

## Species Status Assessment

**Class:** Lepidoptera  
**Family:** Lycaenidae  
**Scientific Name:** *Plebejus melissa samuelis*  
**Common Name:** Karner blue

### Species synopsis:

In New York, the Karner blue butterfly (*Plebejus melissa samuelis*) is considered a subspecies of the Melissa Blue (*Plebejus melissa*) because no published works have revised the taxonomy to elevate this subspecies to species status. Some experts suspect this will prove to be a full species; the number of species in this genus is not well understood (New York Natural Heritage Program 2011).

The Karner Blue is currently found in Minnesota, Wisconsin, Michigan, northern Indiana, New York, Ohio and New Hampshire. The populations in Ohio and New Hampshire have been reintroduced from other states after they had been extirpated. It is still considered extirpated from Illinois, Iowa, Ontario, Pennsylvania, Massachusetts, and Maine..

Currently, the only known occupied sites in New York are clustered in Albany, Schenectady, Saratoga, and Warren Counties and represent remnants of two or three once large metapopulations. Historically there were also specimens, or at least reports from Clayton, Tonawanda, Rome, Sullivan County, and Brooklyn (Shapiro 1974). This species would not persist in New York without active management (New York Natural Heritage Program 2011).

**I. Status**

**a. Current and Legal Protected Status**

- i. **Federal**      Endangered      **Candidate?** N/A
- ii. **New York**      Endangered

**b. Natural Heritage Program Rank**

- i. **Global**      G5T2
- ii. **New York**      S1      **Tracked by NYNHP?** Yes

**Other Rank:**

None

## **Status Discussion:**

The federally and state-listed Karner blue butterfly is completely management-dependent in New York, as is the case in most or all of the remaining portion of the range. Although about 50 subpopulations exist in NY, these cluster into four metapopulations, or recovery units. Of the 50 subpopulations, the vast majority have fewer than 100 butterflies present. This species does not persist well if the total July brood for the metapopulation is fewer than 1,000 adults (New York Natural Heritage Program 2011). The Federal Recovery Plan prescribes a minimum viable meta-population size of at least 3,000 adults in either brood within four of five consecutive years (USFWS 2003). The Plan defines a viable subpopulation as supporting at least 500 adult animals within at least 12.4 acres. To maintain meta-population levels above the minimum recovery thresholds Fuller (2008) determined that a minimum viable meta-population should contain between 7,641 and 12,960 adult butterflies.

More than 10,000 individuals historically occurred at the 300-acre Saratoga Airport during July, but this population has significantly declined to probably less than 1,000. The Saratoga Sandplains Recovery Unit, made up of approximately 140 acres of restored habitat, had estimated second brood populations of greater than 6,000 in 2009 and greater than 17,000 in 2010. The Albany Pine Bush Recovery Unit had an estimated summer brood of 3800 in 2012. Captive rearing has been used successfully in this recovery unit since 2007 to accelerate the colonization of restored habitat. Acquisition of the land base and restoration of habitat is expected to expand both the Saratoga Sandplains and Albany Recovery Units in the near future. Sites in New York that are not actively managed contain fewer than 100 adults.

Since the Federal Listing, this species has apparently been fairly stable in New York, but some small subpopulations have declined or increased slightly. At some sites, the current population sizes are not known (New York Natural Heritage Program 2011).

The Albany area population had declined by over 90% from what it apparently was in the 1970s and the population was probably even higher originally. The site currently supports >5,000 adult butterflies (APBPC unpublished data). The Tonawanda, Brooklyn, and Sullivan County populations are extirpated, as are the Rome and Watertown populations. The Warren County populations are now small remnant colonies (New York Natural Heritage Program 2011). However, the Saratoga Sandplains have seen dramatic increases as a result of management efforts.

According to the U. S. Fish and Wildlife Service (USFWS) (2003), over the past 100 years the Karner blue has declined by 99%, with 90% of that decline occurring in the prior 15 years. As noted above, restoration efforts have increased in two recovery units but only where habitat restoration and just as importantly, maintenance, is occurring regularly.

## **II. Abundance and Distribution Trends**

### **a. North America**

**i. Abundance**

declining  increasing  stable  unknown

**ii. Distribution:**

declining  increasing  stable  unknown

**Time frame considered:** \_\_\_\_\_

Severe decline

**b. Regional**

**i. Abundance**

declining  increasing  stable  unknown

**ii. Distribution:**

declining  increasing  stable  unknown

Severe decline

**Regional Unit Considered:** \_\_\_\_\_ Northeast \_\_\_\_\_

**Time Frame Considered:** \_\_\_\_\_

**c. Adjacent States and Provinces**

**CONNECTICUT**  Not Present   No data \_\_\_\_\_

**i. Abundance**

declining  increasing  stable  unknown

**ii. Distribution:**

declining  increasing  stable  unknown

**Time frame considered:** \_\_\_\_\_

**Listing Status:** None (presumed extirpated) \_\_\_\_\_ **SGCN?** \_\_\_\_\_

**MASSACHUSETTS**                      Not Present   X                        No data       

**i. Abundance**

       declining           increasing                             stable                             unknown

**ii. Distribution:**

       declining           increasing                             stable                             unknown

Time frame considered: \_\_\_\_\_

Listing Status:   None (presumed extirpated)                        SGCN?       

**ONTARIO**                                      Not Present   X                                        No data       

**i. Abundance**

       declining           increasing                                             stable                                             unknown

**ii. Distribution:**

       declining           increasing                                             stable                                             unknown

Time frame considered: \_\_\_\_\_

Listing Status:   None (presumed extirpated)  

**PENNSYLVANIA**                                      Not Present   X                                        No data       

**i. Abundance**

       declining           increasing                                             stable                                             unknown

**ii. Distribution:**

       declining           increasing                                             stable                                             unknown

Time frame considered: \_\_\_\_\_

Listing Status:   None (presumed extirpated)                                        SGCN?

QUEBEC	Not Present	<u> X </u>	No data	_____
VERMONT	Not Present	<u> X </u>	No data	_____
NEW JERSEY	Not Present	<u> X </u>	No data	_____

d. NEW YORK No data \_\_\_\_\_

i. Abundance

\_\_\_\_ declining  X  increasing      \_\_\_\_ stable      \_\_\_\_ unknown

ii. Distribution:

X  declining \_\_\_\_ increasing      \_\_\_\_ stable      \_\_\_\_ unknown  
 Severe decline

Time frame considered: \_\_\_\_\_

**Monitoring in New York.**

Three methods are used to monitor Karner blue butterflies in New York. Some sites have been dropped from monitoring because of lack of manpower or because of the length of time passed since butterflies were last seen.

- 1) Pollard-Yates Index counts using modified Pollard-Yates (PY) methods are now done at fewer sites than in past years both because of a shift to Distance sampling and a shift to searches.
- 2) Distance Distance sampling is the most commonly used method for population estimates. Sites are surveyed in the Albany Pine Bush, Saratoga West, and Saratoga Sandplains.
- 3) Presence/Absence Searches Once numbers have dropped so low that regular transect monitoring is not picking them up, as has happened at many sites, monitors search the entire site for them. This is true for all of the Queensbury Sandplains and Saratoga West sites and many sites in of Albany.

**Trends Discussion:**

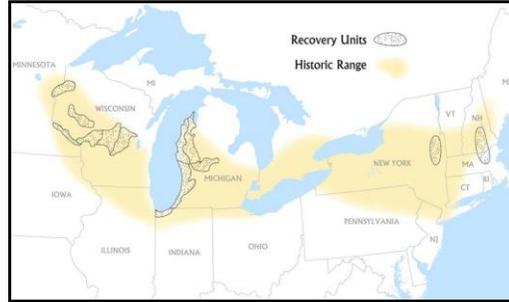


Figure 1. Historic range of the Karner blue butterfly and Federal Recovery Units (Zimmerman and O'Brien 2012).

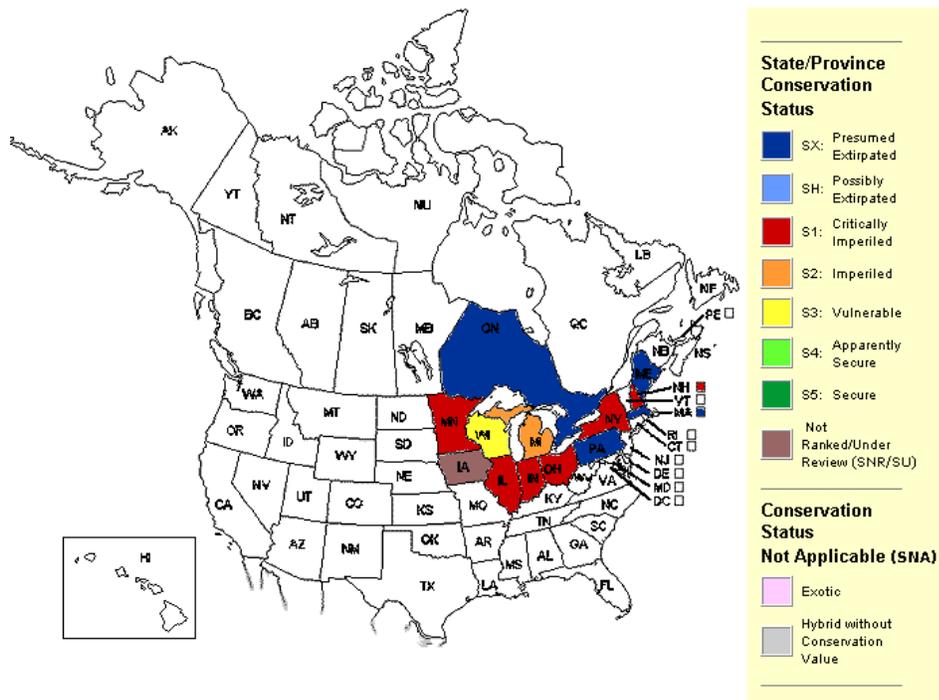


Figure 2. Conservation status of the Karner blue butterfly in North America (NatureServe 2012)

**III. New York Rarity, if known:**

<b>Historic</b>	<b><u># of Animals</u></b>	<b><u># of Locations</u></b>	<b><u>% of State</u></b>
<b>prior to 1970</b>	_____	_____	_____
<b>prior to 1980</b>	_____	_____	_____
<b>prior to 1990</b>	_____	_____	_____

**Details of historic occurrence:**

The Karner blue butterfly was once common in New York (Cryan and Dirig 1978, Dirig 1994). In the Albany area alone, it probably inhabited most of the 25,000 acres of the original Albany Pine Bush, the area from which Karner blues were first described. The Albany Pine Bush area once supported an estimated 17,500 butterflies in one 300 acre site during 1978 (Sommers and Nye 1994). By 1988, only 2,500 acres of the original 25,000 acres remained (Givnish *et al.* 1988), and loss of habitat has continued.

<b><u>Current State</u></b>	<b><u># of Animals</u></b>	<b><u># of Locations</u></b>	<b><u>% of</u></b>
	_____	_____70_____	_____

**Details of current occurrence:**

There are 1-5 elemental occurrence records in New York. Even though there are about 50 subpopulations occupied each year, these cluster into four metapopulations, or recovery units. Of the 50 subpopulations, the vast majority have fewer than 100 butterflies present. There are about 50 sub-eos occupied in New York State each year. Principal element occurrences have not been defined or mapped. The state recovery plan recognizes currently occupied sites in four areas: Albany, Schenectady, Saratoga, and Warren counties (NYSDEC 2013).

The largest metapopulation of the butterfly is at the Saratoga Sandplains Recovery Unit which had an estimated summer brood of 17,000-25000 in 2010. In 2011 and 2012, the number was lower, but analysis of the Distance sampling has not been completed. Additional Karner blue butterfly sites occur in the Saratoga West Recovery Unit and Queensbury Sandplains north of Albany. Metapopulation size estimates for the Albany Pine Bush Recovery Unit were >3,000 in 2012, and >5,000 in 2013 (APBPC unpublished data); the site supports more than 200 acres of suitable habitat and 60 individual sites within 10 sub-populations. Currently identified are 70 Karner blue localities and 56 subpopulations. Of those, 43 subpopulations are within the three recovery areas: 7 in the Albany Pine Bush, 27 in Saratoga Sandplains, and 9 in Saratoga West. Of these 43 subpopulations, only 15 are anticipated to have 8 more than 10 butterflies in the annual index counts. Eight subpopulations are within the Queensbury Sandplains in Warren County, which is considered a location for recovery under the state’s draft recovery plan. Five subpopulations are within Glacial Lake Albany RU, but are isolated from any expected interaction with the sites in the recovery areas. A site is considered occupied until at least five years of adequate survey has failed to find the species.

As a result of considerable conservation efforts by the NYSDEC, USFWS, The Nature Conservancy, the Wilton Wildlife Preserve and Park and the Albany Pine Bush Preserve Commission, metapopulation sizes in the Saratoga Sandplains and Albany Pine Bush currently exceed the minimum federal recovery threshold of 3,000 butterflies in either brood. Both sites have developed recovery plans for their respective recovery units and active management and monitoring programs.

**New York’s Contribution to Species North American Range:**

<b>Distribution</b> (percent of NY where species occurs)	<b>Abundance</b> (within NY distribution)
<input checked="" type="checkbox"/> 0-5%	<input type="checkbox"/> abundant
<input type="checkbox"/> 6-10%	<input type="checkbox"/> common
<input type="checkbox"/> 11-25%	<input type="checkbox"/> fairly common
<input type="checkbox"/> 26-50%	<input checked="" type="checkbox"/> uncommon
<input type="checkbox"/> >50%	<input type="checkbox"/> rare

**NY’s Contribution to North American range**

- 0-5%
- 6-10%
- 11-25%
- 26-50%
- >50%

**Classification of New York Range**

- Core
- Peripheral
- Disjunct

**Distance to core population:**

~900 miles



**V. New York Species Demographics and Life History**

- Breeder in New York**
- Summer Resident**
- Winter Resident**
- Anadromous**
- Non-breeder in New York**
- Summer Resident**
- Winter Resident**
- Catadromous**
- Migratory only**
- Unknown**

**Species Demographics and Life History Discussion:**

Karner blue butterfly larvae feed only on the native lupine (*Lupinus perennis*). The adults take nectar from many kinds of low growing flowers, native or otherwise. The Karner Blue is unlikely to be seen more than a few yards from patches of lupine, although wandering individuals do occur up to a mile or more away from main breeding areas (New York Natural Heritage Program 2011).

The exact phenology varies from year to year and colony to colony. Those in the most open habitats tend to be about a week ahead of those in more wooded places. There are always two annual broods. The eggs overwinter and hatch, but not all at once, around the middle of April. The larvae mature mostly in late May and pupate. Adults emerge in late May to early June and are active for two to three weeks. The eggs from these adults hatch in a few days and the larvae are mostly mature in early July. Second brood adults fly for about three weeks and peak numbers usually occur for about a week in the second half of July. The eggs laid by these adults hatch the following spring (New York Natural Heritage Program 2011). Occasionally, an egg laid by a second brood female may hatch during the second brood and emerge as an adult in August as essentially a “third” brood. Adults may live an average of four to five days, although individuals have been known to live 18 days (Bidwell 1995).

## VI. Threats:

The threats include habitat loss, degradation, and fragmentation, fire suppression, inappropriate management of lupine (*Lupinus perennis*), mosquito spraying and the use of other insecticides, and browsing of lupine by herbivores, primarily deer. There is also a concern that a reduction in winter snow pack and other changes, due to climate change, threaten this species. Such threats could be of particular concern in New York, which has a warmer climate and is farther south than most of the current range for this butterfly.

The primary limiting factors are loss of habitat through development, and canopy closure (succession) without a concomitant restoration of habitat (US Fish & Wildlife Service 2003).

The Karner Blue was classified as “extremely vulnerable” to predicted climate change in an assessment of vulnerability conducted by the New York Natural Heritage Program. The abundance and/or range extent within the geographical area assessed is extremely likely to substantially decrease or disappear by 2050 (Schlesinger et al. 2011).

### **Are there regulatory mechanisms that protect the species or its habitat in New York?**

No       Unknown

Yes

The Karner blue butterfly is protected by its status as state- and federally-listed Endangered.

### **Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:**

The greatest threat to the recovery of the Karner blue butterfly is residential and commercial development which reduces potential habitat and and/or fragments the landscape, preventing subpopulations from interacting Units (Zimmerman and O’Brien 2012).

The second greatest threat to the species is the suppression of natural processes that create and maintain lupine and Karner blue butterfly habitat. This leads to the habitat gradually closing in with trees or other shading vegetation. While lupine may continue to persist for few years, the Karner blue butterfly loses the use of the plants and eventually dies out. Fast growing tree species such as white pine and aspen, and creeping dewberry, a native *Rubus* species, can overgrow lupine and grasses very quickly and form solid canopy shading out everything beneath it (Zimmerman and O’Brien 2012).

Even where habitat is maintained in an open condition, incompatible management and other activities can destroy the ability of lupine or the Kbb to survive. There are several lupine patches along roadsides and on private land in the recovery unit that may be subject to mowing during the growing season. Mowing may crush larvae or deprive them of food. Herbicide application at this time can also kill lupine plants. Additionally, these areas are often used as opportunistic dumping

grounds for yard waste or other debris which buries lupine and encourages the spread of invasive plants (Zimmerman and O'Brien 2012).

Wildfires may occur from careless burning by homeowners, cigarettes dropped along trails or roadsides, repair activities along railroads and right-of-ways which are often near or through Karner blue butterfly habitat, and arson. The impacts from fire are not only from direct burning of vegetation and butterfly, but also from crushing by firefighting equipment and personnel that work on the fire (Zimmerman and O'Brien 2012).

Pesticide use can also be a direct threat to Karner blue butterflies themselves. In the past in the Town of Wilton, aerial spraying for mosquitoes was routinely done for several years. Aerial sprays with adulticides, such as Scourge, could wipe out or seriously damage Karner subpopulations if not regulated. At present use of aerial spraying has been discontinued in Wilton. However, in the future more conflicts could arise if West Nile Virus or other mosquito-borne diseases prompt spraying in more areas. Karner blue butterfly larvae are also susceptible to *Bacillus thuringiensis* (Bt), which is often used to "control" gypsy moths. Currently, NYSDEC prohibits aerial spraying within 100 feet of a Karner blue butterfly subpopulation. Hand or truck spraying of pesticides by landowners is much more difficult to control and may pose a threat to small subpopulations. Individual landowners may contract for aerial spraying of their own property without permits from the Town of Wilton, meaning spraying may take place without the knowledge of authorities working to protect the species (Zimmerman and O'Brien 2012).

Besides facing human activities and competition from other plants, lupine (and thus the Karner blue butterfly) is also impacted by wildlife. Lupine flowers and leaves are often eaten by deer (*Odocoileus virginianus*), wood chucks (*Marmota monax*), and rabbits (*Sylvilagus floridanus*). Feeding deer may pull young plants right out of the ground. Loss of plants and flowers reduces the ability of lupine to spread and maintain a continual recruitment of new plants. Over a period of time a patch may die out entirely. Browse on lupine and other flowers also deprives the butterflies of nectar sources during the adult flights (Zimmerman and O'Brien 2012).

In 2007, a species of exotic thrips (*Odontothrips loti*) was discovered at some sites in the Saratoga Sandplains Recovery Unit. Shortly after, it was found in the adjacent newly restored habitat. It has since been found at several other sites. This thrips feeds in the developing flower bud and can deform the flower and stem, resulting in reduced seed production. It may also cause leaves to be stunted and yellow. This thrips is apparently very easily spread by contamination of clothing and boots, and this may be one of the mechanisms that can account for its spread to individual sites in all three of the northern Recovery Units. At this time it is not known what degree of threat it poses (Zimmerman and O'Brien 2012).

Other invertebrate herbivores that feed on lupine may pose a threat to Karner blue butterflies if they out-compete larvae for food, cause lupine to senesce early, or interfere with flowering and seed production. In some years, heavy aphid (Aphididae) infestations become evident on many lupine plants. The introduced helical bagworm (*Apterona crenulla*) affects many lupine plants in the Albany Pine Bush. Mildew (*Erysiphe polygoni*) appears on lupine leaves in early summer. There may

be other diseases that attack lupine that are, as yet, unknown. The degree to which any of these infestations affect the quality of lupine as larval food is unknown, as are their long-term effects on lupine survival (Zimmerman and O'Brien 2012).

Many species of invasive plants may out-compete lupine and other components of Karner blue butterfly habitat. Other problem species are Oriental bittersweet (*Celastrus orbiculatus*) and spotted knapweed (*Centaurea stoebe*). Black locust (*Robinia pseudoacacia*) is a particularly problematic species in the Albany Pine Bush Recovery Unit. Other species that may become problems as they take hold in the region include Japanese knotweed, swallow-wort, garlic mustard, and invasive grasses (Zimmerman and O'Brien 2012).

Weather events such as heavy rainstorms and high winds can affect Karner blue butterflies by limiting their mobility as well as by physically battering them. Low temperatures can delay larval development and limit adult activity. Drought can decrease lupine growth and may accelerate senescence, affecting larval feeding. Winters with little insulating snowpack and low temperatures may affect egg survival. Populations at sites which are relatively uniform in character may be more vulnerable to a single weather event than those at sites which have a diversity of microhabitat (Zimmerman and O'Brien 2012)

## VII. References

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