Erebia mancinus E. Doubleday, [1849] Taiga Alpine

MN Status:
special concern
Federal Status:
none
CITES:
none
USFS:
yes

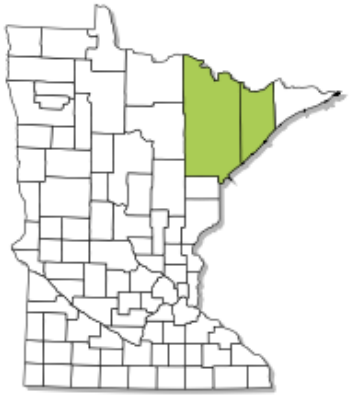
Group:
insect
Class:
Insecta
Order:
Lepidoptera
Family:
Nymphalidae
Habitats:
Forested Acid Peatland

Synonyms

Erebia mancinus, *Erebia disa mancinus*

Basis for Listing

The taiga alpine occurs across northern North America from Labrador to Alaska, but its only occurrence in the contiguous United States is in Minnesota, where it is known from only a handful of localities in a small area in the northeast part of the state. Recent surveys in the extensive Glacial Lake Agassiz peatlands have not discovered any occurrences there, suggesting that it has highly specialized habitat requirements. Because of the small number of known locations, the taiga alpine is vulnerable to habitat destruction and catastrophic events. For this reason, it was listed as a special concern species in Minnesota in 1984. Because its occurrence in Minnesota is at the southern limit of its range, this species may now be highly vulnerable to global warming.



Map Interpretation

Map Interpretation

Description

The taiga alpine is a medium-size dark brown butterfly with rounded wings. Wingspan is 3.5-4.3 cm (1.4-1.7 in.). The sexes are similar in size and markings. The row of black eye spots haloed by orange in the outer part of the dark brown forewing is distinctive. The red-disked alpine (*Erebia discoidalis*) is similar in size and also dark brown, but instead of a band of spots there is a large reddish-brown patch on the forewing. This species flies earlier than the taiga alpine, and favors open habitats. The Jutta arctic (*Oeneis jutta*) often flies in the same habitats and at the same time as the taiga alpine, but it has longer, more pointed wings and is generally a lighter, grayer shade of brown. There are eyespots on the hind wing as well as the forewing, and the eyespot haloes are yellow rather than orange. The jutta arctic usually flies in a fast, jerky manner, while the taiga alpine has a slow, gently bobbing flight.

Habitat

In Minnesota, the taiga alpine appears to favor black spruce (*Picea mariana*) bogs and swamps where pole-like black spruce trees (8-10m) form a park-like environment, with small bushy trees dotting the understory (K. Johnson, pers. comm.). Tamarack (*Larix laricina*) is usually absent. Labrador tea (*Rhododendron groenlandicum*) dominates the shrub layer, which also includes various ericaceous species. Sphagnum mosses (*Sphagnum* spp.) form a carpet in which three-leaved false Solomon's seal (*Maianthemum trifolium*), three-fruited bog sedge (*Carex trisperma*), and few-flowered sedge (*Carex pauciflora*) are common herbs. Bog willow (*Salix pedicellaris*), bog birch (*Betula pumila*), and creeping sedge (*Carex chordorrhiza*) are sometimes present.

This type of habitat is abundant in northern Minnesota, making the very restricted distribution of the butterfly an enigma. In Canada, where it is more common and widespread, it occurs in a broader range of habitats, most commonly in open black spruce-sphagnum bogs (Layberry et al. 1998), although the reported habitat in Manitoba and Quebec bears much similarity to that in Minnesota (Klassen et al. 1989; Layberry et al. 1998).

Biology / Life History

The immature stages are unknown. Some Manitoba populations have records only from alternating years, strongly indicating that development from egg to adult takes 2 years (Klassen et al. 1989). Field work in Minnesota suggests that this may be true here also: some sites appear to have adults only in even-numbered years, others only in odd-numbered years, and still others every year (K. Johnson, pers. comm.). Odd-numbered years seem to be favored, but more field work is needed to clarify this. Adults have been recorded from June 3 to June 26 in the state, with peak flight around mid June, and lasting perhaps 2-3 weeks.

The larval food plants are unknown, but these are undoubtedly grasses or sedges, as this is generally true of species in the subfamily Satyrinae to which it belongs. Field observation in Minnesota suggests that three-fruited bog sedge and few-flowered sedge are the most likely candidates (K. Johnson, pers. comm.). Adults are rarely observed to take floral nectar, but they sometimes sit on damp soil, including gravel roads near their habitat, where they probably take up moisture and dissolved minerals. Carrion, animal feces, and sap flows, often used by members of the subfamily Satyrinae, are other likely adult food sources.

Conservation / Management

The taiga alpine is listed as a special concern species in Minnesota primarily because it is apparently rare and limited to a small geographic area. Habitat alteration or destruction could easily threaten the continued occurrence of the species in Minnesota, but because so little is known about its biology, much is unknown about the specific nature of the changes that would threaten the species. As this butterfly is at the southern limit of its range, where it is dependent on local areas of colder conditions, global warming is clearly a long-term threat. Disturbances that accelerate changes to the forest forced by climate warming should be avoided. Disruption of the hydrology of its peatland habitats is one such disturbance, especially if the result is greater susceptibility to severe forest fires. Clearcutting of occupied habitat will also have great potential for harm; the effects of selective harvest cannot be predicted on the basis of present knowledge. Application of insecticides to the species' habitat would certainly be a threat, as would the use of herbicides that affect graminoid plants.

Conservation Efforts in Minnesota

Data on known occurrences of the taiga alpine are utilized in reviewing various activities for environmental impact, notably the application of insecticides and herbicides. These records are also available to forest managers. A significant area known to support this butterfly is protected within the Minnesota DNR's **Sand Lake Peatland Scientific and Natural Area**. Additional survey work is needed

to determine the full range of this species in Minnesota and its distribution and abundance within that range.

References

Klassen, P., A. R. Westwood, W. B. Preston, and W. B. McKillop. 1989. The butterflies of Manitoba. Manitoba Museum of Man and Nature, Winnipeg, Manitoba. 290 pp.

Layberry, R. A., P. W. Hall, and J. D. LaFontaine. 1998. The butterflies of Canada. University of Toronto Press, Toronto, Ontario. 280 pp. + color plates.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. <http://www.natureserve.org/explorer>. Accessed 3 June 2008.

Opler, P. A., H. Pavulaan, R. E. Stanford, and M. Pogue, coordinators. 2006. Butterflies and moths of North America: Taiga alpine (*Erebia mancinus)*. Bozeman, Montana: NBII Mountain Prairie Information Node. <http://www.butterfliesandmoths.org/species?l=1864>. Accessed 20 July 2006.

Lycaeides idas nabokovi — Nabokov's Blue

MN Status:
special concern
Federal Status:
none
CITES:
none
USFS:
yes

Group:
insect
Class:
Insecta
Order:
Lepidoptera
Family:
Lycaenidae
Habitats:
Fire Dependent Forest

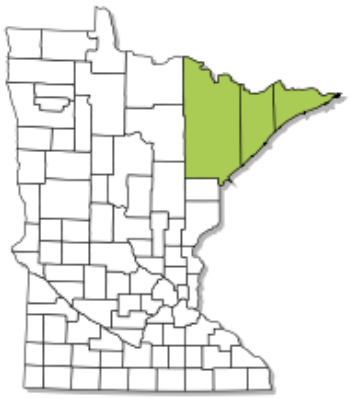
Synonyms

Lycaeides argyrognomon nabokovi, *Plebejus idas nabokovi*

Basis for Listing

Nabokov's blue was originally described from Minnesota specimens. This subspecies of *Lycaeides idas* is restricted to northern Minnesota, southeastern Manitoba, southwestern Ontario, northern Wisconsin, and northern Michigan. Other subspecies range across Canada and southward in the mountains into the western United States. Throughout its limited range, Nabokov's blue is uncommon to rare and highly local (Masters 1972; Klassen et al. 1989).

Recent Minnesota records are confined to the three northeastern most counties, and although focused searches in the past few years have discovered several new occurrences, most appear to be small colonies. Because the species' preferred habitat is open woodland where the larval host plant, dwarf bilberry (*Vaccinium cespitosum*), is abundant, forest fires were probably important in creating and maintaining habitat for the species. Forest management may provide a suitable substitute but this is uncertain, and some silvicultural practices, such as herbicide use, pose a real threat to this species. Given its very limited distribution in the state, Nabokov's blue was listed as a special concern species in Minnesota in 1996.



Map Interpretation

Map Interpretation

Description

Nabokov's blue is a small butterfly with an average wingspan of 2.75 cm (1.08 in.) in both sexes. The upper side of males is an intense, bright blue; females are somewhat variable, but generally they are mostly brownish gray, with blue limited to the basal third at most. A submarginal row of dark spots is usually present on the hind wings, sometimes with a hint of orange along their inner edge. Beneath, the 2 sexes are very similar: irregular rows of white-ringed black dots on a pale grayish ground (females tend towards a warmer, slightly darker shade) and a more regular submarginal band of paired black crescents enclosing orange, especially on the hind wings. The outermost row of dark crescents is enlarged into silvery-blue spots on the hind wings.

Nabokov's blue is very similar to its close relatives the **Karner blue** (*Lycaeides melissa samuelis*) and the Melissa blue (*L. m. melissa*). The orange in the submarginal band beneath is typically more prominent in both subspecies of *L. melissa* than in Nabokov's. Females of the Melissa blue have a prominent submarginal orange band on the upper side of both hind and forewings, and Karner blue females usually have a definite orange band on the upper side of the hind wings. Definitive determination of males not associated with females requires dissection of genitalic structures. Fortunately, neither subspecies of *L. melissa* occurs within the range of Nabokov's in Minnesota. The most likely butterfly to be confused with Nabokov's blue is the greenish blue (*Plebejus saepiolus*), which flies during the same time as the Nabokov's. It is nearly identical in size, but the blue of the male's upper side is paler and more greenish than in the Nabokov's. Beneath, both sexes of the greenish blue butterfly are much less conspicuously spotted, and the orange, if present, is reduced to a single spot on the hind wing. The body is densely clothed in long, hair-like scales, giving the greenish blue a furry appearance. The silvery blue (*Glaucopsyche lygdamus*) is much darker beneath, making the white rings around the spots very conspicuous, and it lacks any trace of orange. Its flight period generally ends before that of the Nabokov's begins. The summer azure (*Celastrina neglecta*) also lacks any orange markings. It is chalky grayish white beneath, with the darker spots somewhat smeary looking. The blue of the upper side is a lighter blue and has a powdery look from the presence of white overscaling; females have a broad, strongly contrasting, charcoal gray to black border along the outer part of the forewing that continues more narrowly along the front edge. The eastern tailed blue (*Everes comyntas*) is distinctly smaller than the Nabokov's, and has a short, hair-like tail extending from the margin of each hind wing.

Other common names for this species include Northern blue and Scudder's blue.

Habitat

The Nabokov's blue inhabits various upland openings in the northern forest with low vegetation and an abundance of the larval host plant, dwarf bilberry, a diminutive rhizomatous shrub that forms mat-like colonies. This plant occurs on sandy soils and on rock outcrops. In Minnesota, all known colonies of this butterfly occur at sandy sites, but it is recorded from rock outcrops in Michigan (Nielsen 1999).

Biology / Life History

The Nabokov's blue has a single annual generation. Larvae hatch from overwintering eggs in early spring and complete growth and pupate by mid-June to early July. Adults emerge after about 10 days in the pupal stage. Females mate shortly after emergence and begin egg laying right away. Eggs are affixed singly to stems of the larval host plant, nearby plants, or debris and remain dormant until the following spring. Adults can live for at least three weeks, but average survival is probably not more than one week (Wolf 1993). They feed on nectar from a variety of available plants, native and non-native; males also feed on dung, urine-soaked soil, or even just damp soil (mud-puddling). Adults are almost always encountered in the close vicinity of host plant patches, giving the impression that this butterfly is highly sedentary. The transient nature of suitable habitat requires that emigration from patches occur to colonize new patches created by disturbance, but this aspect of adult behavior is poorly known. In one small 30-day study, no marked butterfly moved farther than 260 m (853 ft.) from the point of marking, but two unmarked individuals were encountered more than 2 km (1.2 mi.) from a known colony (Wolf 1993).

Dwarf bilberry, in the heather family (Ericaceae), is the only reported larval food plant of Nabokov's blue (other *L. idas* subspecies in eastern North America feed on a variety of plants in the heather and crowberry (Empetraceae) families (Layberry et al. 1998)). Larvae are attended by ants, which probably provide some protection from predators and parasitoids. Nabokov's blue larvae have specialized

organs that produce a secretion that is avidly fed upon by the ants, and, as is documented in other Lycaenid butterflies, they probably have organs that produce mimics of ant pheromones to further manipulate ant behavior (Malicky 1970). Larvae feed and develop normally in the absence of ants (Wolf 1993), but mortality from natural enemies may be much higher. Whether particular ant species are more effective is not known.

Conservation / Management

Reforestation of habitat openings will eliminate this butterfly (although dwarf bilberry, a long-lived perennial, can persist in the understory). All known Nabokov's blue sites in Minnesota are capable of supporting forest, and therefore it appears that the presence of this butterfly in the state historically depended upon periodic habitat-opening disturbances and upon the butterfly's ability to find and colonize new openings as old ones became unsuitable. Occurrence of the host plant is controlled primarily by substrate characteristics; therefore forest disturbances influenced butterfly distribution by making the already present host plant available to the butterflies. Fire was presumably the primary disturbance that created habitat for this butterfly in the presettlement landscape. Today, after decades of fire suppression, Nabokov's blue is dependent on human induced mechanical disturbances, including timber harvest. However, silvicultural practices that reduce or eliminate the host plant, such as rock raking and herbicide application, will negate the potential of timber harvest to create habitat. Rapid reestablishment of tree cover through intensive management will also negatively affect this butterfly, as it shortens the time available for colonists to find the habitat. If the butterfly does colonize, intensive management can shorten the time interval to produce emigrants to colonize other patches. Forest is a barrier to dispersal for Nabokov's blue, so colonization requires connectivity via natural openings such as streams, or via human created openings, such as roads or utility corridors. Managing a few good sites specifically to sustain strong Nabokov's blue populations and otherwise restricting only those silvicultural activities that would harm dwarf bilberry, would probably be an adequate conservation strategy. The use of prescribed burning to maintain the suitability of occupied habitat, while probably the most effective management approach, requires caution as all non-adult life stages of the butterfly are highly vulnerable to incineration. Subdivision of occupied sites and burning the units in a rotation that allows for recolonization after burning will minimize the risk of local extirpation.

Conservation Efforts in Minnesota

In 1986, **The Nature Conservancy** (TNC) purchased a significant portion of the McNair site from a timber company. This site is the type locality for the Nabokov's blue (the source of the specimens from which the subspecies was originally described). TNC transferred the property to the U.S. Forest Service in 1991, which designated it as a Special Use Area in the **Superior National Forest**. Forest Service biologists, with support from the Minnesota DNR, developed a management plan for the site and began cutting planted and invading trees and shrubs and burning small subdivisions of the site in 1998. Monitoring of Nabokov's blue numbers at the site, also begun in 1998, is an ongoing project. Nabokov's blue is included on the U.S. Forest Service Region 9 **Regional Forester Sensitive Species List**, which will encourage attention to the needs of this butterfly in forest planning for the Superior National Forest. Both the Forest Service and the Minnesota DNR have funded inventory efforts in northeastern Minnesota for the butterfly. In 2002, the eastern region of the U.S. Forest Service prepared a **conservation assessment** (Wolf and Brzeskiewicz 2002) for the Nabokov's blue and dwarf bilberry to aid in developing a plan for conserving these species on U.S. Forest Service lands.

References

Klassen, P., A. R. Westwood, W. B. Preston, and W. B. McKillop. 1989. The butterflies of Manitoba. Manitoba Museum of Man and Nature, Winnipeg, Manitoba. 290 pp.

Layberry, R. A., P. W. Hall, and J. D. LaFontaine. 1998. The butterflies of Canada. University of Toronto Press, Toronto, Ontario. 280 pp. + color plates.

Malicky, H. 1970. New aspects on the association between lycaenid larvae (Lycaenidae) and ants (Formicidae, Hymenoptera). Journal of the Lepidopterists' Society 24:190-202.

Masters, J. H. 1972. A new subspecies of *Lycaeides argyrognomon* (Lycaenidae) from the eastern Canadian forest zone. Journal of the Lepidopterists' Society 26:150-154.

Nielsen, M. C. 1999. Michigan butterflies and skippers: a field guide and reference. Michigan State University Extension, East Lansing, Michigan. 248 pp.

Wolf, A. T. 1993. Ecology and conservation of the Northern Blue Butterfly *(Lycaeides idas nabokovi)* and its relationship with Dwarf Bilberry *(Vaccinium caespitosum)* in northern Wisconsin. Thesis, University of Wisconsin, Green Bay, Wisconsin. 114 pp.

Myotis septentrionalis (Trovessart, 1897) Northern Myotis

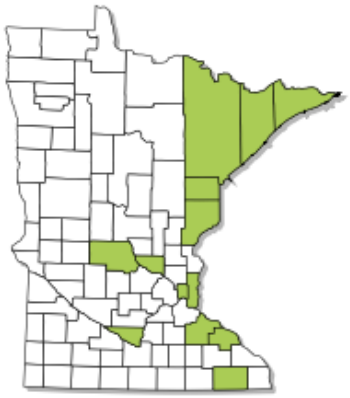
MN Status:
special concern
Federal Status:
none
CITES:
none
USFS:
yes

Group:
mammal
Class:
Mammalia
Order:
Chiroptera
Family:
Vespertilionidae
Habitats:
Fire Dependent Forest, Mesic Hardwood Forest, Subterranean

Basis for Listing

The northern myotis, also known as the northern long-eared myotis, is widely distributed in Canada and throughout the eastern half of the United States. It was designated a species of special concern in Minnesota in 1984, at which time it was known from only a few widely distributed localities in the state. Subsequent survey work has documented additional locations in Minnesota, and confirmed that the species can be found in the state in both summer and winter. A large hibernaculum was discovered in St. Louis County, and northern myotis have been found in most other caves and mines surveyed in Minnesota, although typically in low numbers.

The northern myotis is frequently found hanging with or near groups of little brown bats (*Myotis lucifugus*). Human disturbance in caves occupied by the northern myotis may disrupt hibernation during the winter and unnecessarily stress the bats during their active season. Direct injury from human visitors, and more recently, the emergence of **white-nose syndrome**, a fungal disease that is decimating hibernating bat populations in the eastern United States, also pose potential threats. For these reasons, the northern myotis remains listed as a special concern species in Minnesota.



Map Interpretation

Map Interpretation

Description

The northern myotis is a medium-sized bat with relatively long ears, each with a long, sharply pointed tragus (fleshy projection in the ear). The pelage is dull brown on the back and pale grayish brown on the underside. The membranes are dark, and the calcar (bone or cartilage growth from the ankle that helps to support the tail membrane in flight) is slightly keeled. Adults typically measure 78-95 mm (3.1-3.7 in.), with a tail length of 32-34 mm (1.2-1.3 in.). Weights range from 5-6.4 g (0.18-0.23 oz.) (Hazard 1982). The northern myotis

can be distinguished from the little brown bat by its long ears, which, when folded forward, extend at least 3 mm (0.12 in.) beyond its nose. The ears of the little brown bat, on the other hand, are even with or only barely extend past the tip of the nose.

Habitat

Northern myotis have been found in the winter in Minnesota in natural caves, sand mines, and deep iron mines. They seem to prefer cool, moist hibernating sites where the air is still (Fitch and Shump 1979). Farther south, northern myotis may also use attics, bridges, and buildings. In summer, the species is often associated with forested habitats, especially around wetlands. Summer roosts are believed to include separate day and night roosts. Day roosts may be under loose tree bark, in buildings, or behind signs or shutters, and night roosts may include caves, mines, and quarry tunnels (summarized in **NatureServe 2008**). The sexes tend to roost separately, with females forming small (~30 individuals) maternity colonies in relatively warm sites to bear and rear their offspring.

Biology / Life History

Northern myotis enter their winter hibernacula in late August or September. They are colonial hibernators, but rarely occur in concentrations of over 100 individuals. Most frequently, they are found hanging singly or in small groups (**Nordquist and Birney 1985**). Emergence from the hibernaculum takes place in May. Bats in the family Vespertilionidae display delayed fertilization, where mating takes place in fall but embryo implantation does not occur until spring. Females bear a single offspring in June or July. The earliest-born young are usually able to fly by early July, and the nursery colonies disband around this time. Northern myotis forage for insects over water and forest clearings and under tree canopies, using echolocation to catch prey and to navigate. They may also glean insects off leaves and other surfaces, a behavior that may be aided by its unusually large ears. Foraging takes place throughout the night, but peaks before midnight and again just before sunrise (Laubach et al. 1994).

Conservation / Management

Winter populations of northern myotis should be surveyed annually at all known hibernacula, especially the large underground mine in St. Louis County (**Nordquist et al. 2006**). If possible, hibernacula should be protected from disturbance, as any human activity in a hibernaculum can drastically and negatively affect the status of hibernating bats. Foster and Kurta (1999) found that the number of different trees used for roosting was directly correlated with the duration of tracking. Therefore, retention of diverse native forests is likely important for this species, especially in agricultural areas where forests are often young and widely dispersed. However, forest structure and age class of trees appear to be more important habitat components than the type of tree for the northern myotis, so maintenance of older trees is important when managing for this bat (U.S. Forest Service 2000).

Conservation Efforts in Minnesota

The DNR's **Nongame Wildlife Program** and the **State Wildlife Grants Program** have funded several projects to census bats hibernating in caves and mines throughout the state. Several of the known northern myotis hibernacula are located in **State Parks** and receive adequate protection. Attempts are being made to work with landowners of privately owned hibernacula sites to protect hibernating bats.

References

Fitch, J. H., and K. A. Shump, Jr. 1979. *Myotis keenii*. Mammalian Species 121:1-3.

Foster, R.W., and A. Kurta. 1999. Roosting ecology of the Northern Bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana Bat (*Myotis sodalis*). Journal of Mammalogy 80(2):659-672.

Hazard, E. B. 1982. The mammals of Minnesota. University of Minnesota Press, Minneapolis, Minnesota. 280 pp.

Laubach, C. M., J. B. Bowles, and R. Laubach. 1994. A guide to the bats of Iowa. Iowa Department of Natural Resources. Des Moines, Iowa. 18 pp.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. <http://www.natureserve.org/explorer>. Accessed 9 June 2008.

Nordquist, G. E., K. A. Lynch, and C. A. Spak. 2006. Timing and pattern of bat activity at Soudan underground mine. Final report submitted to the State Wildlife Grants Program, Minnesota Department of Natural Resources. 86 pp.

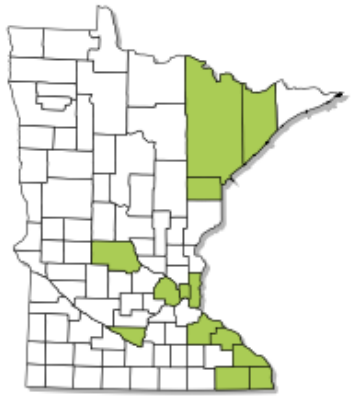
Nordquist, G. E., and E.C. Birney. 1985. Distribution and status of bats in Minnesota. Final report submitted to the Nongame Wildlife Program, Minnesota Department of Natural Resources. 64 pp.+ illustrations.

U.S. Forest Service. 2000. Population viability assessment in forest plan revision. Questions for animal population viability assessment panel: *Myotis septentrionalis*. United States Forest Service, Region 9, Duluth, Minnesota.

Perimyotis subflavus (Menu, 1984) — Tricolored Bat

MN Status:
special concern
Federal Status:
none
CITES:
none
USFS:
yes

Group:
mammal
Class:
Mammalia
Order:
Chiroptera
Family:
Vespertilionidae
Habitats:
Fire Dependent Forest, Mesic Hardwood Forest, Subterranean



Map Interpretation

Map Interpretation

Synonyms

Perimyotis subflavus

Basis for Listing

The tricolored bat, also known as the eastern pipistrelle, ranges over most of the eastern United States and southeastern Canada. It was first discovered in Minnesota at St. Peter in 1934 (Swanson and Evans 1936). It has never been found in large numbers, and no maternity colony has yet been found in the state. Since its designation in Minnesota as a species of special concern in 1984, the tricolored bat has been found to occur regularly, although in low numbers, in caves and mines in the southeastern part of the state. A single hibernating individual was found in 1990 and two were found in 2003 in northeastern Minnesota, several hundred miles north of the previously documented northernmost locality in the state (Knowles 1992). Between 1995 and 1999, seven dead tricolored bats were found in Lincoln County during studies of avian mortality related to wind energy development (Osborn et al. 1996; Johnson et al. 2003). Due to its small population size in the state, its susceptibility to disturbance during hibernation, and the potential for persecution, the tricolored bat remains listed as a special concern species.

Description

The tricolored bat is the smallest of Minnesota's 7 bat species. Its dorsal color varies from yellowish or grayish brown to reddish brown, and the underside is somewhat paler. The tricolored bat can be distinguished from *Myotis* species by its tri-colored pelage: the bases and tips of individual hairs are dark, while the middle sections are light. The ears, muzzle, and membranes on the forearms are light-colored and often appear pinkish, compared to the dark brown or black of both species of *Myotis*. The tragus (fleshy projection in the ear) is short and blunt. The basal third of the tail membrane is furred dorsally, but on some individuals these hairs are sparse. Typically, adults are 75-90 mm (2.9-3.5 in.) long and weigh 4-8 g (0.14-0.28 oz.).

Habitat

Tricolored bats hibernate in caves, mines, and tunnels. While this species is often found hibernating in the same sites as large populations of other bats, such as little brown bats (*Myotis lucifugus*) and northern myotis (***M. septentrionalis***), tricolored bats tend to occupy the deeper portions of the hibernaculum where temperatures and humidity are higher (Hazard 1982). In the summer, tricolored bats generally roost singly, often in trees, but some males and non-reproductive females also roost in their winter hibernaculum (Carter et al. 1999). Maternity colonies have not yet been located in Minnesota, but elsewhere they have been found in trees, rock crevices, and barns or other buildings (Whitaker 1998).

Biology / Life History

Tricolored bats hibernate from October into April. During this time, they enter a state of torpor in which their body temperature drops to that of the surrounding air temperature. Human activity in caves where bats are hibernating can be detrimental, causing disturbed bats to awaken frequently during the winter. Such disturbance may result in bats emerging from the hibernaculum early, before there is an adequate supply of insects for them to feed on, or they may fail to awaken altogether. Disturbance during hibernation is especially damaging to juveniles, who are already less likely to survive the winter because they have had less time than adults to accumulate fat reserves (Stebbings 1969). Tricolored bats mate in the fall, and females give birth to litters, usually of two young, in the spring. While the young are growing, the mothers roost in small maternity colonies. After about four weeks, the young are able to fly and will accompany their mothers on foraging flights. They become independent after another week or two (Whitaker 1998). Tricolored bats forage erly in the evening, and may catch up to half their body weight in insects each hour. They forage mainly over water, and tend to avoid deep woods or open fields. Tricolored bats eat moths, flies, beetles, and ants (Barbour and Davis 1969).

Conservation / Management

Protection of bat hibernacula from human disturbance is a top priority. Suitable wintering sites should be gated or otherwise made inaccessible from September until June. Research on the summer habitat use of this species will be important in determining whether lack of suitable summer habitat is limiting the distribution of tricolored bats in the state. Further survey work to determine the true range of this species in Minnesota is necessary in light of the recent finding of dead tricolored bats in southwestern Minnesota.

Conservation Efforts in Minnesota

In the mid-1980s, a survey of the distribution and status of Minnesota bats was funded by the DNR's **Nongame Wildlife Program**. In 1988, 8-10 tricolored bats were found hibernating in the Heinrich Brewery Cave in Minneapolis (Birney and Nordquist 1989). Subsequently, the Nongame Wildlife Program funded the installation of a bat gate over the cave entrance to prevent disturbance to hibernating bats. Nongame wildlife staff in southeast Minnesota conduct a survey of the Brightsdale Tunnel in Fillmore County, where tricolored bats have been found since 1985, on a three-year rotation. Approximately 800 bats, including individuals of three other species, overwinter in this tunnel, making it one of the largest known bat colonies in the state. To date, bat-friendly gates and doors have been installed at seven cave/mine entrances in the state. In addition, winter surveys are conducted periodically to note any changes in the number of hibernating individuals.

During the course of a study on avian mortality related to wind energy in southwestern Minnesota, the discovery of dead bats, including tricolored bats, led to the development of several studies to investigate bat mortality. The results of these studies indicated that most collision mortality involved migrating or dispersing bats, not resident, breeding bats (Johnson et al. 2003, 2004). Future research should concentrate on determining the cause of bat collisions with wind

turbines and methods to reduce and mitigate the mortality.

References

Barbour, R. W., and W. H. Davis. 1969. Bats of America. The University Press of Kentucky, Lexington, Kentucky. 286 pp.

Birney, E. C., and G. E. Nordquist. 1989. A winter census and conservation of Minnesota cave bats, 1988-89. Report submitted to the Nongame Wildlife Program, Minnesota Department of Natural Resources.

Carter, T. C., M. A. Menzel, B. R. Chapman, and K. V. Miller. 1999. Summer foraging and roosting behavior of an Eastern Pipistrelle *Pipistrellus subflavus*. Bat Research News 40(1):5-6.

Hazard, E. B. 1982. The mammals of Minnesota. University of Minnesota Press, Minneapolis, Minnesota. 280 pp.

Johnson, G. D., M. K. Perlik, W. P. Erickson, and M. D. Strickland. 2004. Bat activity, composition, and collision mortality at a large wind plant in Minnesota. Wildlife Society Bulletin 32(4):1278-1288.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Sheperd, D. A. Sheperd, and S. A. Sarappo. 2003. Mortality of bats at a large-scale wind power development at Buffalo Ridge, Minnesota. American Midland Naturalist 150:332-342.

Knowles, B. 1992. Bat hibernacula on Lake Superior's North Shore, Minnesota. Canadian Field-Naturalist, 106(2):252-254.

Osborn, R. G., K. F. Higgins, C. D. Dieter, and R. E. Usgaard. 1996. Bat collisions with wind turbines in southwestern Minnesota. Bat Research News 37(4):105-108.

Stebbings, R. E. 1969. Observer influence on bat behaviour. Pages 93-100 *in* Proceedings of the First International Bat Conference.

Swanson, G. A., and C. Evans. 1936. The hibernation of certain bats in southern Minnesota. Journal of Mammalogy 17:39-43.

Whitaker, J. O., Jr. 1998. Life history and roost switching in six summer colonies of Eastern Pipistrelles in buildings. Journal of Mammalogy 79(2):651-659.

Pyrgus centaureae freija (Warren, 1924) — Grizzled Skipper

MN Status:
special concern
Federal Status:
none
CITES:
none
USFS:
yes

Group:
insect
Class:
Insecta
Order:
Lepidoptera
Family:
Hesperiidae
Habitats:
Non-forested Acid Peatland, Non-forested Rich Peatland

Map Interpretation

Map Interpretation

Synonyms

Basis for Listing

The grizzled skipper, also known as the Freija's grizzled skipper, is a Holarctic species with three named subspecies in North America. Subspecies *loki* occurs in the Rocky Mountains. Subspecies *wyandot*, which some authorities regard as a separate species (**NatureServe 2008**), occurs in the eastern United States, from Ohio and possibly Michigan to New York and south in the Appalachians to North Carolina. Subspecies *freija* ranges across northern North America from Alaska to Labrador. Minnesota is on the southern margin of its range, and its occurrence here is the only one in the contiguous United States (if the population in Michigan is indeed *wyandot*, as some think it is (NatureServe 2008)). The grizzled skipper is known from only a single locality in Minnesota, in Lake County. It probably occurs at other locations in Minnesota, and the absence of additional records may be explained by its spring flight period, when weather is often unsuitable for butterfly activity, and by the poor understanding of its habitat preferences here. However, there is little doubt that it is rare in the state. The grizzled skipper was listed as a special concern species in Minnesota in 1996.

Description

The grizzled skipper is a small, dark butterfly with a wingspan of 2.4-2.8 mm (0.94-1.14 in.). Females are slightly larger than males, but the sexes are otherwise similar in appearance. The upperside is brownish-black with numerous small, angular white spots on the forewings and diffuse, whitish spots on the hind wings. Conspicuous white and black checkered fringes border both wings. Beneath, the sharply angular white spots in a grayish-brown ground create a strongly checkered effect. Adult grizzled skippers typically fly low over vegetation and may disappear into thickets. Their flight has been described as mothlike, not especially fast, but "blurry" because of the rapid wing strokes. The most similar species that occurs in Minnesota is the common checkered skipper (*Pyrgus communis*). This species is larger on average (wingspan 2.6-3.4 cm; 1-1.3 in.), and is lighter and brighter than the grizzled skipper. The pepper-and-salt skipper (*Amblyscirtes hegon*) is a small, dark, brownish-gray skipper with whitish markings that bears a superficial resemblance to the grizzled skipper. However, the whitish markings are much less prominent both above and beneath and do not create a checkered effect. At rest, the pepper-and-salt skipper holds its wings together vertically or spreads the hind wings more than the forewings, whereas the grizzled skipper typically rests with the hind and forewings held in the same plane, often spread almost horizontally.

Habitat

In Manitoba, the grizzled skipper is reported to frequent "forest edges and openings as well as mixed scrub/heath tundra" (Klassen et al. 1989). At the one known location in Minnesota, the skipper occurs in a large, old clearing on sandy soils dominated by grasses, with some willow (*Salix* spp.), alder (*Alnus incana*), bilberry (*Vaccinium cespitosum*), and blueberries (***Vaccinium angustifolium*** and *V. myrtilloides*). Black spruce (*Picea mariana*) and tamarack (*Larix laricina*) swamps border the clearing in places.

Biology / Life History

Development from egg to adult is reported to take two years in the northern part

of the grizzled skipper's range, but it is not known whether this is the case in Minnesota. Little appears to be known about the life history of subspecies *freija*. In the Michigan entity, late-stage larvae overwinter (Nielsen 1999) and this is probably true in Minnesota. Adults may begin to emerge in late May and all die by the end of June. Cloudberry (*Rubus chamaemorus*) has been reported to be a larval hostplant in Canada and in Europe. Shrubby cinquefoil (*Potentilla fruticosa*) has been reported for subspecies *loki*, and wild strawberry (*Fragaria* sp.) is documented in Michigan. All are members of the family Rosaceae. Adults take floral nectar from available flowers and also imbibe from wet soil.

Conservation / Management

The grizzled skipper is listed as a special concern species in Minnesota because it is apparently rare and limited to a small geographic area. Habitat alteration or destruction could easily threaten the continued occurrence of the species in Minnesota, but because so little is known about its biology, the specific nature of the changes that would threaten the species are not known. Forest fires may be detrimental in the short run, but important for creating and maintaining open habitat. Application of insecticides to grizzled skipper habitat would certainly be a threat, as would the use of herbicides that affect broad-leaved plants.

Conservation Efforts in Minnesota

Data on known occurrences of the grizzled skipper are maintained by the Minnesota DNR's **Natural Heritage and Nongame Research Program** and utilized in reviewing various activities for environmental impact, notably the application of insecticides and herbicides. These records are also available to forest managers. The one known grizzled skipper location was acquired from a timber company and incorporated into the forest plan for the **Superior National Forest**, which designated the site as a Special Use Area. A management plan to maintain the habitat opening with some mechanical clearing and careful prescribed burning has been implemented. The **Minnesota Biological Survey** has conducted limited searches for the grizzled skipper. Additional survey work is needed to determine the full range of this species in Minnesota and its abundance within that range.

References

Huber, R. L. 1981. An updated checklist of Minnesota butterflies. Minnesota Entomological Association Newsletter 14(3):15-25.

Klassen, P., A. R. Westwood, W. B. Preston, and W. B. McKillop. 1989. The butterflies of Manitoba. Manitoba Museum of Man and Nature, Winnipeg, Manitoba. 290 pp.

Layberry, R. A., P. W. Hall, and J. D. LaFontaine. 1998. The butterflies of Canada. University of Toronto Press, Toronto, Ontario. 280 pp. + color plates.

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. <http://www.natureserve.org/explorer>. Accessed 3 June 2008.

Nielsen, M. C. 1999. Michigan butterflies and skippers: a field guide and reference. Michigan State University Extension, East Lansing, Michigan. 248 pp.