Recovery Strategy for the Greenish Blue *insulanus* subspecies (*Plebejus saepiolus insulanus*) in British Columbia

Prepared by the Garry Oak Invertebrates Recovery Implementation Group

BRITISH COLUMBIA
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Ministry of Environment

June 2007

About the British Columbia Recovery Strategy Series

This series presents the recovery strategies that are prepared as advice to the Province of British Columbia on the general strategic approach required to recover species at risk. The Province prepares recovery strategies to meet our commitments to recover species at risk under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada – British Columbia Agreement on Species at Risk*.

What is recovery?

Species at risk recovery is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

A recovery strategy represents the best available scientific knowledge on what is required to achieve recovery of a species or ecosystem. A recovery strategy outlines what is and what is not known about a species or ecosystem; it also identifies threats to the species or ecosystem, and what should be done to mitigate those threats. Recovery strategies set recovery goals and objectives, and recommend approaches to recover the species or ecosystem.

Recovery strategies are usually prepared by a recovery team with members from agencies responsible for the management of the species or ecosystem, experts from other agencies, universities, conservation groups, aboriginal groups, and stakeholder groups as appropriate.

What's next?

In most cases, one or more action plan(s) will be developed to define and guide implementation of the recovery strategy. Action plans include more detailed information about what needs to be done to meet the objectives of the recovery strategy. However, the recovery strategy provides valuable information on threats to the species and their recovery needs that may be used by individuals, communities, land users, and conservationists interested in species at risk recovery.

For more information

To learn more about species at risk recovery in British Columbia, please visit the Ministry of Environment Recovery Planning webpage at:

<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>

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Disclaimer

This recovery strategy has been prepared by the Garry Oak Invertebrates Recovery Implementation Group, as advice to the responsible jurisdictions and organizations that may be involved in recovering the species. The British Columbia Ministry of Environment has received this advice as part of fulfilling its commitments under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada – British Columbia Agreement on Species at Risk.*

This document identifies the recovery strategies that are deemed necessary, based on the best available scientific and traditional information, to recover Greenish Blue *insulanus* subspecies populations in British Columbia. Recovery actions to achieve the goals and objectives identified herein are subject to the priorities and budgetary constraints of participatory agencies and organizations. These goals, objectives, and recovery approaches may be modified in the future to accommodate new objectives and findings.

The responsible jurisdictions and all members of the recovery team had an opportunity to review this document. However, this document does not necessarily represent the official positions of the agencies or the personal views of all individuals on the recovery implementation group.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this strategy. The Ministry of Environment encourages all British Columbians to participate in the recovery of Greenish Blue *insulanus* subspecies.

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The British Columbia Ministry of Environment is responsible for producing a recovery strategy for Greenish Blue *insulanus* subspecies under the *Accord for the Protection of Species at Risk in Canada*. Parks Canada Agency and Environment Canada, Canadian Wildlife Service participated in the development of this recovery strategy.

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The Greenish Blue *insulanus* subspecies Recovery Strategy was drafted by Jennifer Heron, with subsequent review by the Garry Oak Ecosystems Recovery Team Invertebrates at Risk Recovery Implementation Group. Brenda Costanzo and Ted Lea reviewed the recovery strategy and provided information on plants and plant communities. Photographs were taken by Jennifer Heron.

EXECUTIVE SUMMARY

Greenish Blue *insulanus* subspecies (*Plebejus saepiolus insulanus* Blackmore) is a subspecies of the Nearctic butterfly species *P. saepiolus* (Boisduval), the Greenish Blue, in the family Lycaenidae, which includes the blues, hairstreaks, and coppers. Seven subspecies of *P. saepiolus* are taxonomically described, two of which occur in British Columbia (B.C.): Greenish Blue *insulanus* subspecies, and *P. saepiolus amica* (W.H. Edwards). Greenish Blue *insulanus* subspecies is endemic to southern Vancouver Island, BC. The *amica* subspecies occurs from Yukon to Labrador and south through the mountains of California and Arizona (Layberry *et al.* 1998). It occurs throughout B.C. except on the coast (Guppy and Shepard 2001).

The most recent records of Greenish Blue *insulanus* subspecies are from Mount Malahat (1979), Mount Arrowsmith (1962, 1963), and Mount Finlayson (1960). Although the subspecies has not been recorded since 1979, surveys of potential habitat are incomplete and unconfirmed sightings are periodically reported. No extant population is known at this time.

Historic records of Greenish Blue *insulanus* subspecies are from disturbed habitats including roadsides, old campgrounds, clover banks along open streams, and similar habitats. The most recent records are from higher elevations including subalpine areas. Clovers, the apparent host plants, require continual moisture and sunlight. It is unknown if Greenish Blue *insulanus* subspecies can subsist on non-native clover species, although eastern populations of the *amica* subspecies do. Other subspecies of Greenish Blue are typically found in open areas with clovers, such as bog edges, woodland openings, and mountain meadows.

Potential threats to Greenish Blue *insulanus* subspecies include the introduction and encroachment of invasive plants that threaten native clover populations throughout the known range of the butterfly. Greenish Blue *insulanus* subspecies may not be able to use non-native clovers; presence of non-native clovers may also be detrimental to the survival of this butterfly as these species may displace native clovers. At low elevations in Garry oak and associated ecosystems, urban and rural land conversion, development pressure, and recreational use also threaten Greenish Blue *insulanus* subspecies habitat. The effects of climate change on Greenish Blue *insulanus* subspecies are unknown although considered a potential threat to the recovery of this butterfly.

Based on its taxonomic status as assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), no populations of Greenish Blue *insulanus* subspecies are known and recovery is not feasible at this time. If a population is located, recovery is possible through the current framework for species protection in British Columbia. Inventory of potential habitat will continue.

The recovery goal is to confirm the presence or absence of Greenish Blue *insulanus* subspecies within the species historic range in Canada, and protect[1] any extant population(s) if found. The recovery objectives are to (1) survey all historical sites and areas of potential habitat and locate any existing population(s) of Greenish Blue *insulanus* subspecies by 2017; and (2) to implement habitat protection[1] and threat mitigation for any populations located by 2017, using stewardship activities and other mechanisms.

[1] Protection can be achieved through a variety of mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

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BACKGROUND

Greenish Blue *insulanus* subspecies (*Plebejus saepiolus insulanus* Blackmore) is a subspecies of the Nearctic butterfly species *P. saepiolus* (Boisduval), the Greenish Blue, in the family Lycaenidae, which includes the blues, hairstreaks, and coppers. Seven subspecies of *Plebejus saepiolus* are described, two of which occur in British Columbia (B.C.): Greenish Blue *insulanus* subspecies, and Greenish Blue *amica* subspecies, *Plebejus saepiolus amica* (W.H. Edwards). Greenish Blue *insulanus* subspecies is considered endemic to southern Vancouver Island, B.C. (Guppy and Shepard 2001). The *amica* subspecies occurs from Yukon to Labrador and south through the mountains of California and Arizona (Layberry *et al.* 1998). In B.C., *Plebejus saepiolus amica* occurs throughout the province except on the coast (Guppy and Shepard 2001).

Canadian lepidopterists recognize Greenish Blue *insulanus* subspecies as a separate subspecies confined to southeastern Vancouver Island (Layberry *et al.* 1998; Guppy and Shepard 2001). In the United States, Scott (1986) shows the subspecies *Plebejus saepiolus insulanus* as being more widespread and having a range from northwestern California to southwestern B.C. (Vancouver Island only), Montana, Colorado, Nevada, and Utah. Hinchliff (1994) applies *Plebejus saepiolus insulanus* to a few populations that occur only within Oregon. Until the taxonomic uncertainty surrounding the butterfly can be resolved, Greenish Blue *insulanus* subspecies is recognized as a distinct subspecies occurring only on Vancouver Island and found nowhere else in Canada (COSEWIC 2000).

The most recent records of Greenish Blue *insulanus* subspecies are from Mount Malahat (1979), Mount Arrowsmith (1962, 1963), and Mount Finlayson (1960). Although the subspecies has not been recorded since 1979, surveys of potential habitat are incomplete and unconfirmed sightings are periodically reported (J. Heron, pers. comm., 2006; L. Ramsay, pers. comm., 2006). No extant populations are known (J. Heron, pers. comm., 2006).

Species Assessment Information from COSEWIC

Scientific Name	*Plebejus saepiolus insulanus*
Common Name	Greenish Blue (Island Blue under COSEWIC)
Present Status in Canada and Year of Designation	Endangered, 2000
Range in Canada	British Columbia
Rationale for Status	An extremely restricted endemic of southern Vancouver Island, this species was last recorded in 1979. There remains a remote possibility that it still persists in poorly surveyed habitat.

Description of the Species

Current taxonomic literature (Layberry *et al.* 1998; Guppy and Shepard 2001) provides no diagnostic characters for the morphological separation of Greenish Blue *insulanus* subspecies and *amica* subspecies. Figures 1a-c show photographs of Greenish Blue *insulanus* subspecies

taken from specimens deposited at the Spencer Entomological Museum at the University of British Columbia. The following is a general description of adults of the Greenish Blue, provided here as there are no written descriptions of the subspecies itself. The wingspan is 2.1–2.8 cm. The dorsal wing surfaces of the females are dark brown with a bluish metallic sheen and the hindwing margins have a row of black spots with orange caps. The ventral wing surfaces of the female are pale tan to dark grey. The dorsal wing surfaces of the male are metallic blue and have a row of dark spots on the hindwing margins. The ventral wing surfaces are bluish towards the base of the wings and gradually turn silver-grey towards the margins. Both wings have two rows of black spots. The male hindwings have orange caps on the second row of spots that are directed towards a partial third row of spots, with one spot distinctly larger along this row. Both sexes have a distinct black bar in the dorsal forewing.

Figure 1a. Greenish Blue *insulanus* subspecies, dorsal surface (male). Photo: J. Heron.

Figure 1b. Greenish Blue *insulanus* subspecies, ventral surface (female). Photo: J. Heron.

Figure 1c. Greenish Blue *insulanus* subspecies ventral surface. Photo: J. Heron.

The eggs of Greenish Blue *insulanus* subspecies have not been taxonomically described but are likely similar to those of other subspecies of the Greenish Blue, i.e., greenish-white and laid singly among host flowers (Sharp and Parks 1973; Layberry *et al.* 1998).

Taxonomic descriptions of the larvae of Greenish Blue *insulanus* subspecies have not been published; however, a photograph of the *amica* subspecies is published in Guppy and Shepard (2001). Greenish Blue *insulanus* subspecies larvae are likely similar to Greenish Blue larvae.

Greenish Blue larvae are an overall light lime green with white hairs dorsally and laterally, a purplish front or red rear, and a lateral pair of white lines paralleled by a row of white dots (Scott 1986).

The life cycle of Greenish Blue *insulanus* subspecies is not well known. There is one generation per year. Adults fly from late May through early August, depending on locality (COSEWIC 2000), elevation and latitude (Scott 1986). Late season records are usually of females at higher elevations (COSEWIC 2000). Greenish Blue adults are active in June and July; tend to remain near host plants, and have been noted perching on flowers and sedges within bog areas (Christensen 1981; Pyle 1986; Layberry *et al.* 1998; Guppy and Shepard 2001). Scott (1986) notes that adults are local to the host, sipping mud and flowers of *Trifolium*. Males patrol for females near host plants.

Details of Greenish Blue *insulanus* subspecies overwintering, egg development and hatching, and larval development are unknown (COSEWIC 2000), but likely are similar to what has been observed for the Greenish Blue. The Greenish Blue overwinters as an immature larva (Ferris and Brown 1980; Scott 1986; Guppy and Shepard 2001) and other species of *Plebejus* overwinter as eggs or early instar larvae. Thus, Greenish Blue *insulanus* subspecies eggs and larvae may be found on the host plant for extended periods.

Populations and Distribution

Greenish Blue *insulanus* subspecies is endemic to Vancouver Island, B.C., where it has been recorded from Saratoga Beach near Campbell River south to Victoria (Figure 2). No records of this subspecies are known from outside this area (Jones 1951; COSEWIC 2000). Existing data are insufficient for estimates of population and distribution trends. The subspecies was last recorded in 1979 (COSEWIC 2000; B.C. Ministry of Water, Land and Air Protection 2004). Future inventory may find unknown or presumed-to-be-extirpated populations.

The global rank is G5TH (i.e., *Plebejus saepiolus* is globally secure, while *P. saepiolus insulanus* subspecies is possibly extinct; NatureServe Explorer 2007).

The provincial rank is SH (i.e., possibly extinct) and the subspecies is Red-listed by the B.C. Conservation Data Centre (2007).

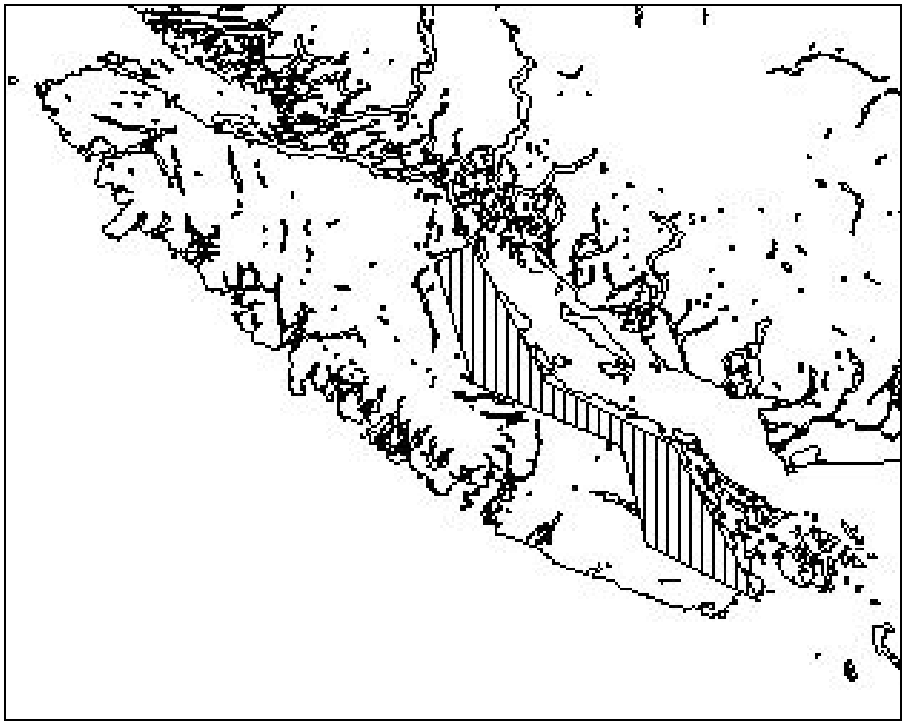

Figure 2. Historical distribution of Greenish Blue *insulanus* subspecies in British Columbia. Map Ministry of Environment.

Needs of the Greenish Blue *insulanus* subspecies

Habitat and biological needs

Greenish Blue *insulanus* subspecies historic records are from disturbed areas including roadsides, old campgrounds, cloverbanks along open streams, and similar habitats. The most recent records are from higher elevations including subalpine areas (COSEWIC 2000). Native clovers, thought to be the host plants, require continual moisture and sunlight. It is unclear if Greenish Blue *insulanus* subspecies can subsist on non-native clover species. In the Pacific Northwest, other subspecies of the Greenish Blue typically are found in open areas with clovers such as bogs, woodland openings, and mountain meadows.

Food plant specificity of Greenish Blue *insulanus* subspecies is unknown although it is likely that the subspecies uses native or non-native clovers (*Trifolium* spp.) (Emmel and Emmel 1973) as do other subspecies of the Greenish Blue. Clovers are low-lying perennials of the family Fabaceae found in moist places at low to middle elevations (Pojar and MacKinnon 1994). Oviposition and larval development in many species of *Plebejus* (including the Greenish Blue) occur in the flower heads of legumes, especially clovers (Layberry *et al.* 1998; COSEWIC 2000; Guppy and Shepard 2001). Greenish Blue has been recorded feeding on native Springbank Clover (*T. wormskjoldii* Lehn.) (Scott 1986), which occurs on Vancouver Island. In eastern Canada, *amica* spp. larvae feed on introduced white (*T. repens* L.) and alsike clover (*T. hybridum* L.) but apparently do not feed on introduced red clover (*T. pratense* L.) (Christensen 1981; Layberry *et al.* 1998). Larvae of Greenish Blue feed upon both flowers and fruits and are typically found within the flower heads. Similar behaviour is probable for Greenish Blue

insulanus subspecies. Scott (1986) also suggests Greenish Blue may feed upon *Lotus* species, another genus in the pea family, once clovers senesce. Within southern Vancouver Island, eight *Lotus* spp. occur: five are native and three are introduced. These plants occur within grassy meadow habitats, roadsides, pastures, and clearings – similar habitats to that of Greenish Blue *insulanus* subspecies. Greenish Blue *insulanus* subspecies has not been documented feeding on *Lotus* spp.

Most species of *Plebejus* overwinter as eggs or first- or second-instar larvae (Ferris and Brown 1980; Guppy and Shepard 2001). It is not known in what life stage Greenish Blue *insulanus* subspecies overwinters.

Ecological role

Adult butterflies are minor plant pollinators. Many Lycaeninae butterflies (a subfamily of Lycaenidae) are obligatorily or facultatively associated with ants (Pierce and Elgar 1985; Pierce *et al.* 2002). The specific ecological role of Greenish Blue *insulanus* subspecies is unknown.

Limiting factors

Host plant specificity: On Vancouver Island, as elsewhere (COSEWIC 2000), native clovers have possibly been outcompeted, have been replaced by non-native plants, and thus are no longer common. If the subspecies's only food plants are native clovers, limited host plant resources would limit populations of Greenish Blue *insulanus* subspecies. In other parts of the species' range, subspecies of Greenish Blue are known to be polyphagous and will subsist upon non-native clovers, and as suggested in Scott (1986), on *Lotus* spp. Greenish Blue *insulanus* subspecies has only been recorded in association with native clovers and possibly depends upon these plants alone. However, research into polyphagy is necessary to clarify this limiting factor.

Dependency on ant species: Greenish Blue *insulanus* subspecies belongs to the subfamily Lycaeninae, some members of which have obligate or facultative relationships with ants (Pierce *et al.* 2002). It is unknown if Greenish Blue *insulanus* subspecies is an ant associate.

Threats

Greenish Blue *insulanus* subspecies has not been observed or recorded since 1979 and threats to the subspecies are undocumented and unknown. The list below is of potential threats based on experience with at-risk species occurring within parts of Greenish Blue *insulanus* subspecies historic range (GOERT 2006). These activities and processes may have contributed to degradation or loss of habitat or populations in the past, and could threaten populations.

Description of threats

The following are considered to be threats, assuming that populations of Greenish Blue *insulanus* subspecies exist:

I. *Invasive and exotic species.* Their introduction and encroachment threaten native host plant species, and change ecosystems (GOERT 2006). It is unknown if Greenish Blue *insulanus* subspecies populations may be able to subsist on non-native clovers, and if host plant switching is possible.
II. *Habitat destruction*. Most ecosystems of southern Vancouver Island that contain suitable Greenish Blue *insulanus* subspecies habit occur primarily on private land and are under development pressure. Suitable habitat is becoming increasingly fragmented and species that depend upon these ecosystems are increasingly vulnerable to natural threats including disease and predation, inclement weather, and effects of forest succession (e.g., see GOERT 2006).
III. *Recreational use.* Historic locations for Greenish Blue *insulanus* subspecies are periodically used for recreational purposes including hiking, camping, pet exercise, mountain biking, and some all terrain vehicle use.
IV. *Btk spray*. Some parts of southern Vancouver Island, the adjacent Gulf Islands, and the mainland are periodically sprayed with the biological control agent Btk (*Bacillus thuringiensis* var. *kurstaki*), to eradicate introduced populations of European or Asian Gypsy Moths (*Lymantria dispar* L.). Btk is a naturally occurring bacterium that, at certain concentrations, is pathogenic to feeding butterfly and moth larvae. Aerial or ground sprays are highly effective in controlling gypsy moths but will also affect caterpillars of non-target species feeding within spray zones.
V. *Climate change.* The effects of climate change on Greenish Blue *insulanus* subspecies are unknown but may seriously impede the recovery of this taxon. Studies on other butterfly taxa indicate an overall threat to this group (J. Hellmann, pers. comm., 2006).
VI. *Collecting.* Butterfly enthusiasts may want to collect specimens of Greenish Blue *insulanus* subspecies. Specimens should not be collected for reasons other than research. Specimens collected should be reported to the B.C. Conservation Data Centre and deposited in the Royal British Columbia Museum or the Canadian National Collection of Insects and Arachnids. Collecting individuals of Greenish Blue *insulanus* subspecies is illegal on federal lands because the species is listed as Endangered in the *Species at Risk Act* (SARA). Any collection activities should only occur if essential to the recovery of the species and only by qualified government personnel or those individuals issued a collection permit from the appropriate authority.

Actions Already Completed or Underway

- Survey of potential habitat of Greenish Blue *insulanus* subspecies in subalpine areas of southern Vancouver Island (B.C. Ministry of Water, Land and Air Protection 2004). No populations of the subspecies were found during this survey.
- *Status of Five Butterflies and Skippers in British Columbia* (Shepard 2000). Southern Vancouver Island and the adjacent Gulf Islands were surveyed for at-risk butterflies. No populations of Greenish Blue *insulanus* subspecies were found.
- Southeastern Vancouver Island Garry oak meadows. Repeated annual surveys of seven meadows from Victoria to Hornby Island have found neither Greenish Blue *insulanus* subspecies nor native clover specimens (J. Hellmann, pers. comm., 2006).

Knowledge Gaps

Little is known about Greenish Blue *insulanus* subspecies life history, habitat requirements, potential threats, and distribution. In the absence of known populations, most knowledge gaps cannot be filled. Determining if populations of Greenish Blue *insulanus* subspecies exist is the first priority. Should populations be located, habitat and other biological knowledge gaps (including description and assessment of threats) should be addressed to define management activities for population protection and maintenance. Clarification of the subspecies taxonomy within *Plebejus saepiolus* is a knowledge gap.

RECOVERY

Recovery Feasibility

Recovery is "the process by which the decline of an endangered, threatened or extirpated species is arrested or reversed, and threats removed or reduced to improve the likelihood of the species persistence in the wild. A species will be considered *recovered* when its long-term persistence in the wild has been secured" (Environment Canada *et al.* 2005). Recovery of Greenish Blue *insulanus* subspecies depends upon the location of at least one population, eliminating threats to this population, and otherwise ensuring its survival.

As with many other rare species, little is known about the historical distribution of Greenish Blue *insulanus* subspecies. Nothing indicates that this subspecies was ever abundant or widespread in British Columbia. No data exist on the habitat and ecology of this subspecies and population viability cannot be estimated.

Canadian lepidopterists recognize Greenish Blue *insulanus* subspecies as a separate subspecies confined to southeastern Vancouver Island (Layberry *et al.* 1998; COSEWIC 2000; Guppy and Shepard 2001). In the United States, Scott (1986) shows the subspecies *P. saepiolus insulanus* as being more widespread and having a range from northwestern California to southwestern B.C. (Vancouver Island only), Montana, Colorado, Nevada, and Utah. Hinchliff (1994) applies *P. saepiolus insulanus* to a few populations that occur only within Oregon. Until the taxonomic uncertainty surrounding the butterfly can be resolved, Greenish Blue *insulanus* subspecies is recognized as a distinct subspecies occurring only on Vancouver Island and found nowhere else in Canada (COSEWIC 2000). Recovery of Greenish Blue *insulanus* subspecies is not currently feasible as there are no known populations of the subspecies. If a population is found, recovery could be possible through the current framework for species protection in British Columbia.

Are individuals capable of reproduction currently available to improve the population growth rate or population abundance?
No population of Greenish Blue *insulanus* subspecies is known. Should a population be located, successful reproduction is implied. The capability of such a population to serve as a source to repopulate unoccupied habitat is unknown. Little information exists on population structure, dispersal and reproductive capability of this subspecies.

Is sufficient habitat available to support the species or could it be made available through habitat management or restoration?
Habitat and host information for Greenish Blue *insulanus* subspecies is scarce; few museum specimens exist and the most recent record is 1979. Because of this, the true extent of existing suitable habitat cannot be determined. General habitat and host information can be inferred from available data for other subspecies of the Greenish Blue. Locating a population of Greenish Blue *insulanus* subspecies would permit determination of details of habitat and host requirements.

Can significant threats to the species or its habitat be avoided or mitigated through recovery actions?
Much of the range of Greenish Blue *insulanus* subspecies falls within a densely populated area of British Columbia and habitat threats within that area (e.g., development pressure, invasive species) are expected to continue. At higher elevations, development pressure is less of a threat, although forestry may occur in adjacent habitats (e.g., road building through potential Greenish Blue *insulanus* subspecies habitat). Habitat threats may be mitigated through stewardship agreements with private landholders, working with local governments and industry on provincial Crown lands managed for resource extraction, and/or other measures.

Do the necessary recovery techniques exist and are they known to be effective?
If a population of the subspecies is found, effective recovery techniques exist and may be successful. Captive breeding of Greenish Blue *insulanus* subspecies to gain life history and reproduction knowledge and supplement wild populations may be feasible. Techniques potentially used in the recovery of this subspecies would be similar to the techniques applied to species with similar threats, issues, and requirements: captive breeding, invasive species control, host plant propagation. However, all threats to survival of this subspecies must be mitigated first and some may preclude successful recovery.

Recovery Goal

The recovery goal is to confirm the presence or absence of Greenish Blue *insulanus* subspecies within the species historic range in Canada, and protect[1] any extant population(s) if found.

Recovery Objectives

I. To survey all historical sites and areas of potential habitat and locate any existing population(s) of Greenish Blue *insulanus* subspecies by 2017.
II. To implement habitat protection[1] and threat mitigation for any populations located by 2017, using stewardship activities and other mechanisms.

[1] Protection can be achieved through a variety of mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

Approaches Recommended to Meet Recovery Objectives

Potential threats include invasive species encroachment, habitat destruction, recreational habitat use, Btk spraying, climate change, and collecting (Table 1). The broad strategies to address the threats are as follows (II – III strategies apply should a population be located):

I. *Inventory* – survey historic locations and additional suitable habitat.
II. *Site protection* – protect[1] any extant populations and their habitats if the species is relocated in British Columbia
III. *Clarify taxonomic uncertainty* within the *Plebejus saepiolus* subspecies group.
IV. *Research and monitoring* - conduct research on populations, habitats, and potential threats; identify the real threats by establishing a monitoring program for known and potential threats and to monitor changes in population attributes and habitats.

Recovery Planning Table

Table 1. Recovery Planning Table

Priority	Obj. no.	Threats addressed	Recommended approaches to meet recovery objectives
High	I–II	I–III	o Draft an *Inventory Strategy for Greenish Blue insulanus subspecies*, a document that describes a scheduled approach to surveying historically occupied sites and areas of potential habitat for Greenish Blue *insulanus* subspecies, including procedures for long-term monitoring of any newly found populations. o Within the Inventory Strategy for Greenish Blue *insulanus* subspecies, identify and record potential threats at each historic location. o Create a habitat map for the likely range of Greenish Blue *insulanus* subspecies, showing the distribution of potential food plants and habitats on Vancouver Island.
Low	I–II	I–VI	o Develop a public education program on butterfly species at risk and the threats to these species, in conjunction with the Garry Oak Ecosystems Recovery Team public education program. o Develop an approach to establishing stewardship agreements, covenants, or other relevant partnerships with private owners of suitable Greenish Blue *insulanus* subspecies habitat o Identify the invasive species that may further threaten the subspecies. o Support further research into the threats to Greenish Blue *insulanus* subspecies o Clarify taxonomic status and uncertainty around Greenish Blue *insulanus* subspecies and its relationship to additional subspecies o Support long-term butterfly monitoring within the gypsy moth spray zone.

Performance Measures

Criteria for evaluating progress towards achieving the goals and objectives of this strategy include the following (III–V assume populations are located):

I. Clarification of the taxonomic relationship between subspecies in the *Plebejus saepiolus* subspecies group.
II. Confirmation of the presence or absence of the subspecies in Canada.
III. The percentage of recovery habitat sites that are under some form of effective protection. The number of stewardship agreements and/or covenants in place on private lands, or other measures on Crown land.
IV. The initiation and progress of research projects on existing populations, habitats, understanding of threats, determination of ecological and habitat requirements, establishment of a monitoring program.
V. The number of educational and stewardship activities conducted with landowners and land managers.

Critical Habitat

Identification of the species' critical habitat

No critical habitat, as defined under the federal *Species at Risk Act* [S.2], is proposed for identification at this time. The critical habitat for Greenish Blue *insulanus* subspecies cannot be defined. The subspecies was last recorded in 1979 and specific habitat information is not available. If a population of the subspecies is found, a detailed definition of Greenish Blue *insulanus* subspecies critical habitat will be prepared according to a schedule of studies (Table 2).

Recommended schedule of studies to identify critical habitat

Table 2. Schedule of studies

Description of activity	Outcome/Rationale	Timeline
o Survey all historical locations of Greenish Blue *insulanus* subspecies.	If a population is located, record habitat information and compile critical habitat description. Better understanding of habitat requirements.	2017
o Create an inventory strategy for the entire range of Greenish Blue *insulanus* subspecies, including mapping the distribution of potential host plants and habitats on Vancouver Island where the subspecies could occur.	If a population is found, record habitat information and compile critical habitat description.	2010
o Initiate an inventory of priority potential new habitat (excluding historical sites where records are from).	Possible new populations located; better understanding of habitat requirements.	
o Within the potential habitat, identify suitable habitat that meets the needs for survival and recovery of the species if it is relocated.		

Existing and Recommended Approaches to Habitat Protection

If a population of Greenish Blue *insulanus* subspecies is found, the habitat should be a priority for protection. If the habitat is private land, landowner contact should be initiated and best management practices should be made available to the landowner. If the habitat is Crown owned, legislative protection measures should be implemented. If the land is regional or municipally owned, contact these governments and make best management practices available.

For successful implementation of species at risk protection measures, there is a strong need for engaging stewardship activities on a variety of land tenures, including private and First Nations lands. Stewardship involves voluntary cooperation of landowners to protect Species at Risk and the ecosystems they rely on. The Preamble to the federal *Species at Risk Act* states that "stewardship activities contributing to the conservation of wildlife species and their habitat should be supported" and that "all Canadians have a role to play in the conservation of wildlife in this country, including the prevention of wildlife species from becoming extirpated or extinct." Furthermore, the Bilateral Agreement between British Columbia and Canada on Species at Risk states that "stewardship by land and water owners and users is fundamental to preventing species from becoming at risk and in protecting and recovering species that are at risk" and that "cooperative, voluntary measures are the first approach to securing the protection and recovery of species at risk."

Effects on Other Species

Recovery efforts for Greenish Blue *insulanus* subspecies will benefit all native butterfly species that occur within the same habitat through inventory, habitat conservation, restoration, and invasive species removal. Effects on other species will be assessed as recovery work is undertaken, assuming Greenish Blue *insulanus* subspecies populations are located.

Socio-economic Considerations

No social or economic considerations are evident as populations of Greenish Blue *insulanus* subspecies are not known to exist. If the species is relocated, a socio-economic analysis could be conducted; there is currently no reason to believe there would be significant impacts.

Statement on Action Plans

Pending the discovery of new occurrences of Greenish Blue *insulanus* subspecies during the planned inventory, the recovery goals and objectives for the subspecies will be redefined, and an action plan will be completed within five years of the date of the revised recovery strategy.

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