds or 30 seconds to make it easier to calculate duration. Include duration of search even for zigzag and exhaustive searches.

Determining Relative Butterfly Abundance at Occupied Sites: Zigzag Transects Method

- Establishing Transects
 - As reported in McCabe (1993), zigzag transects should be designed to cover each site. Transects should remain constant from day to day and for both broods. If monitoring longer term, transects should also remain constant from year to year so that data can be accurately compared through time. If the transect needs to be expanded (i.e., due to expansion of lupine population), it should be segmented so that data collected from the original transect can continue to be compared to that of previous years.
 - The distance between zigzags shall be sufficient to avoid counting an individual butterfly more than once. The distance between zigzags can be increased in areas where high butterfly densities would have resulted in many butterflies being counted more than once.
 - If the zigzag method is employed and surveys do not pick up butterflies regularly, abundance cannot be determined using this method (consult with State).

- Standard Methods

- Observers walk at a comfortable pace gently swinging a butterfly net above the vegetation to stir the butterflies into motion. All butterflies seen, both at rest and in flight, are counted and their numbers recorded on a data sheet. Butterflies that fly into areas not yet walked are to be counted only if they fly no further than one zigzag ahead. Butterflies which fly farther than one zigzag ahead are left to be counted later in the walk-through (McCabe 1993). Butterflies that fly out of the census area are counted.
- The sex of a butterfly should be recorded during the walk if it is obvious to the observer (i.e., a butterfly sitting in the path of the observer with its wings open). However, sexing butterflies during the transect walk should be done judiciously so as not to change the length of time necessary to walk the site or introduce inaccuracies caused by losing track of counted butterflies. A separate walk-through should be conducted in order to determine the sex ratio of the butterflies.
- After completing the transect walk and sex ratio determination, Karner blue butterfly nectar species should be noted and the number of butterflies observed to be nectaring recorded. Other plants in bloom and weather notes should also be recorded on the data sheet.
- Follow weather and time protocols listed above.
- Marked transects may be along a continuous line or in zigzags, as long as they cover the entire potential habitat on a site.
- Keep eyes forward a short distance ahead, but regularly glance toward your feet and about 10 feet ahead. This will help you to stay on the transect and avoid trampling too much lupine. Also sometimes the butterflies won't fly up as you step over them.
- Keep walking at a steady pace, about one heart beat per step. Avoid the tendency to slow down as you get into a lot of butterflies and speed up when there isn't much lupine. If you wander off the transect route by more than a few feet, start over again. Do not try to slow down or speed up to keep your time exactly the same, but practice your pace to try to keep it steady enough that you are doing the transect within 10-15 seconds of the same duration each time.
- **NOTE: CENSUS NUMBERS SHOULD NOT BE INTERPRETED AS THE ABSOLUTE NUMBER OF KARNER BLUE BUTTERFLIES IN A GIVEN SUB-POPULATION. RATHER THEY REPRESENT AN INDEX FOR THE SIZE OF AN INDIVIDUAL SUBPOPULATION THAT CAN BE COMPARED FROM YEAR TO YEAR. ONLY IN INSTANCES WHERE THE SUBPOPULATION IS QUITE SMALL AND CONFINED TO A WELL-DEFINED AREA THAT CAN BE CENSUSED THOROUGHLY DO CENSUS NUMBERS APPROACH THE**

ABSOLUTE NUMBER OF KARNER BLUES IN A GIVEN SUBPOPULATION AT A GIVEN DAY.

- Zigzag surveys (for sites too small to effectively monitor with marked transects)
 - Monitors should strive to walk the same areas each time, but essentially should cover the entire habitat without counting butterflies twice. The zigzag surveys for unmarked transects should be done as described above for marked transects.

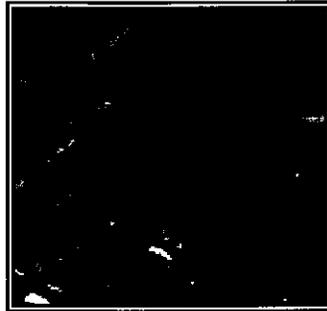
III. Recommended Annual Monitoring Methods

Sites that are part of the SHA should be monitored on an annual basis in a manner similar to all other annually monitored sites by TNC and the State. Research is currently underway to determine the best monitoring techniques and so our recommendations for annual monitoring may change within a few years based on the results of that research. Until the research is completed, sites should be monitored for Karner blue with the marked transect or zigzag transect methods described above and for frosted elfin as presence/absence surveys. Currently sites monitored by TNC and the State are visited throughout the entire extent of both flights to determine when the peak abundance for each flight occurs. At a minimum, we recommend 5 surveys for each flight (total of 10 surveys). Visits should be spaced so that no more than 2 days pass between visits unless weather is unsuitable. This survey effort should be sufficient to capture the peak events.

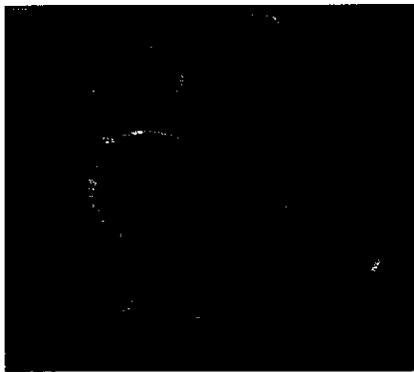
Similar Species

- Karner blue butterfly
 - There are three blue butterflies similar in appearance to Karner blue butterfly that may be present in Karner blue butterfly sites during both adult flights – the eastern tailed blue (*Everes comyntas*), spring azure (*Celastrina ladon*), and silvery blue (*Glaucopsyche lygdamus*). (See photographs provided below.)
 - Eastern tailed males are blue on the upper side of the wings like male Karner blues, but have small orange dots at the bottom of the upper side of the hindwing. Female eastern tailed blues are similar to female Karner blues except that the orange on the upper side of the hind wing is limited to a few small dots instead of the row of orange crescents along the entire edge of the hindwing. In both sexes, the underside of the wings looks similar to Karner blues except the Karner blue has a row of orange crescents that line the entire edge of the hindwing and sometimes part of the forewing. Eastern tailed blues have only 2 or 3 small orange dots at the bottom of the hindwing. The Eastern tailed blue has slender projection or “tails” at the bottom of hindwing, but these may be difficult to see or broken off.

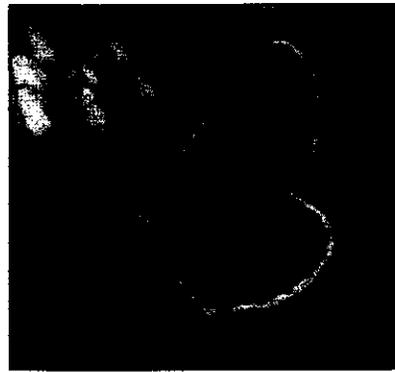
- Both sexes of spring azures are blue on the upper side of the wings, but have a larger blue margin, especially the females. The underside of the wings has no orange dots or crescents. Spring azures are very likely to fly high up and fly off into tree canopies while Karner blues will do so very infrequently. This behavior is not enough to confirm identification, however.
 - Like the spring azure, the silvery blue has black dots, but no orange on the underwings. The upper wings are a pale blue.
 - Wing markings are extremely difficult to see while the animals are in flight. At sites where Karner blue butterfly presence is not documented or where numbers are known to be very low, blue butterflies must be closely observed for field markings when perched or else captured in nets and seen through the net or placed in a clear jar for confirmation. An unknown blue butterfly should not be recorded as a Karner blue unless it is confirmed. However, a blue butterfly that was not identified should be noted in the field data sheet.
- Frosted elfin butterfly
 - Frosted elfins are brown butterflies, 1" to 1-1/4" in size. They can be identified at close range by a black spot above a short tail stump on the hindwing. They are named for the gray "frosting" on the hindwing. They can easily be confused with both the hoary elfin (*Callophrys polios*), eastern pine elfin (*C. niphon*), and Henry's elfin (*C. henrici*). Transect monitoring described for Karner blue would not be appropriate for frosted elfin because of the greater difficulty in identification. Presence/absence monitoring can be done either earlier than or in conjunction with Karner blue first brood monitoring. Monitors should walk around the site and capture potential specimens or view the occasionally cooperative perched butterfly. Potential specimens should be captured with a soft mesh net and observed through the netting or passed into a clear jar for good visibility of field markings and then released. Frosted elfins can be found within lupine patches, but also may be found well outside of patches.
 - Persius duskywing
 - Because of the need for dissection of males to positively identify Persius duskywing, the survey methods described above will not be appropriate for this species. Baseline occupancy will be determined based on proximity to an occupied site. The State's endangered species program will continue to develop sampling methods for this species.



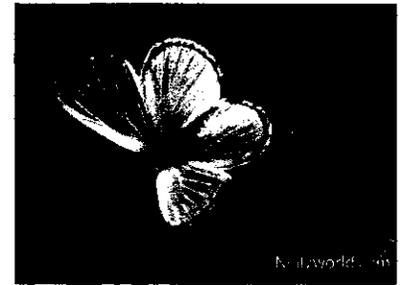
Frosted elfin butterfly – ventral surface
(www.google.com/images)



Female

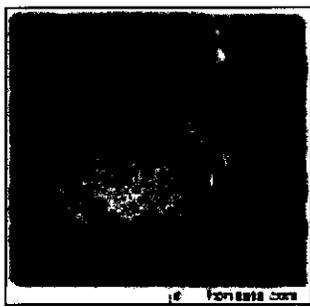


Male



Silvery blue male dorsal surface
(Nielyworld.com)

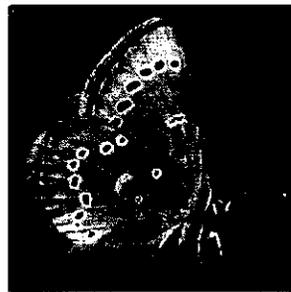
Karner blue butterfly – dorsal view (K. Breisch)



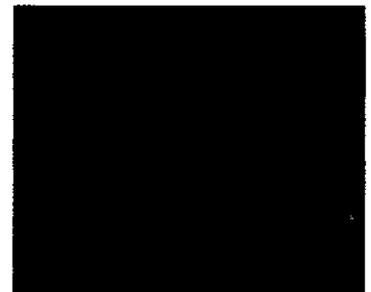
Eastern tailed blue
ventral surface
(www.google.com/images)



Spring azure
ventral surface
(www.google.com/images)



Silvery blue
ventral surface
(E. Nielson)



Karner blue
ventral view
(K. Breisch)

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