

***Lycaeides melissa samuelis* Nabokov, 1944**
Karner Blue
(Lycaenidae: Polyommatae: Polyommataini)

Profile prepared by Scott Hoffman Black and Mace Vaughan
The Xerces Society for Invertebrate Conservation

SUMMARY

The Karner Blue differs from many other federally listed butterflies in that it is geographically widespread and in some areas it continues to be locally abundant. Despite its 1,000 mile wide distribution, the butterfly is limited to small patches of dynamic successional habitat that support its exclusive larval hostplant, wild (or sundial) lupine. Much of its original savanna or barrens habitat has been destroyed by development or degraded by succession. The presence of wild lupine is essential to the survival of the Karner Blue.

CONSERVATION STATUS

Xerces Red List Status: Critically Imperiled

Other Rankings:

Canada – Species at Risk Act:	Extirpated
Canada – provincial status:	ON: Endangered
Mexico:	N/A
USA – Endangered Species Act:	Endangered
USA – state status:	IL, ME, MN, NH, NY, OH: Endangered; MI: Threatened
NatureServe:	G5T2 (01Sep1998)
IUCN Red List:	N/A

SPECIES PROFILE

DESCRIPTION

The Karner Blue is a member of the genus *Lycaeides*, in the family Lycaenidae (gossamer-wing butterflies). It has a wingspan of about one inch. The upper surface of the male is blue, with a black edge and white outer fringe. The female is similar but more brown or grayish in color, with a row of dark spots with orange crescents along the wing

margins. The underside of both is similar: a slate gray background with several marginal rows of orange and black spots.

TAXONOMIC STATUS

Lycaeides melissa samuelis Nabokov, 1944.

The Blues are a difficult group taxonomically and there have been many changes, particularly in the species/subspecies status of many taxa. The Karner Blue is no exception. Although assigned subspecies status (of the Melissa Blue), there are a number of biological differences and no intergrades present, and its status as a separate species has not been ruled out. However, electrophoretic work done by Laurence Packer and colleagues support the Karner Blue's subspecies status. It has been classified in the genera *Plebejus* in the past.

LIFE HISTORY

The Karner Blue is closely associated with wild lupines (*Lupinus perennis*; also called sundial lupine), prairie grasses, and nectar plants such as butterflyweed (*Asclepias* sp.). This vegetation is characteristic of oak savannas. Oak savannas are dry habitats dominated by drought-resistant prairie plants and widely-spaced oak trees. The common grass is usually little bluestem.

Each year this butterfly typically has two broods and, subsequently, two adult flight periods. The Karner Blue hatches in April after overwintering as an egg. The caterpillar feeds exclusively on wild lupine. The caterpillars are often tended by ants, who take honey dew secreted by the caterpillars and offer some protection from predators to the caterpillars. In mid-May, the caterpillars develop into chrysalids from which they emerge as adult butterflies in early June. The adult butterflies feed on nectar from prairie plants through June and lay their eggs on wild lupine plants in July. These eggs mature into adult butterflies before the end of the summer and lay eggs that hatch the following April.

DISTRIBUTION

Historically, the Karner Blue occurred throughout a geographic band between 41° and 46° N latitude, extending from Minnesota eastward to Maine. In Canada, the Karner Blue was only recorded in Ontario. As of fall 1996, populations of Karner blue existed in Indiana, Michigan, Minnesota, New Hampshire, New York, and Wisconsin. The Ontario populations were extirpated before 1990.

THREATS

Karner Blue differs from many other federally listed butterflies in that it is geographically widespread and in some areas it continues to be locally abundant. Despite its 1,000 mile wide distribution, the butterfly is limited to small patches of dynamic successional habitat that support its exclusive larval hostplant. Much of its original savanna or barrens habitat has been destroyed by development or degraded by succession. Fragmentation of the landscape from larger suitable habitats to smaller, sometimes isolated, habitats is also implicated in its decline. The loss of suitable habitat resulted in a rapid decline in

population numbers and extirpation of large populations across its range, and prompted its listing as a federally endangered species.

Extirpation of the Karner Blue from Canada (Ontario) was probably due to dry summers in 1988 and 1989 that caused the lupine to die before the second generation of Karner adults could lay their brood.

CONSERVATION STATUS

The U.S. Fish & Wildlife Service recently changed the population status from increasing to stable. Even though reintroduction and management efforts are contributing to population increases, there have been recent population losses in New Hampshire (Concord) and Indiana (Ivanhoe Dunes). Recovery achievements include the significant reduction of threats to the butterfly in Wisconsin because of the implementation of the Wisconsin Statewide Habitat Conservation Plan (HCP) for the Karner blue butterfly.

It was listed as a Federal Threatened Species in 1992 (*Federal Register*: 57(240):59236-59244).

Recovery plan (ESA): http://ecos.fws.gov/docs/recovery_plans/2003/030919.pdf
(Approved on August 25, 2003)

Critical habitat (ESA): None designated.

It is on Schedule 1 of Canada's Species at Risk Act, where it is classified as extirpated.

The Karner Blue is also listed under endangered species legislation in several states. It is listed as endangered in Illinois, Maine, Minnesota, New Hampshire, New York, and Ohio, and listed as threatened in Michigan.

Given the reliance of the Karner Blue on wild lupine for larval survival, it is also worth noting the status of this plant. *Lupinus perennis* is on the endangered and threatened species lists for several states: Iowa, Maine, Maryland, New Hampshire, Pennsylvania, and Vermont. Maine and New Hampshire include both the lupine and the butterfly on their state lists, although neither apparently survive in Maine (there the lupine is listed as "possibly extirpated").

CONSERVATION NEEDS

The most important issue is to protect and maintain Karner Blue habitat. Across its range, these habitats have been under intense pressure from development and neglect and require active management to retain the open vegetation conditions required.

There are three captive rearing and reintroduction programs in the U.S.:

- (1) the Toledo Zoo has an on-going captive rearing program,
- (2) the Nature Conservancy, USFWS, and New Hampshire Department of Fish and Game are collaborating in a project based out of Concord, New Hampshire, and
- (3) the Nature Conservancy has a project to rear and reintroduce the Karner Blue to the Ivanhoe Nature Preserve in Indiana.

In Canada, a recovery team has been established under the auspices of the Species at Risk Act. A recovery plan is in development, detailed habitat assessments have been made throughout Ontario, and a number of habitat restoration projects have been implemented. The Toronto Zoo has developed a captive rearing protocol, based largely on the needs of the Tailed Blue, a very similar butterfly.

RESEARCH NEEDS

Research should focus on habitat, both the impacts on the butterfly of habitat changes and management activities and on the most appropriate ways to maintain the successional vegetation stage required by the Karner Blue.

RESOURCES

CONTACTS

U.S. Fish and Wildlife Service, Region 3: Cathy Carnes, Endangered Species Coordinator and Karner Blue Recovery Coordinator, Endangered Species Field Office, 2661 Scott Tower Drive, New Franken, Wisconsin 54229. Telephone: (920) 866-1732; email: Cathy_Carnes@fws.gov.

Butterfly Conservation Initiative: Shelly Grow, Program Coordinator, 8403 Colesville Road, Suite 710, Silver Spring, Maryland 20910. Telephone: (301) 562-0777 x263; email: sgrow@aza.org.

The Ohio Lepidopterists: Roger Zebold. 675-B Sprague Road. Wilmington, Ohio 45177

The Nature Conservancy Indiana Field Office: 1505 N. Delaware Street, Suite 200, Indianapolis, IN 46202. Telephone: (317) 951-8818; fax: (317) 917-2478

New York State Department of Environmental Conservation: Endangered Species Unit. 625 Broadway. Albany, NY 12233-4754.

Ontario Karner Blue Butterfly Recovery Team: Peter Carson, Co-chair, 316 Regional Road 60, RR 1, Walsingham, Ontario N0E 1X0. Telephone (519) 586-3985; email: gartcar@kwic.com.

REFERENCES

Andow, D.A., R.J. Baker and C.P. Lane. (eds) 1994. Karner Blue Butterfly: A Symbol of a Vanishing Landscape. Univ. Minnesota Agr. Experiment Sta., St. Paul. *Misc. Publ.* 84-1994. 220 pp.

Baker, R.J. 1994. The Karner blue butterfly: 1993 and beyond. Pp. 163-169 In Andow, D.A., R.J. Baker and C.P. Lane. (eds) 1994. Karner Blue Butterfly: A Symbol of a Vanishing Landscape. Univ. Minnesota Agr. Experiment Sta., St. Paul. *Misc. Publ.* 84-1994. 220 pp.

- Bidwell, A.D. 1994. *Mark-release-recapture of Karner blue butterflies (Lycaeides melissa samuelis) at Fort McCoy Military Reservation*. Unpubl. Rept. to U.S. Fish & Wildl. Service, St. Paul.
- Bidwell, A. 1996. *A Habitat Evaluation Plan for the Karner Blue Butterfly*. Unpubl. Rept. to Wisconsin Dept. Natural Resources, Madison. 26 pp.
- Bleser, C.A. 1993. *Status Survey, Management and Monitoring Activities for the Karner Blue Butterfly (Lycaeides melissa samuelis) in Wisconsin, 1990-1992*. Final Rept. to U.S.F.W.S. per Coop. Agree. E-113, Study 320. Wisconsin Dept. Natural Resources, Madison. 88 pp. + appendices.
- Borth, R.J. 1997. *Karner blue management implications for some associated Lepidoptera of Wisconsin barrens*. Unpub. Rept. to HCP partners. Wisconsin Gas, Milwaukee.
- Brown, J.A. and M.S. Boyce. 1996. *Monitoring of Karner blue butterflies (Lycaeides melissa samuelis) for the proposed Habitat Conservation Plan, Wisconsin*. Unpubl. Rept. to National Fish and Wildlife Foundation. Washington, DC. 78 pp.
- Cryan, J.F. and R. Dirig. 1978. *A report on the status of the Karner blue butterfly (Lycaeides melissa sammuelis Nabokov) in New York State*. (Rept. to) New York State Dept. Environmental Conservation. 18 pp.
- Cushman, J.H. and D.D. Murphy. 1993. Conservation of North American lycaenids- an overview. Pp. 37-44 In New, T.R. (ed). 1993. Conservation Biology of Lycaenidae (Butterflies). *Occas. Pap. IUCN Species Survival Comm.* (8):1-173.
- Cuthrell, D.L. 1990. *Status of the Karner blue butterfly, Lycaeides melissa samuelis Nabokov, in Minnesota, 1990*. Rept. Minnesota Non-game Wildl. Prog. [not seen, but cited in Lane 1994]
- Grundel, R., N.B. Pavlovic and C.L. Sulzman. 1998. Habitat use by the endangered Karner blue butterfly in oak woodlands: The influence of canopy cover. *Biological Conservation* 85:47-53.
- Haack, R.A. 1993. The endangered Karner blue butterfly (Lepidoptera: Lycaenidae): Biology, management considerations, and data gaps. Pp 83-110 In Gillespie, A.R., G.R. Parker, P.E. Pope and G. Rink (eds). Proceedings of the 9th Central Harwood Forest Conference. *General Tech. Rept. NC-161*. USDA-Forest Service, North Cent. For. Exper. Sta., St. Paul.
- Herms, C.P. 1996. *The Endangered Karner Blue Butterfly (Lepidoptera: Lycaenidae) in Michigan: Habitat Suitability, Potential Impacts of Gypsy Moth (Lepidoptera: Lymantriidae) Suppression, and Laboratory Rearing*. M.S. Thesis. Michigan State Univ., East Lansing. 175 pp.

Herms, C.P., D.G. McCullough, L.S. Bauer, R.A. Haack, D.L. Miller and N.R. Dubois. 1997. Susceptibility of the endangered Karner blue butterfly (Lepidoptera: Lycaenidae) to *Bacillus thuringiensis* var. *kurstaki* used for Gypsy moth suppression in Michigan. *Great Lakes Entomologist* 30(4):125-141.

Kirk, K. 1996. *The Karner blue community: Understanding and protecting associated rare species of the barrens*. Final Rept. to USFWS (Amendment #38 to Cooperative Agreement #14-16-0003-89-933). Wisconsin Dept. Natural Resources, Madison.

Lane, C.P. 1994. Habitat preferences of the Karner blue butterfly in Minnesota. Pp. 63-72 In Andow, D.A., R.J. Baker and C.P. Lane. (eds) 1994. *Karner Blue Butterfly: A Symbol of a Vanishing Landscape*. Univ. Minnesota Agr. Experiment Sta., St. Paul. *Misc. Publ.* 84-1994. 220 pp.

Lane C. 1999. *Benefits of heterogeneous habitat: Oviposition preference and immature performance of Lycaeides melissa samuelis Nabokov (Lepidoptera: Lycaenidae)*. Ph.D. thesis. The thesis can be obtained from the Dissertation Service in Ann Arbor, Michigan (1-800-521-0600).

Lawrence, W.S. 1994. Karner blue butterfly populations in the Allegan State game Area, Michigan. Pp. 53-62 In Andow, D.A., R.J. Baker and C.P. Lane. (eds) 1994. *Karner Blue Butterfly: A Symbol of a Vanishing Landscape*. Univ. Minnesota Agr. Experiment Sta., St. Paul. *Misc. Publ.* 84-1994. 220 pp.

Lawrence, W.S. and A.C. Cook. 1989. *The status and management of Karner blue (Lycaeides melissa samuelis) populations in the Allegan State Game Area, Michigan*. Unpubl. Rept. to The Nature Conservancy, East Lansing. 57 pp.

Leach, M.K. 1993. *Status and distribution of the Karner blue butterfly at Fort McCoy, Wisconsin*. Final Rept. to Natural Resources Mngmnt. Div., Fort McCoy Military Res. and Wisconsin Chapter, the Nature Conservancy, Madison.

Maxwell, J. and T. Givnish. 1993. *Research on the Karner blue butterfly at Fort McCoy, Wisconsin: Progress report for the 1993 field season*. Unpubl. Rept. to U.S. Fish & Wildl. Serv. and U.S. Dept. Army.

Maxwell, J. and T. Givnish. 1994. *Research on the Karner blue butterfly at Fort McCoy, Wisconsin: Progress report for the 1994 field season*. Unpubl. Rept. to U.S. Fish & Wildl. Serv. and U.S. Dept. Army.

Opler, P.A. 1995. Scientific evaluation of literature cited in "A review of the information on federally endangered Karner blue butterfly *Lycaeides melissa samuelis* Nabokov (Lepidoptera: Lycaenidae)" by Premo et al. (1994). 24 pp. In National Fish and Wildlife Foundation. *Review and Assessment of Information on the Federally Endangered Karner Blue Butterfly (Lycaeides melissa samuelis)*. Washington, DC.

Packer, L. 1987. *Status Report on the Karner Blue Butterfly*, *Lycaeides melissa samuelis Nabokov*, in Canada. Unpubl. Rept. to World Wildlife Fund and Ontario Ministry Nat. Res. 66 pp.

Packer, L. 1994. The extirpation of the Karner blue butterfly in Ontario. Pp. 143-151 In Andow, D.A., R.J. Baker and C.P. Lane. (eds) 1994. *Karner Blue Butterfly: A Symbol of a Vanishing Landscape*. Univ. Minnesota Agric. Exper. Sta., St. Paul. *Misc. Publ.* 84-1994. 220 pp.

Premo, D.B., E.I. Rogers, S.I. Apfelbaum and K.F. Premo. 1994. *A Review of Information on the Federally Endangered Karner Blue Butterfly*, *Lycaeides melissa samuelis Nabokov* (Lepidoptera: Lycaenidae). White Water Associates, Inc. 80 pp.

Savignano, D.A. 1990. *Field Investigations of a Facultative Mutualism Between Lycaeides melissa samuelis Nabokov (Lycaenidae), the Karner Blue Butterfly, and Attendant Ants*. Ph.D. Thesis. Univ. Texas.

Savignano, D.A. 1994a. The distribution of the Karner blue butterfly in Saratoga County, New York. Pp. 73-80 In Andow, D.A., R.J. Baker and C.P. Lane. (eds) 1994. *Karner Blue Butterfly: A Symbol of a Vanishing Landscape*. Univ. Minnesota Agr. Experiment Sta., St. Paul. *Misc. Publ.* 84-1994. 220 pp.

Savignano, D.A. 1994b. Benefits to Karner blue butterfly larvae from association with ants. Pp. 37-46 In Andow, D.A., R.J. Baker and C.P. Lane. (eds) 1994. *Karner Blue Butterfly: A Symbol of a Vanishing Landscape*. Univ. Minnesota Agr. Experiment Sta., St. Paul. *Misc. Publ.* 84-1994. 220 pp.

Schweitzer, D. 1989. *Fact sheet for the Karner blue butterfly with special reference to New York*. The Nature Conservancy, New York. 14 pp. [not seen, but cited in Lane 1994]

Swengel, A.B. and S.R. Swengel. 1996. Factors affecting abundance of adult Karner blues (*Lycaeides melissa samuelis*) (Lepidoptera: Lycaenidae) in Wisconsin surveys 1987-95. *Great Lakes Entomologist* 29(3):93-105.

Swengel, A.B. and S.R. Swengel. 1997. Co-occurrence of prairie and barrens butterflies: Applications to ecosystem conservation. *Journal of Insect Conservation* 1:131-144.

U.S. Fish and Wildlife Service. 1992a. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Karner Blue Butterfly (50 CFR Part 17) *Federal Register* 57(240):59236-59244.

U.S. Fish and Wildlife Service. 1997. *Karner Blue Butterfly* (*Lycaeides melissa samuelis*) *Working Draft Recovery Plan*. Karner Blue Butterfly Recovery Team and USFWS, Green Bay, WI.

Weaver Boos Consultants, Inc. 1996. *The Strategic Management Plan for Linear Corridors in Areas Inhabited by the Karner Blue Butterfly (Lycaeides melissa samuelis Nabakov)*. Unpubl. Rept. for The Linear Corridor Partners Wisconsin HCP Team.

Welch, R. 1993. *Dispersal and conservation behavior in the Karner blue butterfly (Lycaeides melissa samuelis) in central Wisconsin*. Unpubl. Rept. to USFWS, Green Bay.

Wilder, T. 1995. *Fort McCoy Karner Blue Butterfly Conservation Plan, Final Draft*. Nat. Res. Manage. Div., Fort McCoy. 21 pp + appendices.

Zaremba, R.E. and M. Pickering. 1994. Lupine ecology and management in New York state. Pp. 87-93 In Andow, D.A., R.J. Baker and C.P. Lane. (eds) 1994. *Karner Blue Butterfly: A Symbol of a Vanishing Landscape*. Univ. Minnesota Agr. Experiment Sta., St. Paul. *Misc. Publ.* 84-1994. 220 pp.

WEBSITES

U.S. Fish & Wildlife Service; Threatened and Endangered Species System: Karner blue butterfly.

http://ecos.fws.gov/species_profile/SpeciesProfile?scode=I00F

(Accessed 3/29/05)

U.S. Fish & Wildlife Service, Region 3; Endangered Species: Karner Blue.

<http://www.fws.gov/midwest/Endangered/insects/kbb/index.html>

(Accessed 3/29/05)

Environment Canada; Species at Risk: Karner Blue.

http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?speciesID=293

(Accessed 3/29/05)

Michigan Department of Natural Resources; Karner Blue Butterfly.

http://www.michigan.gov/dnr/0,1607,7-153-10370_12145_12204-33007--,00.html

(Accessed 3/29/05)

New York State Department of Environmental Conservation; Karner Blue Butterfly Fact Sheet.

<http://www.dec.state.ny.us/website/dfwmr/wildlife/endspec/kbbufs.html>

(Accessed 3/29/05)

Ohio Department of Natural Resources.

<http://www.dnr.state.oh.us/wildlife/Resources/projects/karner/karner.htm>

(Accessed 3/29/05)

Wisconsin Department of Natural Resources; Statewide Karner Blue Butterfly Habitat Conservation Plan and Environmental Impact Statement.

<http://dnr.wi.gov/org/land/forestry/karner/>

(Accessed 3/29/05)

State University of New York, Roosevelt Wild Life Station; Karner Blue butterfly and Pine-oak Barrens Ecosystem.

<http://www.esf.edu/resorg/rooseveltwildlife/research/karnerblue/karnerblue.htm>

(Accessed 3/29/05)

NatureServe Explorer.

<http://www.natureserve.org/explorer/>

(Accessed 3/29/05)

National Wildlife Federation; Karner Blue Butterfly.

<http://www.nwf.org/wildlife/karnerbluebutterfly/>

(Accessed 3/29/05)

The Nature Conservancy; Saving the Karner Blue

<http://nature.org/wherework/northamerica/states/indiana/preserves/art12848.html>

(Accessed 3/29/05)

American Zoo and Aquarium Association; Butterfly Conservation Initiative: Karner Blue Butterfly Recovery Project.

<http://endangered.fws.gov/aza/kbbweb/start1.htm>

(Accessed 3/29/05)

Save The Pine Bush; The Karner Blue Butterfly: The Pine Bush's Most Famous Resident.

http://www.savethepinebush.org/KB/KB_Index.html

(Accessed 3/29/05)

Save the Dunes Council; The Karner Blue Butterfly at Indiana Dunes National Lakeshore.

<http://www.savedunes.org/html/karnerblue.html>

(Accessed 3/29/05)