(DRAFT) - Taxonomy
Species BUTTERFLY, BLUE, LOTIS
Species Id ESIS501003
Date 13 MAR 96

TAXONOMY

NAME - BUTTERFLY, BLUE, LOTIS

OTHER COMMON NAMES - BUTTERFLY, BLUE, LOTIS; BLUE, LOTIS;BUTTERFLY, BLUE and LOTUS

ELEMENT CODE -

CATEGORY - Terrestrial Insects

PHYLUM AND SUBPHYLUM - ARTHROPODA,

CLASS AND SUBCLASS - INSECTA,

ORDER AND SUBORDER - LEPIDOPTERA,

FAMILY AND SUBFAMILY - LYCAENIDAE,

GENUS AND SUBGENUS - LYCAEIDES,

SPECIES AND SSP - ARGYROGNOMON, LOTIS

SCIENTIFIC NAME - LYCAEIDES ARGYROGNOMON LOTIS

AUTHORITY -

TAXONOMY REFERENCES -

COMMENTS ON TAXONOMY -
Lotis Blue Butterfly

Lycaeides argyrognomon lotis Linter, 1879

KINGDOM:	Animal	GROUP:	Insect
PHYLUM:	Arthropoda	CLASS:	Insecta
ORDER:	Lepidoptera	FAMILY:	Lycaenidae

Lycaeides argyrognomon (Bergstrasser) is circumpolar in its distribution and was described from the old world. Lycaeides argyrognomon lotis (Lintner) is one of 11 subspecies described in North America (02,03). The type locality is Mendocino County, CA (11).

The subspecies is morphologically distinguished from other

subspecies of the widely distributed species Lycaeides argyrognomon, by its size, wing color and maculation pattern. The lotis blue butterfly exhibits one of the largest wingspans of any Nearctic race of L. argyrognomon. The typical wingspan averages slightly less than 2.5 cm, with a range of about 1.5 to 3.2 cm. The upper surface of the wing is a deep violet-blue in the male with a crenulate black boarder and fringe of white scales along the outer wing margin. In the female, the upper wing surface is brown, sometimes bluish-brown, with

a wavy band of orange across the subtermen of the fore and hind wings. An inconspicuous black crenulate band and fringe of white (frequently brownish white) scales lie along the termen. Ventral facies in both sexes are characterized by a grayish ground color with scattered black maculations in the distal, subterminal and terminal areas. Light blue-green scales may be present basally. A wavy band of orange maculations between two rows of sinuous black maculations borders the terment of the hindwings (01).

The original description of the species was done by Lintner, 1879. Taxonomic problems consist of: The name lotis was applied to the Southern California population of Lycaeides melissa for many years, but was correctly reapplied by Nabokov, 1949. A nomenclaturial reassignment of names for some European species, based on a decision of the International Commission on Zoological Nomenclature, apparently gives the specific name idas to the species that Nabakov, 1949, identified with the widespread one in North America. American usage does not yet fully reflect this change. This species has also been known by the scientific name Plebejus argynognomon lotis (10). Another common name for the subspecies is the lotis blue (12), and the U.S. Fish and Wildlife Service Recovery Plan for this species confuses the genus of the host plant with the common name of the insect spelling it lotus blue butterfly.

Illustrations may be found in (04,05,06). Specimens are lodged in the California Academy of Sciences, UC Berkeley, and the LA County Museum. More information on this species can be obtained from: Dr. Richard A. Arnold, Wellman Hall, Entomology Department, University of California, Berkley.

(DRAFT) - Status
Species BUTTERFLY, BLUE, LOTIS
Species Id ESIS501003
Date 13 MAR 96

STATUS

Coded Status

E: Federal Endangered

Non-consumptive recreational

COMMENTS ON STATUS -
U.S. STATUSES AND LAWS:

The lotis blue butterfly (Lycaeides argyrognomon lotis) has been designated an Endangered species pursuant to the Endangered Species Act of 1973 (50 CFR, Sec. 17.11; P.L. 93-205, 87 Stat. 884; 16 U.S.C. 1531-1540), as amended. The subspecies has this status wherever found including the State of California. Critical Habitat has not been designated for this subspecies.

This subspecies is protected by the Lacey Act (P.L. 97-79, as amended; 16 U.S.C. 3371 et seq.) which makes it unlawful to import, export, transport, sell, receive, acquire, or purchase any wild animal (alive or dead including parts, products, eggs, or offspring):

(1) in interstate or foreign commerce if taken, possessed, transported or sold in violation of any State law or regulation; or

(2) if taken or possessed in violation of any U.S. law, treaty, or regulation or in violation of Indian tribal law.

It is also unlawful to possess any wild animal (alive or dead including parts, products, eggs, and offspring) within the U.S. territorial or special maritime jurisdiction (as defined in 18 U.S.C. 7) that is taken, possessed, transported, or sold in violation of any State law or regulation, foreign law, or Indian tribal law.

RESPONSIBLE FEDERAL AGENCIES:

USFWS -Responsible for the management/recovery, listing, and law enforcement/protection of this species.

All Federal agencies have responsibility to ensure that any action authorized, funded, or carried out by that agency is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of Critical Habitat (50 CFR 402), and to utilize their authorities to carry out programs for the conservation of the species.

STATE STATUSES AND LAWS:

STATE: California
DESIGNATED STATUS: None

INTERNATIONAL STATUSES, TREATIES, AND AGREEMENTS:
The lotis blue butterfly is listed as Endangered in the 1986 IUCN Status - 1

(DRAFT) - Status

Species BUTTERFLY, BLUE, LOTIS

Species Id ESIS501003

Date 13 MAR 96

Red List of Threatened Animals.

ECONOMIC STATUSES:

This species has recreational value to naturalists as a rare species and has value as a component of California's natural heritage of biotic diversity.

75/03/20:40 FR 12691/ - Notice of review of status
75/10/14:40 FR 48139/48140 - Proposed listing as Endangered
76/06/01:41 FR 22041/22044 - Listing as Endangered
81/02/27:46 FR 14651/14658 - Five year review
87/07/07:52 FR 25523/25528 - Notice of Review

HABITAT ASSOCIATIONS

HABITAT - TERRESTRIAL
INLAND AQUATIC

SOCIETY OF AMERICAN FORESTRY TYPES

SAF TYPE	STAGE	CLOSURE
Sitka spruce-western hemlock	shrub--seedling	
Sitka spruce-western hemlock	young tree	
Sitka spruce-western hemlock	mature tree	
Redwood	young tree	
Redwood	mature tree	

LAND USE -

Evergreen Forest Land
Forested Wetland

NATIONAL WETLAND INVENTORY CODES

NWI	NWICLS	NWIMOD	NWISPEC
Palustrine	SS3		
Palustrine	ML		

COMMENTS ON HABITAT ASSOCIATIONS -

Historically the lotus blue butterfly has been found in several coastal localities in wet meadows and sphagnum-willow bogs (05). Today the species is known only from a sphagnum bog in the Pygmy Forest, Mendocino County, CA. The bog is surrounded by a closed-cone pine forest, dominated primarily by bishop pine (Pinus muricata). It is bisected by a Pacific Gas and Electric Company power line right-of-way. However, the presence and maintenance of utility poles is incidential to the species occurrence there and the presence of such in no way is uniquely associated with the lotis blue butterfly. Other tree species that occur sporadically in the overstory include pygmy cypress (Cupressus pygmaea) and grand fir (Abies grandis). Both of these species are dominant members of the coastal coniferous forests of WA and OR, but reach the southern limits of their distribution in Mendocino County (07). Two other species that are major associates in the Pygmy Forest vegetation are beach pine (Pinus contorta var. bolanderi) and Ft. Bragg manzanita (Arctostaphylos nummularia) also grow at this site.

A very dense shrub layer is present at the bog habitat site.

Dominant species in the shrub layer include California huckleberry (Vaccinium ovatum), western labrador tea (Ledum glandulosum), sala (Gaultheria shallon), wax myrtle (Myrica californica), California rose-bay (Rhododendron macrophyllum), western hemlock (Tsuga heterophylla), and sitka spruce (Picea sitchensis). Other species at the site include sphagnum, sundew (Drosera rotundifolia), deer fern (Blechnum spicant), horsetail (Equisetum sp.), and sedge (Carex sp.).

Plants that may occur at the site that are catorgorized by the California Native Plant Society as Rare or Endangered include Carex californicais (a sedge), Campanula californica (bellflower) and Lilium maritimum (coast lilly).

The vegetation of the Pygmy Forest is dominated by pygmy cypress and beach pine with an ericaceous understory. The growth of these trees is stunted because the soils have a shallow hardpan. The soils do not provide good growing conditions because they are shallow, poor

in nutrients, waterlogged in the winter, and very dry in the summer (01).

Habitat requirements of the lotis blue butterfly are poorly known. Rice's blue butterfly (L. a. ricei Cross) in northern California and the Anna blue butterfly (L. a. anna Edwards), use other Lotus species as their larval food plants (08,09). L. a. ricei is found in boggy meadows similar to L. a. lotis. Thus, while the larval food plant of L. a. lotis has not been positively identified, circumstantial evidence suggests that Lotus formosissimus is the prime candidate (01). Although most adults were observed in the bog, a few of the 16 adults seen by Arnold since 1977 were found along California Highway 1 in association with a small patch of coast trefoil less than 5 meters in diameter.

Soils at the site are formed on Pleistocene beach deposits belonging to the Noyo series, underlain by graywacke sandstone of the Franciscan Formation at a depth of about 30 meters. The water level is usually within 1 to 2 meters of the surface. The bog is poorly drained, acidic, and contains deep deposits of peat. Standing water is stained brown by leached tannins (01).

Habitat Associations - 2

(DRAFT) - Food Habits
Species BUTTERFLY, BLUE, LOTIS
Species Id ESIS501003
Date 13 MAR 96

FOOD HABITS

TROPHIC LEVEL -
HERBIVORE

LIFESTAGE	FOOD	FOOD PART
General	Forb	Flowers/Fruit/Seed
General	Forb	Leaves/Stems

(DRAFT) - Environment Associations
Species BUTTERFLY, BLUE, LOTIS
Species Id ESIS501003
Date 13 MAR 96

ENVIRONMENTAL ASSOCIATIONS

G = General
LIM = Limiting
J = Juvenile
RJ = Resting Juvenile
FJ = Feeding Juvenile
L = Larvae
RL = Resting Larvae
FL = Feeding Larvae

A = Adult
RA = Resting Adult
FA = Feeding Adult
BA = Breeding Adult
P = Pupae
E = Egg

LIFESTAGE	ENVIRONMENTAL ASSOCIATIONS
G	Inland Wetlands: Bogs

(DRAFT) - Life History
Species BUTTERFLY, BLUE, LOTIS
Species Id ESIS501003
Date 13 MAR 96

LIFE HISTORY

FOOD HABITS:

Nothing is known for certain about food habits of the lotis blue butterfly, as the larval host plant is not confirmed (01).

Rice's blue butterfly (L. a. ricei Cross) in northern California and the Anna blue butterfly (L. a. anna Edwards) use other Lotus species as their larval food plants (08,09). L. a. ricei is found in boggy meadows similar to L. a. lotis. Thus, while the larval food plant of L. a. lotis has not been positively identified, circumstantial evidence suggests that Lotus formosissimus is the prime candidate (01).

HOME RANGE/TERRITORY:

The species is non-territorial. Although most adults were observed in the bog, a few of the 16 adults seen by Arnold since 1977 were found along California Highway 1 in association with a small patch of coast trefoil less than 5 meters in diameter. Only a few specimens of the Lotus were found in the bog itself, but about 10 patches of it grow around the border of the bog. These patches vary in size from less than 1 meter to 5 meters in diameter (01).

PERIODICITY:

Museum records suggest that the butterfly has a protracted single generation, with adult flight occurring from mid-April to early July (01). The species is active (flies) during the day.

MIGRATION PATTERNS:

This species is nonmigratory.

COVER/SHELTER REQUIREMENTS:

Historically the lotis blue butterfly has been found in several coastal localities in wet meadows and sphagnum-willow bogs (05). Today the species is known only from a sphagnum bog in the Pygmy Forest, Mendocino County, CA. The bog is surrounded by a closed-cone pine forest, dominated primarily by bishop pine (Pinus muricata).

A very dense shrub layer is present at the bog habitat site. Dominant species in the shrub layer include California huckleberry (Vaccinium ovatum), western labrador tea (Ledum glandulosum), sala (Gaultheria shallon), wax myrtle (Myrica californica), California rose-bay (Rhododendron macrophyllum), western hemlock (Tsuga heterophylla), and sitka spruce (Picea sitchensis). Other species at the site include sphagnum, sundew (Drosera rotundifolia), deer fern (Blechnum spicant), horsetail (Equisetum sp.), and sedge (Carex sp.).

Plants that may occur at the site that are catorgorized by the California Native Plant Society as Rare or Endangered include Carex californicais (a sedge), Campanula californica (bellflower) and Lilium maritimum (coast lilly).

Adult butterflys have been seen in association with coast trefoil (Lotus formosissimus), their suspected larval food plant. Deerweed (Lotus scoparius) occurs on drier ground adjacent to the bog, however, no adult lotis blue butterflys have been found in association with

this species (01).

REPRODUCTIVE SITE REQUIREMENTS:
A female in oviposition behavior was observed on Lotus formosissimus (01).

REPRODUCTIVE CHARACTERISTICS:
The flight season of the adult is from mid-April to early July. Most collection records are from mid-May to mid-June (01). The species appears to be univoltine (01).

PARENTAL CARE:
No parental care takes place.

POPULATION BIOLOGY:
The lotis blue butterfly is an exceedingly rare species. At this time, nothing is known about the population biology of the species other than it is seldom collected and, when observed, occurs in very low numbers (01).

SPECIES INTERRELATIONSHIPS:
It is thought, from circumstantial evidence, that the larval food plant is Lotus formosissimus. This, however, has not been proven by studies (01).

OTHER LIFE HISTORY DESCRIPTORS:
None.

(DRAFT) - Management Practices
Species BUTTERFLY, BLUE, LOTIS
Species Id ESIS501003
Date 13 MAR 96

MANAGEMENT PRACTICES

RESULT	MANAGEMENT PRACTICE
Beneficial	Restricting/regulating human disturbance of populations
Beneficial	Developing/maintaining/protecting wetlands
Beneficial	Controlling water levels
Beneficial	Restricting/regulating human use of habitats
Beneficial	Land Acquisition
Beneficial	Controlling pollution [thermal, chemical, physical]
Beneficial	Controlling/Restricting Pesticide Use
Beneficial	Controlling/Restricting Herbicide Use
Beneficial	Reforestation
Beneficial	Controlling/Removing Nonnative Vegetation
Beneficial	Stocking captive-reared wild-strain animals
Beneficial	Transplanting wild animals
Beneficial	Transplanting Wild Eggs/Wild Seeds
Beneficial	Restricting Poaching
Adverse	Collecting
Existing	Collecting
Adverse	Food Supply Reduction
Existing	Food Supply Reduction
Adverse	
Existing	
Adverse	Low Gene Pool
Existing	Low Gene Pool
Adverse	Rural Residential/Industrial Areas
Existing	Rural Residential/Industrial Areas
Adverse	Highway/Railroads
Existing	Highway/Railroads
Adverse	Transmission Lines/Towers
Existing	Transmission Lines/Towers
Adverse	Soil compaction by heavy equipment in mine areas
Existing	Soil compaction by heavy equipment in mine areas
Adverse	Draining wetlands, marshes, ponds, lakes
Existing	Draining wetlands, marshes, ponds, lakes
Adverse	Strip mining
Existing	Strip mining
Adverse	Water Level Fluctuation
Existing	Water Level Fluctuation
Adverse	Flooding
Existing	Flooding
Adverse	Groundwater drawdown
Existing	Groundwater drawdown
Adverse	Applying herbicides

Existing	Applying herbicides
Adverse	Applying pesticides
Existing	Applying pesticides
Adverse	Vegetation Composition Changes
Existing	Vegetation Composition Changes
Adverse	Suppressing wildfire
Existing	Suppressing wildfire
Adverse	Forest Alteration

(DRAFT) - Management Practices
Species BUTTERFLY, BLUE, LOTIS
Species Id ESIS501003
Date 13 MAR 96

RESULT	MANAGEMENT PRACTICE
Existing	Forest Alteration
Adverse	Harvesting
Existing	Harvesting

COMMENTS ON MANAGEMENT PRACTICES -

The lotis blue butterfly appears to be a naturally rare insect. The limited number of specimens in museum collections and personal observations of lepidopterists preclude an accurate assessment of the abundance of the lotis blue butterfly prior to its Federal listing as an Endangered species. Based on discussions with several lepidopterists who collected or observed the lotis blue butterfly prior to 1975, it is apparent that even then the species occurred at very low density. Seven specimens are the most any collector took on a single day, although another 12 to 15 specimens were observed on that same day (08).

The reasons this butterfly may have declined are largely speculative or limited to circumstantial evidence. The species may have declined because of natural biological factors (high larval mortality, succession of plant community, etc). Also, climatic factors or a change in land management practices since the arrival of European man to California may have affected the butterfly. A drought during 1976-1977 caused the water table to drop as much as 90 meters below its normal level. The sphagnum bog habitat dried out and no specimens of the suspected larval foodplant (coast treefoil - Lotus formosissimus) were noted within the confines of the bog. Lotis blue butterflies were not observed that year. Presumably the species has survived earlier droughts.

Suppression of fire and other practices that caused disturbance of the forest may affect the distribution and abundance of the species. The only probable foodplant, which grows in limited abundance, is Lotus formosissimus. This plant is more abundant along roadcuts and graded areas. Several small, scattered patches of the plant occur along forest edges, on drier sites adjacent to the bog, and in forest clearings. Since 1977, the abundance of Lotus at these localized patches has declined. The Lotus is a perennial that is a denizen of locally disturbed areas. As succession of the vegetation proceeds, this plant decreases in abundance.

Logging of the forest may also decrease the abundance of the foodplant and the butterfly because of changes in water relationships, the building of roads and subsequent urbanization (including the filling of wetlands) of logged areas. Foodplant distribution is not necessarily the key to the abundance of the lotis blue butterfly because the butterfly is not present at all of the areas that contain Lotus.

The lotis blue butterfly is extremely vulnerable to further loss or alteration of its habitat because of its limited distribution and small population size. Additional or continued threats to the species

and its habitat include logging, powerline corridor maintenance or replacement, use or drift of herbicides or insecticides, and impoundment or drainage of water. At present the site is in a

near-natural condition, but its small makes it susceptible to even a very localized disturbance (01). Collection of any of the stages of this species may also jepardize the subspecies because of its low population numbers (01).

APPROVED PLAN:
U.S. Fish and Wildlife Service. 1985. Lotus Blue Butterfly Recovery Plan. U.S. Fish and Wildlife Service. Portland, OR. 46 pp.

The interim objectives for the Recovery Plan of the Lotis Blue Butterfly are:

a) To protect all known populations on habitats of at least two hectares.

b) To establish three viable self-sustaining populations on sites of at least two hectares.

c) To determine the population numbers and sizes of secure habitats to allow declassifying and delisting.

In order to accomplish the interim objectives and formulate primary objectives, the following recovery activities must be attained:

1) Preserve and protect populations at all known, new, and reestablished sites. This can be accomplished by investigating establishment of agreements with the owners of the habitat and adjacent lands; conducting vegetation studies to determine ecological factors and vegetational management needs; controlling pesticide (insecticides, herbicides, etc.) use; minimizing other incompatible human activities such as overdraft of the aquifer, fire control activities (brushing, etc.); developing and revising management strategies; developing monitoring techniques and annually surveying habitat; and surveying for additional sites or for sites suitable for reintroduction. It may be necessary to designate habitat as an "Environmentally Sensitive Habitat" to increase protection.

2) Establish three new, self-sustaining viable populations on suitable secure habitats of at least two hectares which will incorporate measures such as securing habitat, removing exotic vegetation, rehabilitating habitats, reintroducing host plant species if necessary (transplanting wild seeds if feasible), and reintroducing butterflys from wild stock or propagated stock (conduct basic research first as to the feasibility of using surrogate species, transplanting wild eggs, etc.).

3) Conduct ecological studies to develop management recommendations, determine larval and adult host plants, physiological requirements, demographics, and other biological/ecolgical studies, and to determine criteria for declassifying and delisting.

4) Develop and implement public information and education programs.

5) Enforce laws and regulations prohibiting illegal take and enforce land use plans and ordinances. Revisions to existing regulations may be necessary to increase protection. New legislation

may also be necessary.

The U.S. Fish and Wildlife Service Recovery Plan for this species confuses the genus of the host plant with the common name of the

insect, spelling it lotus blue butterfly.

References

***** REFERENCES FOR ALL NARRATIVES EXCEPT N-OCCURRENCE *****

01 U.S. Fish and Wildlife Service. 1985. Lotus Blue Butterfly Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 46 pp.

02 dos Passos, C.F. 1964. A synomic list of the Nearctic Rhopalocera. Lepid. Soc. Memoir No 1. 145 pp.

03 Downey, J.C. 1975. Genus Plebejus Kluk. In: W.H. Howe (ed). The butterflies of North America. P. 346. Doubleday and Co., Inc. Garden City, NY.

04 Nabokov, V. 1949. The Nearctic members of the genus Lycaeides, Hubner (Lepidoptera:Lycaenidae). Bull. Mus. Comp. Zool., Harvard Univ. 101:479-541.

05 Tilden, T.W. 1965. Butterflies of the San Francisco Bay region. Univ. of CA Press.

06 Howe, W.H. (ed). 1975. The butterflies of North America. Doubleday and Co., Inc. Garden City, NY.

07 Munz, P.A. and D.D. Keck. 1968. A California flora. Univ. of CA Press, Berkeley. 1681 pp.

08 Emmel, J. 1984. Pers. comm. Hemet, CA.

09 Kellner, C. 1984. Pers. comm. Department of Zoology, University of California, Davis, CA.

10 Sacramento Endangered Species Office. Lotis blue butterfly files.

11 Lintner, A. 1876. 30 th Rept. New York State Mus. Nat. Hist. 169 pp.

12 Sutherland, D.W.S. 1978. Common names of insects and related organisms (1978 revision). Spec. Publ. 78-1. Entom. Soc. of Am. College Park, MD.

***** REFERENCES FOR N-OCCURRENCE NARRATIVE ONLY *****

01 U.S. Fish and Wildlife Service. 1985. Lotus Blue Butterfly Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 46 pp.

02 Tilden, T.W. 1965. Butterflies of the San Francisco Bay region.
Univ. of CA Press.
03 Sacramento Endangered Species Office. Lotis blue butterfly files.
04 Arnold, R.A. 1978. Survey and status of six Endangered butterflies in California, 1977. Calif. Dept. of Fish and Game,
Nongame Wildl. Invest. Rpt. 95 pp.
05 Arnold, R.A. 1980. Ecological studies of 6 Endangered butterflies: island biogeography, patch dynamics, and the design
of nature preserves. Ph.D. thesis. Univ. of Calif., Berkley, CA.
365 pp.