PROPOSED

Species at Risk Act
Recovery Strategy Series
Adopted under Section 44 of SARA

Recovery Strategy for the Dun Skipper *vestris* subspecies (*Euphyes vestris vestris*) in Canada

Dun Skipper *vestris* subspecies



2017

Government of Canada
Gouvernement du Canada
Canada

Recommended citation:

Environment and Climate Change Canada. 2017. Recovery Strategy for the Dun Skipper *vestris* subspecies (*Euphyes vestris vestris*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. 2 parts, 24 pp. + 36 pp.

For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry[1].

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Également disponible en français sous le titre
« Programme de rétablissement de l'hespérie rurale de la sous-espèce *vestris* (*Euphyes vestris vestris*) au Canada [Proposition] »

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ISBN
Catalogue no.

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[1] http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

RECOVERY STRATEGY FOR THE DUN SKIPPER *VESTRIS* SUBSPECIES (*Euphyes vestris vestris*) IN CANADA

2017

Under the Accord for the Protection of Species at Risk (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada.

In the spirit of cooperation of the Accord, the Government of British Columbia has given permission to the Government of Canada to adopt the *Recovery Plan for Dun Skipper (*Euphyes vestris*) in British Columbia* (Part 2) under Section 44 of the *Species at Risk Act* (SARA). Environment and Climate Change Canada has included a federal addition (Part 1) which completes the SARA requirements for this recovery strategy.

The federal recovery strategy for the Dun Skipper *vestris* subspecies in Canada consists of two parts:

Part 1 – Federal Addition to the *Recovery Plan for Dun Skipper (*Euphyes vestris*) in British Columbia*, prepared by Environment and Climate Change Canada.

Part 2 – *Recovery Plan for Dun Skipper (*Euphyes vestris*) in British Columbia*, prepared for the British Columbia Ministry of Environment.

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Part 1 – Federal Addition to the *Recovery Plan for Dun Skipper (*Euphyes vestris*) in British Columbia*, prepared by Environment and Climate Change Canada

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[2] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of Environment and Climate Change is the competent minister under SARA for the Dun Skipper *vestris* subspecies and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Province of British Columbia (B.C.), as per section 39(1) of SARA. SARA section 44 allows the Minister to adopt all or part of an existing plan for a species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Province of British Columbia provided the attached recovery plan for the Dun Skipper (Part 2) as science advice to the jurisdictions responsible for managing the species in British Columbia. It was prepared in cooperation with Environment and Climate Change Canada.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment and Climate Change Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Dun Skipper *vestris* subspecies and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment and Climate Change Canada and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When critical habitat is identified, either in a recovery strategy or an action plan, SARA requires that critical habitat then be protected.

[2] http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area[3] be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies.

If the critical habitat for a migratory bird is not within a federal protected area and is not on federal land, within the exclusive economic zone or on the continental shelf of Canada, the prohibition against destruction can only apply to those portions of the critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies as per SARA ss. 58(5.1) and ss. 58(5.2).

For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

Acknowledgements

Development of this recovery strategy was coordinated by Kella Sadler and Matt Huntley (Environment and Climate Change Canada, Canadian Wildlife Service – Pacific Region (ECCC CWS-PAC)). Jennifer Heron (British Columbia Ministry of Environment (B.C. MoE)) provided supporting data and background documents. Patrick Lilley, Crispin Guppy, Connie Miller-Retzer (B.C. Ministry of Forests, Lands and Natural Resource Operations), David Trotter (B.C. Ministry of Agriculture), Jennifer Heron (B.C. MoE), Peter Fielder (B.C. MoE), Chris Pasztor (B.C. Ministry of Natural Gas Development), Kim Borg (ECCC CWS – National Capital Region), and Peter Bedrossian (Department of National Defence) provided helpful editorial advice and comment. Nick Page and Claudia Schaefer of Raincoast Applied Ecology compiled information for the first draft of this recovery strategy. Danielle Yu and Douglas Hrynyk (ECCC CWS-PAC) provided additional assistance with mapping and figure preparation.

[3] These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Bird Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

Additions and Modifications to the Adopted Document

The following sections have been included to address specific requirements of the federal *Species at Risk Act* (SARA) that are not addressed in the *Recovery Plan for Dun Skipper (*Euphyes vestris*) in British Columbia* (Part 2 of this document, referred to henceforth as "the provincial recovery plan") and/or to provide updated or additional information.

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Therefore, statements in the provincial recovery plan referring to protection of survival/recovery habitat may not directly correspond to federal requirements and are not being adopted by Environment and Climate Change Canada as part of the federal recovery strategy. Recovery measures dealing with the protection of habitat are adopted; however, whether these measures will result in protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.

Two Dun Skipper subspecies occur in Canada: a western subspecies (*Euphyes vestris vestris*) found only in British Columbia (B.C.), and an eastern subspecies (*Euphyes vestris metacomet*) found from Alberta east to Nova Scotia (Layberry et al. 1998; NatureServe 2015). Only Dun Skipper, *vestris* subspecies has been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). All references to "Dun Skipper" in this document refers to Dun Skipper *vestris* subspecies unless stated otherwise.

1. Species Status Information

This section replaces the "Species Status Information" (section 2) in the provincial recovery plan.

Legal Status: SARA Schedule 1 (Threatened) (2000).

Table 1. Conservation Status of Dun Skipper *vestris* subspecies (NatureServe 2015, B.C. Conservation Data Center 2015, B.C. Conservation Framework 2015).

Global (G) Rank*	National (N) Rank*	Sub-national (S) Rank*	COSEWIC Designation	B.C. List**	B.C. Conservation Framework
G5T4***	Canada (N2); United States (N3N4)	Canada: British Columbia (S2); United States: Washington (S3), Wyoming (SNR)	Threatened (2013)	Red (2013)	Highest priority: 2 under goal 2****

*Rank 1– critically imperiled; 2– imperiled; 3- vulnerable to extirpation or extinction; 4- apparently secure; 5– secure; H– possibly extirpated; NR – status not ranked
**List of ecological communities, species and subspecies considered to be extirpated, endangered or threatened (Red List), special concern (Blue List) or not at risk (Yellow List) in B.C.
***T-rank indicates the status of infraspecific taxa (i.e. the *vestris* subspecies).

****The three goals of the B.C. Conservation Framework are: 1. Contribute to global efforts for species and ecosystem conservation; 2. Prevent species and ecosystems from becoming at risk; 3. Maintain the diversity of native species and ecosystems

Approximately 15% of the global range of Dun Skipper *vestris* subspecies is estimated to be in Canada (COSEWIC 2013).

2. Species Populations and Distribution

This section replaces the information summary for known populations[4] of Dun Skipper *vestris* subspecies in Canada (Table 1 in section 3.2 of the provincial recovery plan).

The information summary below (Table 2) describes the updated distribution of populations in Canada, all occurring in southwestern B.C. Since publication of the provincial recovery plan, two additional populations have been included from occurrences near Pemberton in 2009, at Blackwater Creek (Population 26) and Railroad Creek (Population 27) (Knopp et al. 2009). Excepting these additional populations (i.e., Populations 26 & 27), all population numbers in this section align with those provided in the provincial recovery plan. Several unverified records have also been reported (e.g., Cumberland Marsh near Comox in 2010, Rhododendron Lake near Parksville in 2013 and 2014, and many similar older records), however owing to the difficulty in accurately identifying the species from singleton/quick fly-by sightings, these have not been included in the population summary table.

Of the 27 recorded Dun Skipper populations, 19 are considered extant, 7 are considered extirpated (not observed for > 20 years, and/or suitable habitat is no longer present), and one is of unknown status. Population #11 (unknown status) has not been verified and specific date and location details are lacking.

Table 2. Summary of Dun Skipper populations in B.C. For each population (Pop.), the location, date of last observation (Last Obs.), and current status are described.

Pop.	Location	Last Obs.	Status[a]
1	Cowichan Station (Vancouver Island)	1996	Extirpated
2	Mill Bay, Malahat Ridge (Vancouver Island)	1996	Extirpated
3	Malahat, Colpman, and van Home Creeks; Spectacle Lake (Vancouver Island)	2003 (van Home Creek)[b]; 1993 (Colpman Creek; 1963 (Spectacle Lake)	Extant[b]
4	Mount Tzuhalem; Maple Bay (Vancouver Island)	1994	Extirpated
5	Cobble Hill (Vancouver Island)	1995	Extirpated
6	Nanaimo River (Vancouver Island)	2011	Extant
7	Port Alberni, northeast of (Vancouver Island)	2003	Extant
8	Mount Currie (Mainland)	2001	Extant

[4] Populations are based on the biological parameters of the butterfly (e.g. dispersal distance and habitat connectivity between known occurrences, and whether the individuals mix between). Population designations in this federal addition are based on those provided in the provincial recovery plan.

Pop.	Location	Last Obs.	Status[a]
9	Shawnigan Lake, west of (Vancouver Island)	2003	Extant
10	Big Sicker Mountain; Little Sicker Mountain; Mount Prevost; Somenos Garry Oak Preserve (Vancouver Island)	2003 (Big Sicker Mountain)[b]; 1973 (Little Sicker Mountain, Mount Prevost, Somenos Garry Oak Preserve)	Extant[b]
11	Powell River (Sunshine Coast, mainland)	Unknown	Unknown (unverified)
12	Koksilah River (Vancouver Island)	2003	Extant
13	Colquitz; Francis/King Park and Thetis Lake Park (Vancouver Island)	1963 (Thetis Lake Park); 1962 (Francis/King Park)	Extirpated
14	Wellington (Vancouver Island)	1979	Extirpated
15	Goldstream (Vancouver Island)	1923	Extirpated
16	Boston Bar (lower Fraser Valley)	2007	Extant
17	Dog Mountain (lower Fraser Valley)	2010	Extant
18	Denman Island (northern Gulf Islands)	2007	Extant
19	Saltspring Island; southeast (southern Gulf Islands)	2009	Extant
20	Burns Bog (Lower Mainland)	2004	Extant
21	Hornby Island (Northern Gulf Islands)	2004	Extant
22	Morris Lake, west of (lower Fraser Valley)	2011	Extant
23	Soowahlie Indian Reserve 14 (lower Fraser Valley)	2004	Extant
24	Yale (lower Fraser Valley)	2001	Extant
25	Lytton, south of (lower Fraser Valley)	2007	Extant
26	Blackwater Creek (Mainland)	2009	Extant
27	Railroad Creek (Mainland)	2009	Extant

[a] The status of Dun Skipper populations is as follows: Extant – record has been verified since 2001; [b] indicates site of last observation for populations with multiple location records; Extirpated - record before 2001 or habitat no longer present; Unknown (unverified) – Recent observation but occurrence details are lacking (i.e., presence of habitat, precise population, etc.).

3. Critical Habitat

This section replaces the “Information on Habitat Needed to Meet Recovery Goal” (section 7) in the provincial recovery plan.

Section 41 (1)(c) of SARA requires that recovery strategies include an identification of the species’ critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. The provincial recovery plan for Dun Skipper includes a description of the biophysical attributes of survival/recovery habitat. This science advice was used to inform the following critical habitat sections in this federal recovery strategy. Detailed methods and decision-making processes relating to critical habitat identification are archived in a supporting document.

Critical habitat for the Dun Skipper can only be partially identified at this time. Critical habitat cannot yet be identified for one population (#11) owing to a high level of location uncertainty and its unknown status. A schedule of studies (section 3.2) has been included to provide the information necessary to complete the identification of critical habitat for Dun Skipper. The identification of critical habitat will be updated when the information becomes available, either in a revised recovery strategy or action plan(s).

Critical habitat for Dun Skipper is identified in this document to the extent possible; as responsible jurisdictions and/or other interested parties conduct research to address the schedule of studies and/or other knowledge gaps[5] (including identification of specific host plant(s) of larval and overwintering stages, or other descriptive habitat requirements), the critical habitat methodology and identification may be modified and/or refined to reflect new knowledge.

3.1 Identification of the Species' Critical Habitat

Geospatial location (population) of areas containing critical habitat

Critical habitat for Dun Skipper is identified for 19 known extant populations (refer to Table 2) in southwestern British Columbia (Figures 1-9):

- Population 3: van Home Creek (Figure 1)
- Population 6: Nanaimo River (Figure 2)
- Population 7: northeast of Port Alberni (Figure 3)
- Population 8: Mount Currie (Figure 4)
- Population 9: west of Shawnigan Lake (Figure 1)
- Population 10: Big Sicker Mountain (Figure 2)
- Population 12: Koksilah River (Figure 1)
- Population 16: Boston Bar (Figure 5)
- Population 17: Dog Mountain (Figure 6)
- Population 18: Denman Island (Figure 3)
- Population 19: southeast Saltspring Island (Figure 7)
- Population 20: Burns Bog (Figure 8)
- Population 21: Hornby Island (Figure 3)
- Population 22: west of Morris Lake (Figure 9)
- Population 23: Soowahlie Indian Reserve 14 (Figure 9)
- Population 24: Yale (Figure 6)
- Population 25: south of Lytton (Figure 5)
- Population 26: Blackwater Creek (Figure 4)
- Population 27: Railroad Creek (Figure 4)

[5] Refer to priority actions outlined in the recovery planning table (Table 4) of the provincial recovery plan.

The areas containing critical habitat for Dun Skipper *vestris* subspecies are identified based on a combination of (1) all recent (<20 years old) documented occurrences[6] from known or suspected extant populations, and (2) an estimate of the lifetime seasonal dispersal capabilities of adult Dun Skipper, applied as a 1000 m radius around each documented occurrence.

The dispersal ability of Dun Skipper *vestris* subspecies is not known. However, based on studies of biologically similar species, best available information indicates a dispersal estimate of approximately 1000 m. NatureServe (Schweitzer 2001) cites a default upper limit of 1000 m inferred extent buffer for grass skippers[7] when the extent is unknown. The Mardon Skipper (*Polites mardon*), has an apparent maximum dispersal distance of about 1.6 km (Runquist 2004), but generally moves less than 800 m annually (Potter and Fleckenstein 2001). Dakota Skipper (*Hesperia dacotae*) and Ottoe Skipper (*H. ottoe*), which share many life history characteristics with Dun Skipper, have been observed surviving for 19 days in the wild under normal conditions (Dana 1991). On average, Dakota Skippers moved 39 m/day while Ottoe Skippers moved 53 m/day (Dana 1991). In absence of specific information, a daily movement distance of 53 m/day x 19 days = 1007 m, or approximately 1 km lifetime seasonal dispersal, was considered to be an appropriate distance to use in delineating area containing critical habitat for Dun Skipper.

Biophysical attributes of critical habitat

Within the areas identified as containing critical habitat, critical habitat is identified wherever any of the following habitat types occur:

- Open Douglas-fir (*Pseudotsuga menziesii*) forest; open deciduous woodlands (including Bigleaf Maple (*Acer macrophyllum*)); Garry Oak (*Quercus garryana*) and associated ecosystems
- Open areas without developed tree or shrub layer that are natural or anthropogenic in origin, e.g., open sparsely vegetated cliffs; gently sloping hillsides, grasslands, or meadows; roadsides, ditches, utility right-of-ways
- Permanent or seasonally wet areas (i.e., areas with wet and moist ground throughout the spring/summer) that are natural or anthropogenic in origin, e.g., wetlands; seasonally wet grasslands or meadows; areas with spring floods; natural hot springs; seeps; seasonally wet areas; stream banks; ditches; roadside banks, swamps; marshes; bogs

[6] An occurrence is defined as the occupied habitat patch at which an individual(s) was observed. Occurrences may consist of multiple individuals over multiple years from a spatially distinct site that were obtained during surveys or research projects. Occurrence areas include the associated potential error from geographic positioning system (GPS) units (uncertainty may range up to 25 m depending on the GPS unit accuracy).
[7] Dun Skipper belongs to the Lepidoptera sub-family of grass skippers (Hesperiinae).

Within the habitat types mentioned, Dun Skipper uses host plants for larval feeding, and other plants for adult nectaring, as well as structural elements for resting and hiding from predators. Information about the identity, composition, density, and spatial relationship of larval host plant and nectar source plant species required by Dun Skipper used during different life history stages is unknown. Dun Skipper has been observed to use a variety of native and non-native flowering plants as nectar sources during the flight period (May to August, inclusive), depending on availability, including but not limited to: Dogbane (*Apocynum* spp.), Alfalfa (*Medicago sativa*)[*], Fireweed (*Epilobium angustifolium*), Lotus Milk-vetch (*Astragalus lotiflorus*), Goldenrod (*Euthamia* spp. and *Solidago* spp.), Sweet William (*Dianthus barbatus*)*, various species of thistles (family Asteraceae), Self-heal (*Prunella vulgaris*)*, Mint (*Mentha* spp.) and Oxeye Daisy (*Leucanthemum vulgare*)*. Larval host plants for the eastern North American subspecies (*Euphyes vestris metacomet*) and Harbison's Dun Skipper (*E. v. harbisoni*) from southern California are known to be sedges (*Carex* or *Cyperus* species) (COSEWIC 2013; Marschalek and Deutschman 2015). It is likely that Dun Skipper in B.C. may use and/or require sedge plants and/or grasses for overwintering and larval feeding. Considering its distribution, it is likely that more than one larval host plant species is used. Based on the observations of larval silk shelters (required by Dun Skipper for pupation in spring), it would appear that as long as the leaf type is suitable, any species in the sedge (Cyperaceae) or grass families (Poaceae) may be adequate for larval development (Shepard 2000; James and Nunnallee 2011).

Biophysical attributes of critical habitat include the vegetation (composition and abundance of plant species), permanent or seasonally wet areas, and substrates that comprise the habitat types described above. The areas containing critical habitat for Dun Skipper (totaling 11184 ha) are presented in Figures 1-9. Critical habitat for Dun Skipper in Canada occurs within the shaded yellow polygons shown on each map where the criteria and methodology set out in this section are met.

Within these polygons, clearly unsuitable habitats such as: (i) areas of dense, closed, dry forest, (ii) deeper water areas (i.e., > 50 cm depth at lowest recorded watermark) beyond the range of shoreline vegetation, and (iii) existing permanent anthropogenic infrastructure (buildings) and/or running surfaces of paved roads or other artificial surfaces do not possess biophysical attributes required by Dun Skipper, and neither are they identified as critical habitat. The 1 km x 1 km UTM grid overlay shown on these figures is a standardized national grid system that highlights the general geographic area containing critical habitat, for land use planning and/or environmental assessment purposes. Detailed methods and decision-making processes relating to critical habitat identification are archived in a supporting document.

[*] Introduced (non-native) to B.C.

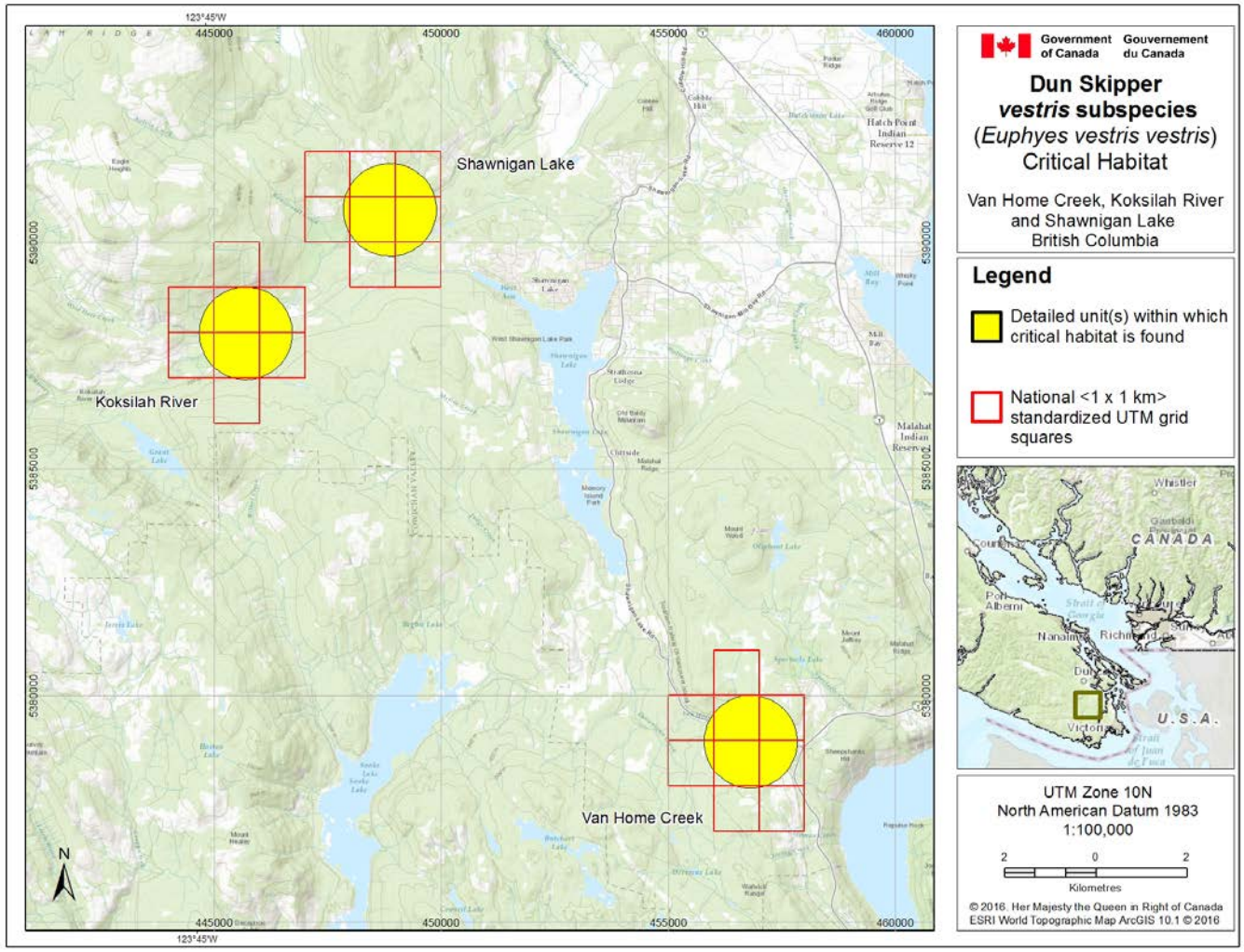


Figure 1. Critical habitat for Dun Skipper *vestris* subspecies at van Home Creek (Population 3; 329.6 ha), Koksilah River (Population 12; 329.6 ha), and west of Shawnigan Lake (Population 9; 329.6 ha), B.C. is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 1.1 are met. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area within whichcritical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

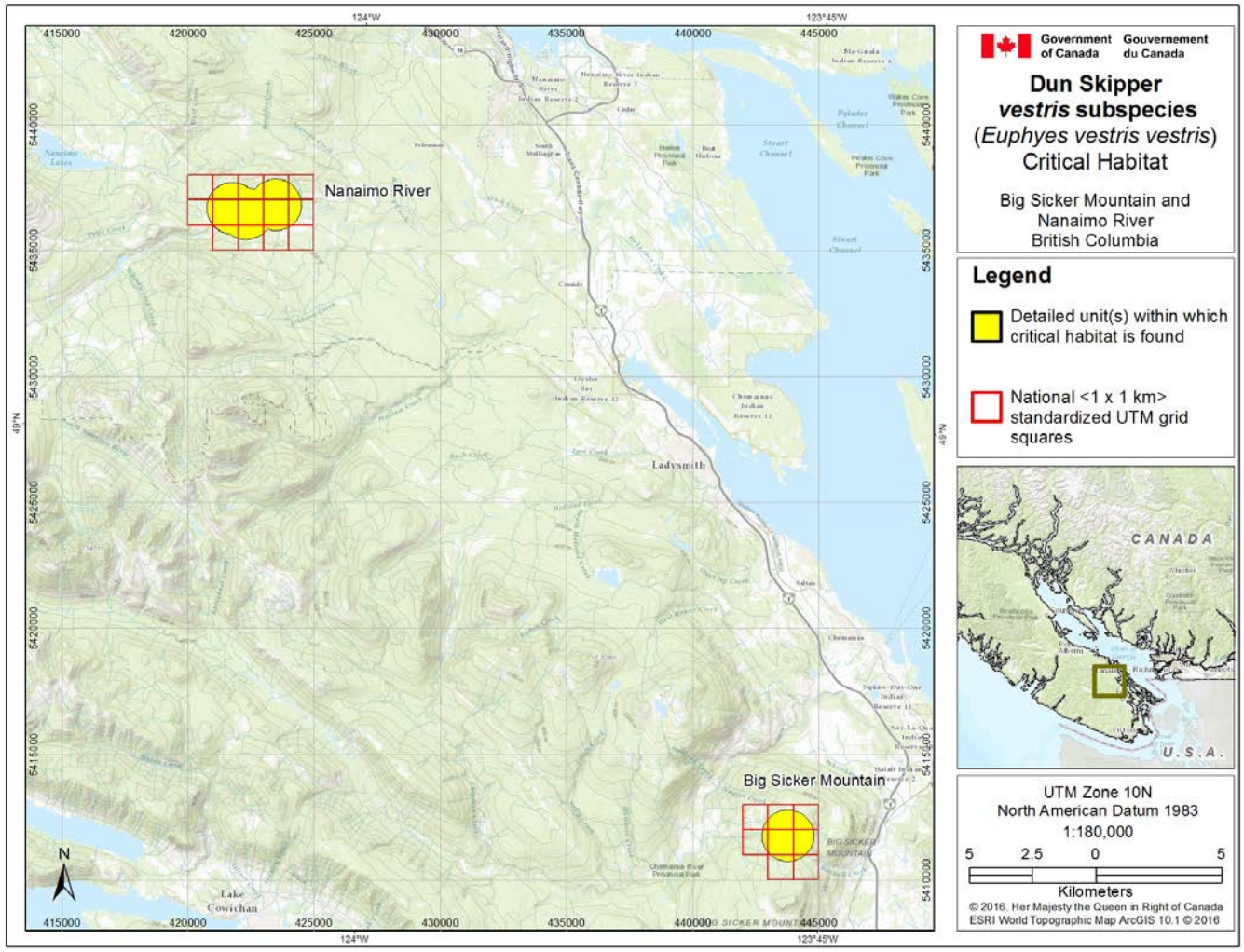


Figure 2. Critical habitat for Dun Skipper *vestris* subspecies at Nanaimo River (Population 6; 682.0 ha) and Big Sicker Mountain (Population 10; 329.6 ha), B.C. is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 1.1 are met. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

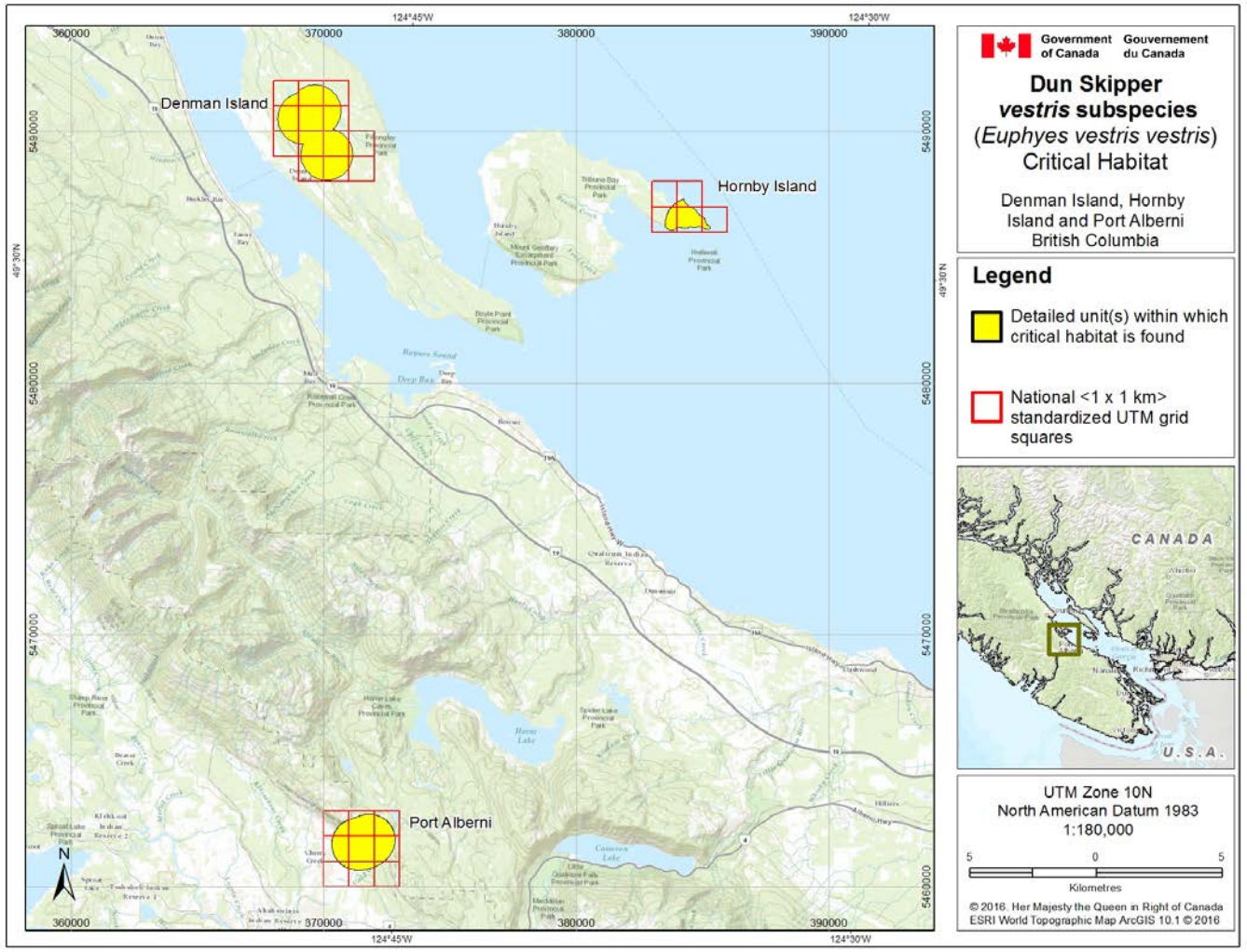


Figure 3. Critical habitat for Dun Skipper *vestris* subspecies northeast of Port Alberni (Population 7; 434.7 ha), at Denman Island (Population 18; 739.2 ha), and at Hornby Island (Population 21; 129.1 ha), B.C. is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 1.1 are met. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

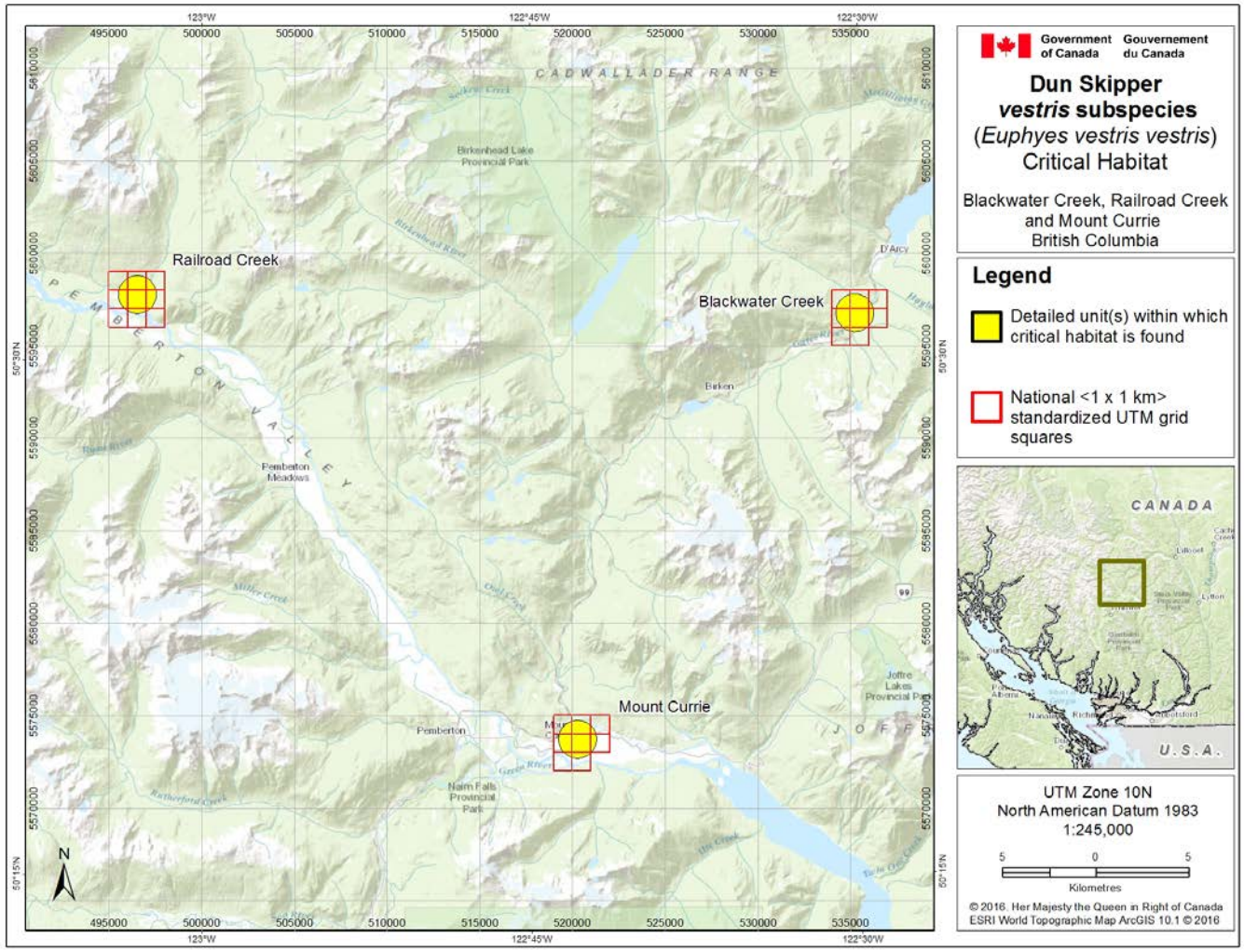


Figure 4. Critical habitat for Dun Skipper *vestris* subspecies at Mount Currie (Population 8; 329.6 ha), Blackwater Creek (Population 26; 329.6 ha), and Railroad Creek (Population 27; 329.6 ha), B.C. is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 1.1 are met. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area within whichcritical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

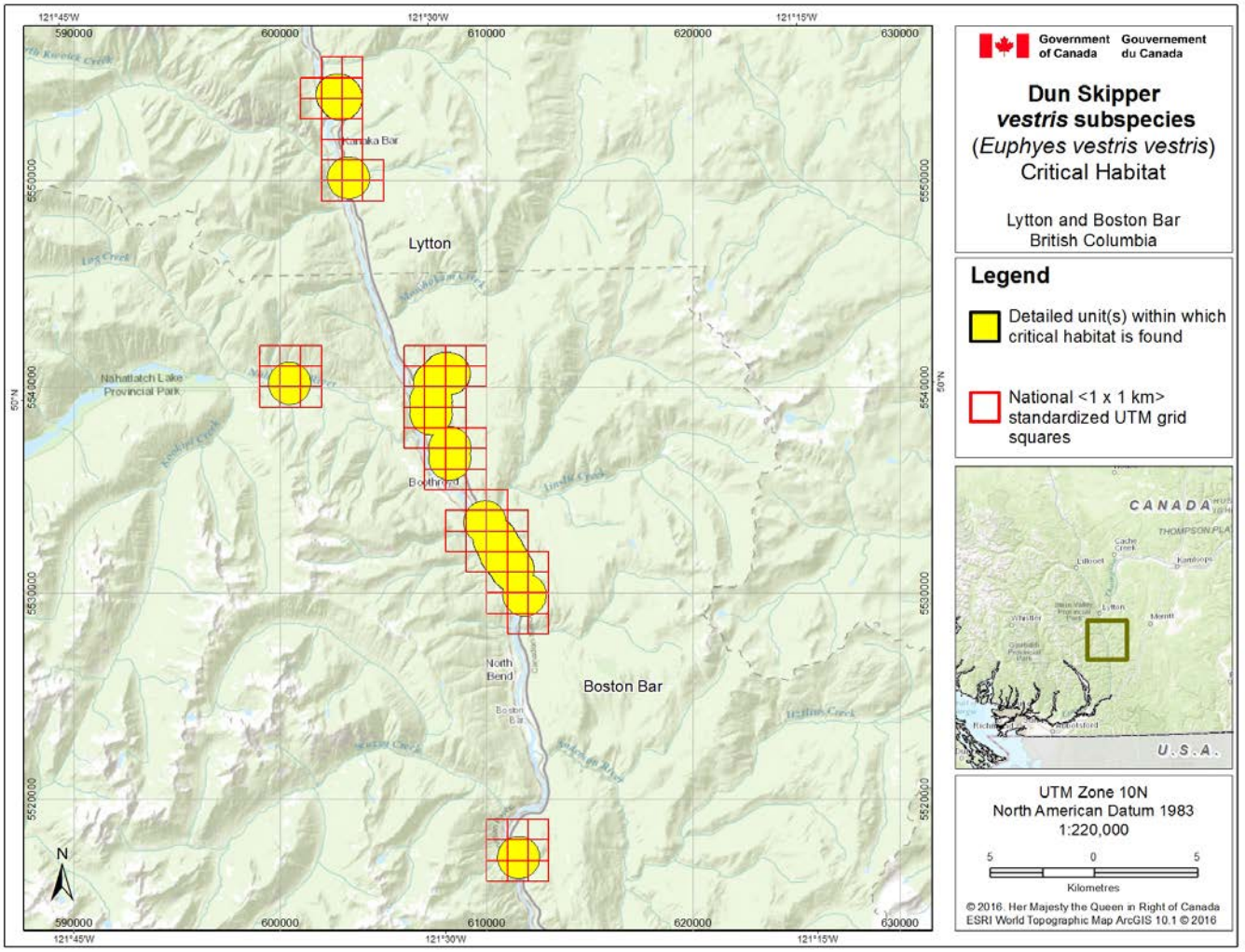


Figure 5. Critical habitat for Dun Skipper *vestris* subspecies south of Lytton (Population 25; 724.0 ha) and at Boston Bar (Population 16; 3063.7 ha), B.C. is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 1.1 are met. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

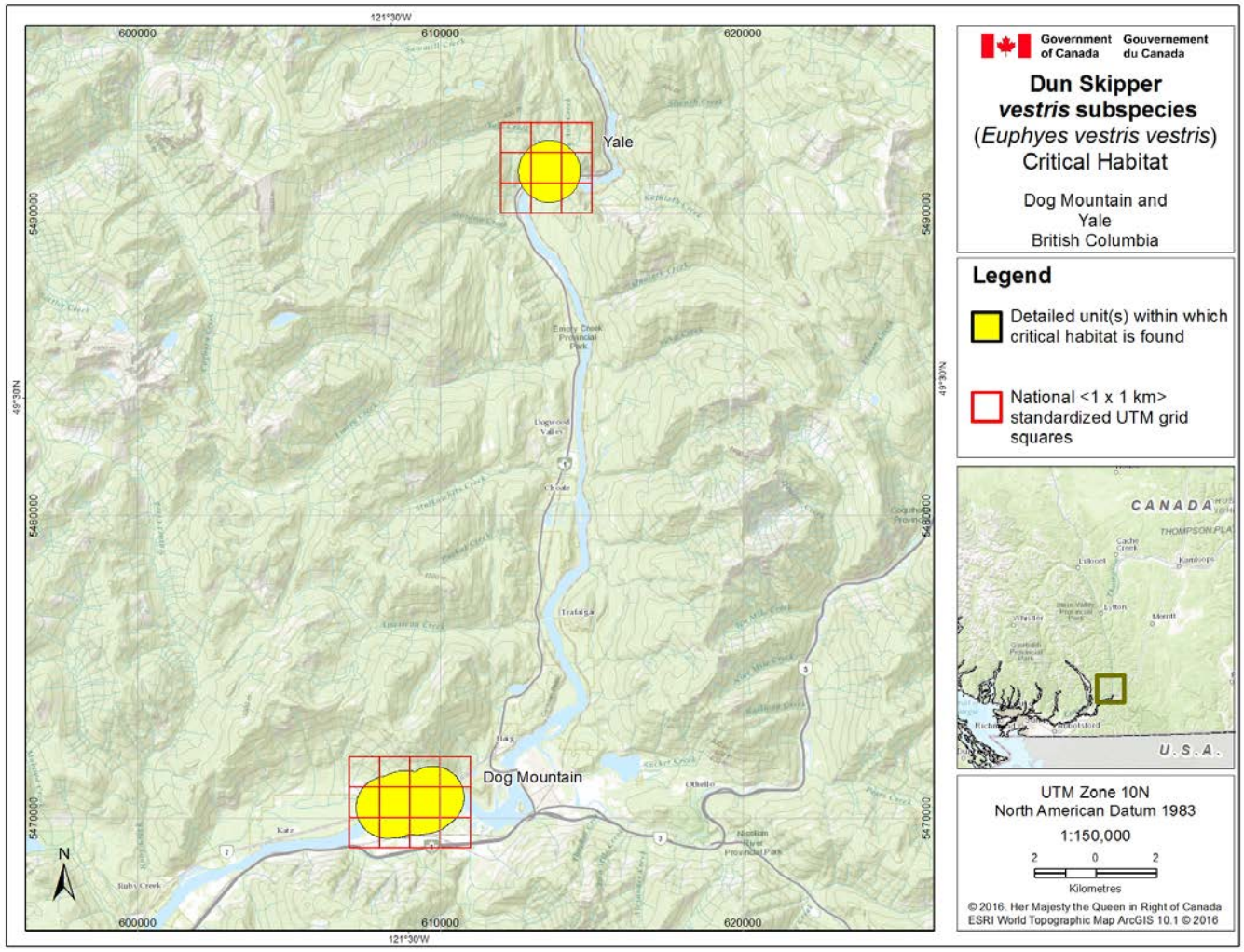


Figure 6. Critical habitat for Dun Skipper *vestris* subspecies at Dog Mountain (Population 17; 664.9 ha) and at Yale (Population 24; 329.6 ha), B.C. is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 1.1 are met. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

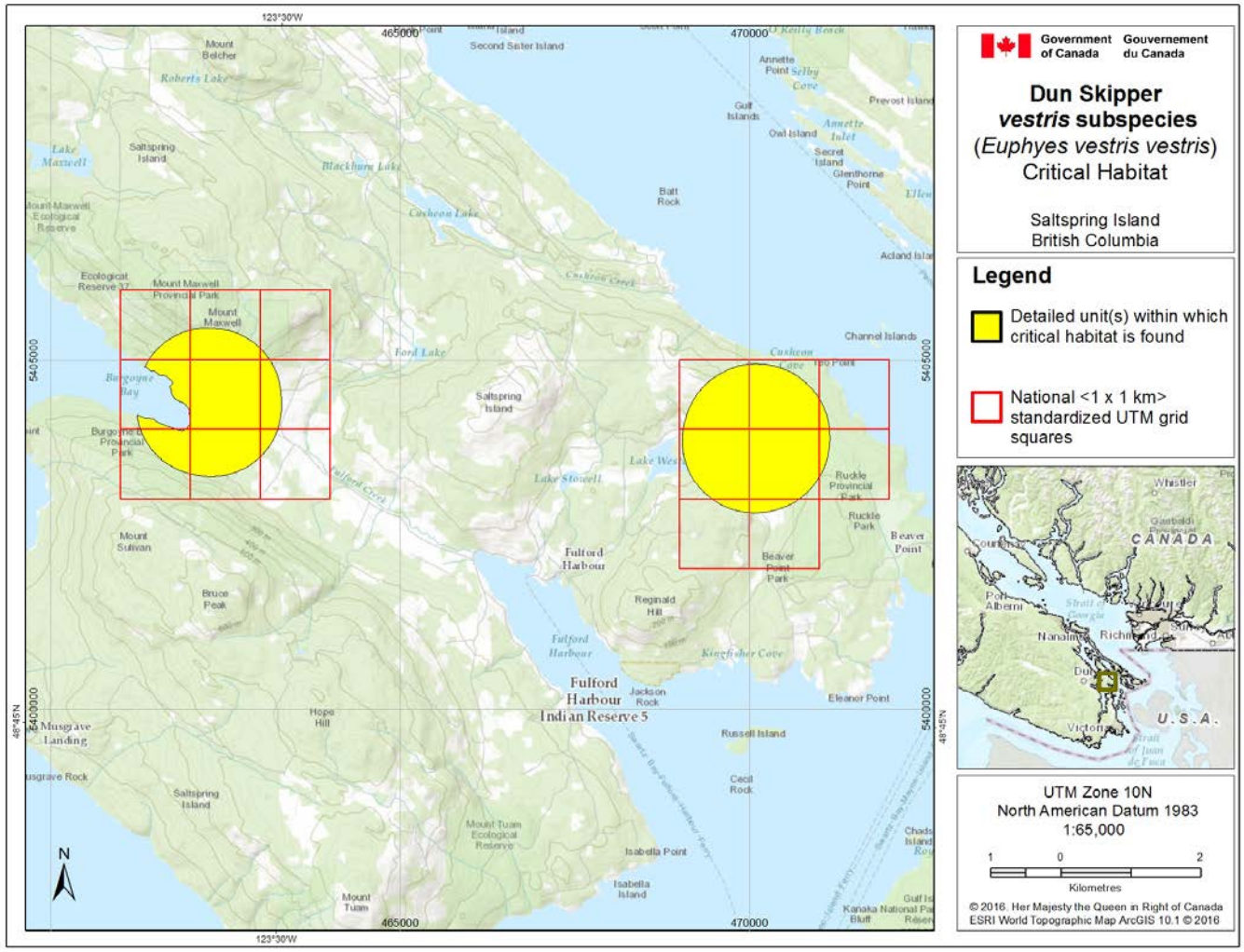


Figure 7. Critical habitat for Dun Skipper *vestris* subspecies at Saltspring Island (Population 19; 666.0 ha), B.C. is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 1.1 are met. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

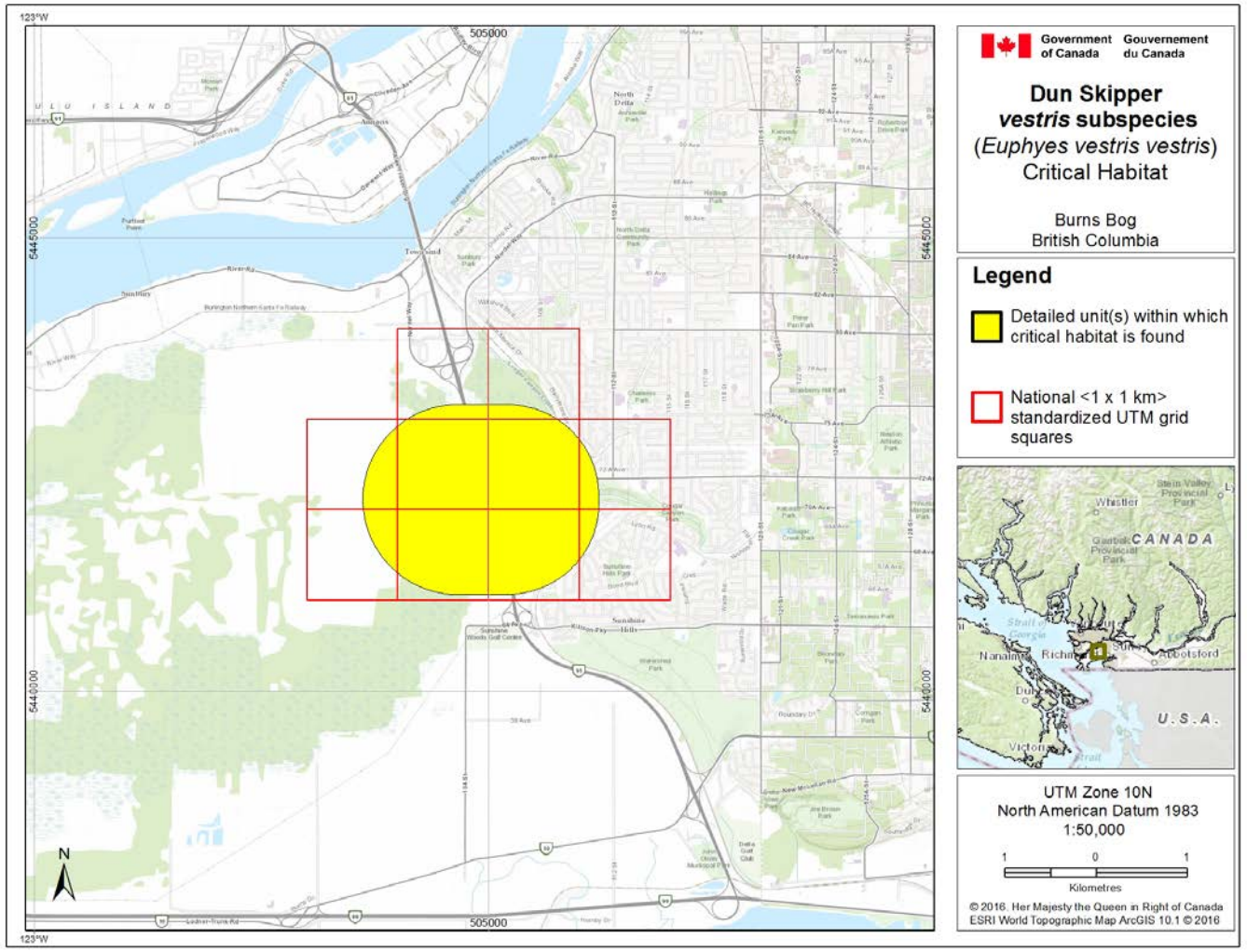


Figure 8. Critical habitat for Dun Skipper *vestris* subspecies at Burns Bog (Population 20; 454.3 ha), B.C. is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 1.1 are met. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

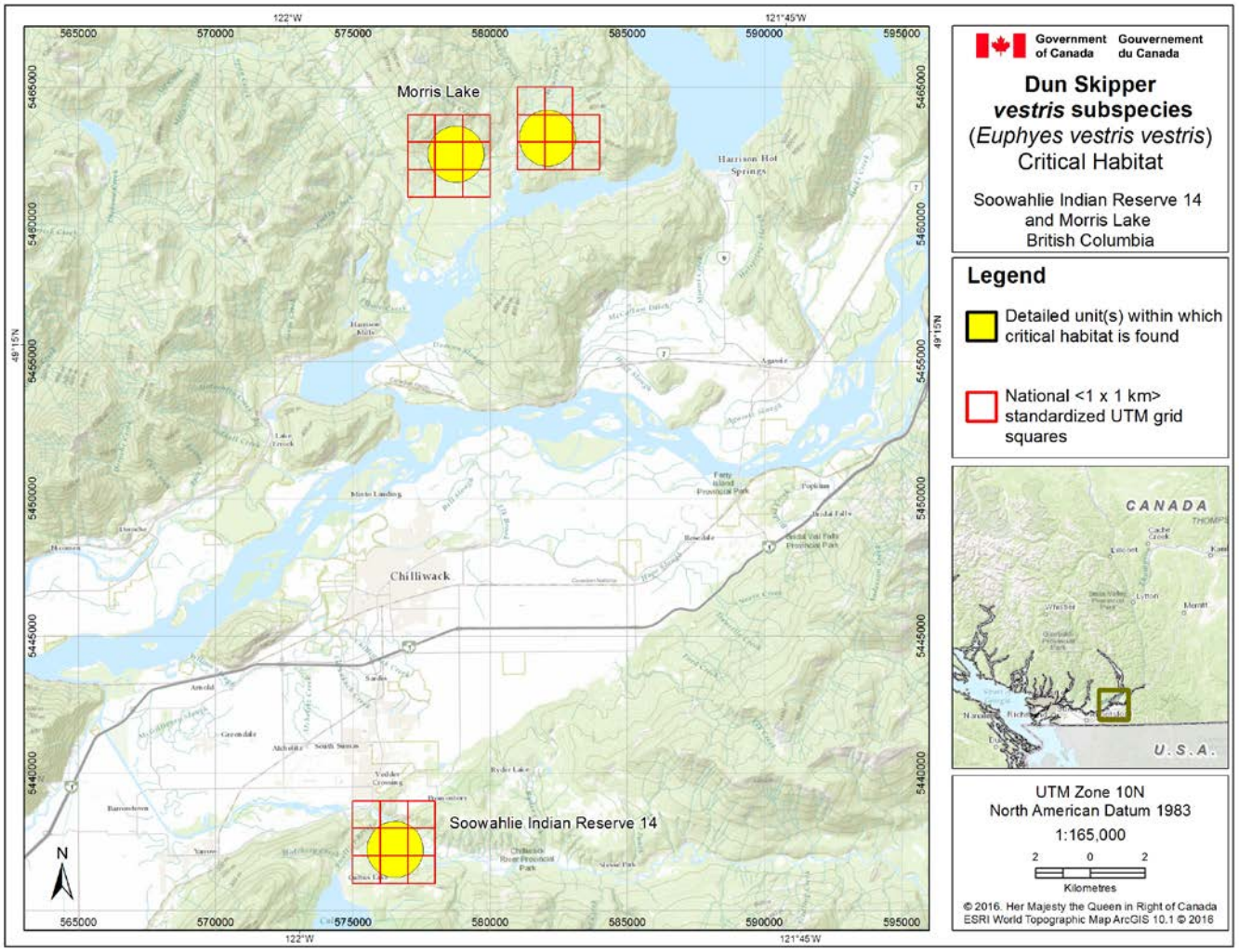


Figure 9. Critical habitat for Dun Skipper *vestris* subspecies west of Morris Lake (Population 22; 659.2 ha) and at Soowahlie Indian Reserve 14 (Population 23; 329.6 ha), B.C. is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 1.1 are met. The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

3.2 Schedule of Studies to Identify Critical Habitat

This section replaces the “Studies needed to describe survival/recovery habitat” section (section 7.2) in the provincial recovery plan.

The following schedule of studies (Table 3) outlines the activity required to complete the identification of critical habitat for Dun Skipper *vestris* subspecies[8].

Table 3. Schedule of Studies to Identify Additional Critical Habitat

Description of Activity	Outcome/Rationale	Timeline
Conduct targeted, comprehensive surveys in areas of suitable habitat within the proximity of the observation of Dun Skipper at population #11 to identify the population of this record and confirm the status as extant.	Critical habitat could not be identified for one population owing to its "unknown" status. Without further information on the status and spatial location of this population, it is unknown whether there is sufficient critical habitat identified for Dun Skipper.	2017 - 2022

3.3 Activities Likely to Result in the Destruction of Critical Habitat

Understanding what constitutes destruction of critical habitat is necessary for the protection and management of critical habitat. Destruction is determined on a case by case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single or multiple activities at one point in time or from the cumulative effects of one or more activities over time. Activities described in Table 4 include those likely to cause destruction of critical habitat for Dun Skipper *vestris* subspecies; destructive activities are not limited to those listed.

[8] For further research to address knowledge gaps, refer to priority actions outlined in the recovery planning table (Table 4) of the provincial recovery plan.

Table 4. Activities likely to result in the destruction of critical habitat for Dun Skipper *vestris* subspecies. IUCN Threat numbers are in accordance with the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system (CMP 2010).

Description of activity	Description of effect on biophysical attribute (or other) in relation to loss of function	Related threats and additional information
Conversion of natural landscape for human developments (e.g. housing and urban areas, commercial and industrial areas, tourism and recreation; agriculture; mining and quarrying; expansion of transportation and service corridors)	Results in the direct loss of critical habitat through vegetation removal and replacement, debris deposition, and/or other related indirect effects which cause damage or destruction to biophysical attributes required by Dun Skipper. Indirect loss of critical habitat can also occur by alteration of local microsite conditions (such as light and hydrological conditions) to the extent that it is no longer suitable for Dun Skipper larval host and/or nectar source plants.	Related IUCN threats: # 1.1, 1.2, 1.3, 2.1, 3.2, 4.1, 4.2 The primary threat to Dun Skipper *vestris* is the cumulative loss, degradation, and fragmentation of suitable habitat. Several urban housing, commercial, and recreational facility (e.g., golf course) developments are ongoing or planned for immediate commencement. Roadside gravel extraction could occur at Population #16 (Boston Bar). Increased roads, trails and corridor developments are ongoing or proposed at several populations.
Construction and maintenance activities along transportation and utility corridors (e.g., natural gas line installment or repair, grading, ditch maintenance to remove eroded debris and re-contour ditch slopes, vegetation mowing or herbicide spraying for noxious weed control, vegetation removal to reduce wildfire concerns, and/or pesticide spraying to control invertebrate pests). This may include on-site activities, and/or drift from adjacent areas.	Results in the temporary or permanent loss of biophysical attributes that are required for Dun Skipper, including habitat required for larval host and/or nectar source plants (directly, or indirectly via decreased available moisture retention within habitats). Efforts to control invertebrate pests or invasive plants through chemical means (pesticides or herbicides) or by physical means can result in destruction of critical habitat by degrading or removing larval host and/or nectar source plants required for survival (as a consequence of weed-pulling), or microhabitat toxicity resulting from the application of pesticides and/or herbicides.	Related IUCN threats: #4.1, 4.2, 7.1, 7.3, 8.1 Depending on frequency and scheduling, mowing and brush-cutting may, in some circumstances, have a neutral or even beneficial effect on Dun Skipper by reducing encroachment. Thresholds are unknown, however appropriate timing (i.e., outside of flight period: May to August) and application (i.e., avoiding loss of larval host plants and substrate disturbance) are essential to avoid destruction. Herbicides are used to control roadside and right-of way vegetation at several populations. Dun Skipper is within the introduction range of European Gypsy Moth (*Lymantria dispar*) and spray has been applied to eradicate this species in numerous areas within the range of Dun Skipper.
Fire suppression and/or human-caused fire resulting in destruction to existing biophysical attributes of critical habitat	Continued active fire suppression results in long-term loss of open habitat due to tree encroachment (succession), and alteration of plant community composition such that it no longer contains habitat types required by Dun Skipper. Conversely, where these biophysical attributes do exist, human-caused fire can result in their destruction.	Related IUCN threats: # 4.1, 4.2, 7.1, 7.3, 8.2 Fire suppression within Garry oak and associated open habitats has led to a decline in open habitats required by Dun Skipper. The threat of fire is also present, particularly within large natural tracts of land as well as areas adjacent to roadways and right-of-ways and in recreational areas where brush burning may be used as a form of fire suppression.
Deliberate introduction of alien invasive species, for example by not following provincial best management practices for clean equipment use[a] in transportation/utility corridor maintenance.	Alien invasive species may cause destruction of habitat available to Dun Skipper by displacing required habitat attributes, as a consequence of their physical occupation of space and resources, and/or indirectly through effects on associated vegetation.	Related IUCN threat # 8.1 Many of the locations where Dun Skipper has been recorded have become degraded and/or dominated by introduced species such as agronomic grasses and weedy forbs, as well as Scotch Broom (*Cytisus scoparius*), and Himalayan Blackberry (*Rubus armeniacus)*.

[a] see "Best Management Practices for Invasive Plants in Parks and Protected Areas of British Columbia"

4. Measuring Progress

This section replaces the "Section 8: Measuring Progress" section in the provincial recovery plan.

Priority actions for Dun Skipper *vestris* subspecies are included in Table 4 of the provincial recovery plan. The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives:

- The distribution and abundance of all known extant Dun Skipper *vestris* subspecies populations (including any newly identified populations) have been maintained, i.e., population size and extent of occurrence or area of occupancy at each site is stable and/or naturally increasing.

5. Statement on Action Plans

One or more action plans for Dun Skipper will be posted on the Species at Risk Public Registry by 2022.

6. Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*[9]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the Federal Sustainable Development Strategy's[10] (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

The provincial recovery plan for Dun Skipper contains a section describing the effects of recovery activities on other species (i.e., Section 9). Environment and Climate Change Canada adopts this section of the provincial recovery plan as the statement on effects

[9] http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[10] http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1

of recovery activities on the environment and other species. The distribution of Dun Skipper overlaps with that of several other federally-listed species at risk in British Columbia that occur in the coastal lowlands of southeastern Vancouver Island, the Gulf Islands, and the lower Fraser Valley. Recovery planning activities for Dun Skipper will be implemented with consideration for all co-occurring species at risk, to avoid or minimize negative impacts to these species or their habitats. Some management actions for Dun Skipper (e.g., inventory and monitoring, threat mitigation, habitat conservation, education, and research) may promote the conservation of other species at risk that overlap in distribution and rely on similar habitat attributes.

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Part 2 – *Recovery Plan for Dun Skipper (*Euphyes vestris*) in British Columbia*, prepared for the British Columbia Ministry of Environment

Recovery Plan for Dun Skipper (*Euphyes vestris*) in British Columbia



Prepared by B.C. Ministry of Environment

BRITISH COLUMBIA | Ministry of Environment

December 2013

About the British Columbia Recovery Strategy Series

This series presents the recovery documents that are prepared as advice to the Province of British Columbia on the general approach required to recover species at risk. The Province prepares recovery documents to ensure coordinated conservation actions and to meet its 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 provincial recovery document?

Recovery documents summarize the best available scientific and traditional information of a species or ecosystem to identify goals, objectives, and strategic approaches that provide a coordinated direction for recovery. These documents outline what is and what is not known about a species or ecosystem, identify threats to the species or ecosystem, and explain what should be done to mitigate those threats, as well as provide information on habitat needed for survival and recovery of the species. This information may be summarized in a recovery strategy followed by one or more action plans. The purpose of an action plan is to offer more detailed information to guide implementation of the recovery of a species or ecosystem. When sufficient information to guide implementation can be included from the onset, all of the information is presented together in a recovery plan.

Information provided in provincial recovery documents may be adopted by Environment Canada for inclusion in federal recovery documents that the federal agencies prepare to meet their commitments to recover species at risk under the *Species at Risk Act*.

What's next?

The Province of British Columbia accepts the information in these documents as advice to inform implementation of recovery measures, including decisions regarding measures to protect habitat for the species.

Success in the recovery of a species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this document. All British Columbians are encouraged to participate in these efforts.

For more information

To learn more about species at risk recovery in British Columbia, please visit the B.C. Ministry of Environment Recovery Planning webpage at:
<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>

Recovery Plan for Dun Skipper (*Euphyes vestris*) in British Columbia

Prepared by B.C. Ministry of Environment

December 2013

Recommended citation

B.C. Ministry of Environment. 2013. Recovery plan for Dun Skipper (*Euphyes vestris*) in British Columbia. Prepared for the B.C. Ministry of Environment, Victoria, BC. 36 pp.

Cover illustration/photograph

Denis Knopp, BC's Wild Heritage Consultants, Sardis, BC

Additional copies

Additional copies can be downloaded from the B.C. Ministry of Environment Recovery Planning webpage at:

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

Publication information

Library and Archives Canada Cataloguing in Publication

Recovery plan for dun skipper (Euphyes vestris) in British Columbia [electronic resource] / prepared by the B.C. Ministry of Environment.

(British Columbia recovery strategy series)
Electronic monograph in PDF format.
Includes bibliographical references.
ISBN 978-0-7726-6722-9

1. Hesperiidae--British Columbia. 2. Rare butterflies--British Columbia. 3. Wildlife recovery--British Columbia. I. British Columbia. Ministry of Environment II. Series: British Columbia recovery strategy series

QL561 H5 R43 2013 333.95'57 C2013-980076-X

Disclaimer

This recovery plan has been prepared by the British Columbia (B.C.) Ministry of Environment with input from the Dun Skipper Working Group of the BC Invertebrates Recovery Team, as advice to the responsible jurisdictions and organizations that may be involved in recovering the species. The B.C. Ministry of Environment has received this advice as part of fulfilling its commitments under the *Accord for the Protection of Species at Risk in Cana*da, 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 Dun Skipper 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 working group have 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 working 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 plan. The B.C. Ministry of Environment encourages all British Columbians to participate in the recovery of Dun Skipper.

ACKNOWLEDGEMENTS

Jennifer Heron (B.C. Ministry of Environment [MoE]) wrote the recovery plan with subsequent review and input from some members of the BC Invertebrates Recovery Team. Leah Westereng (B.C. MoE) completed editorial revisions and policy guidance (B.C. Ministry of Environment 2010a). Both the recovery plan and updated Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status report were written simultaneously, and much of the text and information contained within are in both documents.

Thank you to private landowners on Denman Island, Hornby Island, Courtenay, Comox, southeastern Vancouver Island, Metro Vancouver, Fraser Valley Regional District, and other owners that also granted access to their properties for surveys.

The following people contributed information to this document: Denis Knopp and Lee Larkin (BC's Wild Heritage Consultants); Laura Parkinson (B.C. Conservation Foundation); Nick Page (Raincoast Applied Ecology); Suzie Lavallee (University of B.C., Faculty of Forestry); Michelle Connolly (Private Entomologist); Patrick Lilley (Echo Blue Consulting); Crispin Guppy (Private Entomologist); Darren Copley (Royal BC Museum); Jeremy Tatum; Steve Ansell; Derrick Marvin; James Miskelly; David Threatful; Janice Jarvis, Alison Eveley, and Markus Merkens (Metro Vancouver); Marilyn Fuchs (Capital Regional District); Bill Woodhouse, Drew Chapman, and Mike Rody (BC Parks); and the B.C. Conservation Data Centre (Leah Ramsay, Lea Gelling, and Katrina Stipec).

The Dun Skipper Working Group thanks the following people:

- Claudia Copley (Royal BC Museum) and Karen Needham (University of B.C., Beaty Biodiversity Museum, Spencer Entomological Collection) for assistance with museum records.
- Ann Potter (U.S. Fish and Wildlife Service), Ted Thomas (Washington Department of Fish and Wildlife), and Robert Pyle for information about Dun Skipper in Washington State.
- Kathryn Martell, Shyanne Smith, and Chris Junck (Garry Oak Ecosystems Recovery Team). Rob Knight (B.C. MoE, retired) for facilitating access to the orthophotos used for habitat identification and mapping.
- local conservation organizations for butterfly surveys and private landowner contact (Robin Annschild, Tyla Crowe, Michael Dunn, Tony Law, Francis McLean, J. Thornton, and A. Fyson).

The following MoE staff completed a review on an earlier draft: Patrick Daigle, Jenny Feick, Brenda Costanzo, Ted Lea, and Jeff Brown.

DUN SKIPPER WORKING GROUP

Jennifer Heron (Chair), B.C. Ministry of Environment, Vancouver
Trudy Chatwin, B.C. Ministry of Environment, Nanaimo (Region 1)
Megan Harrison, Canadian Wildlife Service, Environment Canada, Delta

Chris Junck, Garry Oak Ecosystems Recovery Team, Victoria
Denis Knopp, BC's Wild Heritage, Sardis
Suzie L. Lavallee, University of British Columbia, Vancouver
Patrick Lilley, Echo Blue Consulting, North Vancouver
Erica McClaren, B.C. Parks and Protected Areas, Black Creek
Kristina Robbins, B.C. Ministry of Forests, Lands and Natural Resource Operations Region 2, Surrey
Malissa Smith, B.C. Ministry of Forests, Lands and Natural Resource Operations Region 2, Surrey
Andrea Tanaka, Canadian Wildlife Service, Environment Canada, Delta

EXECUTIVE SUMMARY

Dun Skipper (*Euphyes vestris*) is a small butterfly (wingspan 23–32 mm) with uniform chocolate-brown wings with a purplish hue and tan fringes on the outer margins. Adults sit with their hindwings laid flat and their forewings held upright. The head and thorax of adults (both sexes) are yellowish-orange. Eggs are pale green, crescent-shaped, globular, and smooth when first laid, but prior to hatching the top of the egg changes to a reddish colour. Larvae have a shiny, pale green body with many fine and wavy silvery lines. Pupae are various shades of yellow, brown, and light green, with a blunt, ridged edge at one end.

Dun Skipper was designated as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2001. The reasons for this assessment were that the western population of Dun Skipper (*vestris* subspecies) occurs in a restricted area. It has all but disappeared from Vancouver Island and its continued survival on the island is doubtful. Although the mainland population is limited by the availability of suitable habitat, populations at some locations are relatively secure. The butterfly is listed as Threatened in Canada on Schedule 1 of the *Species at Risk Act* (SARA). In British Columbia, Dun Skipper is ranked S3 (special concern, vulnerable to extirpation or extinction) by the Conservation Data Centre and is on the provincial Blue list. The B.C. Conservation Framework ranks Dun Skipper as a priority 2 under goal 2 (prevent species and ecosystems from becoming at risk). Recovery is considered to be biologically and technically feasible.

Dun Skipper has been observed in a variety of habitats: adjacent to or within open forest comprised of Douglas-fir with lowland forest components below cliffs and hillsides; close to open, sparsely vegetated cliffs; edges of sedge-dominated wetlands and wet grasslands; and bog habitats with moisture for host plant longevity. Towards the interior of the Fraser Valley, and as habitats became drier (e.g., Boston Bar, Lillooet to Pemberton), Dun Skipper has been observed on gently sloping hillsides, generally within 1 km of cliff habitat. In the most xeric sites (e.g., Lillooet), the sites were sheltered from wind and associated with moister Douglas-fir habitat. The butterfly has been recorded in disturbed sites including roadsides, railway right-of-ways, ditches, and power line right-of-ways; areas with spring floods, natural hot springs or seeps, and stream banks; and habitats that appear dry but where spring floods likely occur and moist conditions sustain populations of potential host plants. The primary correlation between these habitat types is the high wet and moist ground throughout the spring/summer, thus preventing premature host plant senescence. Dun Skipper is also recorded from Garry oak and associated ecosystems on southeastern Vancouver Island. Dun Skipper host plants are not known but are thought to be in the sedge family (*Carex* spp.) including *Carex heliophila* (no English name) and the grass family (*Poa* spp).

Threats to the Dun Skipper include (1) habitat loss, degradation, and fragmentation from land conversion and infilling of the open wet habitat and plant communities throughout the Lower Mainland and southeastern Vancouver Island; (2) natural forest succession; (3) pesticide application to control European Gypsy Moth (*Lymantria dispar*); and (4) climate change, primarily through increases in summer drought, potentially resulting in desynchronised larval and host plant phenology.

The population and distribution goal is to maintain current populations for Dun Skipper throughout the species natural range and distribution in British Columbia.

The following are the recovery objectives:

1. To identify and prioritize Dun Skipper habitat throughout the species' range in B.C.
2. To secure protection[1] for Dun Skipper habitats within the species' range.
3. To assess and reduce threats to all known Dun Skipper sites in B.C.
4. To address knowledge gaps (e.g., population size, host plant requirements) that will enable quantitative population and distribution objectives to be set.

RECOVERY FEASIBILITY SUMMARY

The recovery of Dun Skipper in B.C. is considered technically and biologically feasible based on the criteria outlined by the Government of Canada (2009):

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

   Yes. Dun Skipper individuals capable of reproducing continue to be recorded from some of the known sites; however, the population viability and longevity are unknown. Approximately 18 locations (based on land ownership) for Dun Skipper are known from recent surveys (2000–2010) within the Canadian (B.C.) range. It is unknown if populations within larger habitat patches may be able to persist with little or no management of threats and whether these individuals can repopulate habitats quickly (e.g., within 25 years, 50 years).

2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.

   Yes. Dun Skipper has been observed in a variety of open habitat types and potential host plants are widespread within the species' B.C. range. There is abundant habitat similar to where Dun Skipper has recently been observed (2000–2010). Restoration of habitats that have already been modified by urban or agricultural practices may be possible in some cases.

3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.

   Yes. Numerous Dun Skipper sites and corresponding habitats are within provincial Crown and municipal government lands (see Table 1) and lands managers are aware of the butterfly and its habitat needs. Stewardship activities through the South Coast Conservation Program (SOSCP 2012) and Garry Oak Ecosystems Recovery Team

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

(GOERT 2013) aim to bring awareness to private landowners and land users about Dun Skipper and other butterfly species at risk. The provincial Gypsy Moth Committee is aware of Dun Skipper and aims to avoid known locations and habitat in the event of aerial and ground spray programs to control gypsy moth. The B.C. range of Dun Skipper coincides with a densely human populated, fertile part of B.C. and threats to unsurveyed potential habitat will continue. Threats to the species habitat (e.g., urban and rural private land development, introduced species changing natural plant communities) are unavoidable although mitigation efforts will aid in protecting the species.

4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.

   Yes. Techniques used to recover Dun Skipper are similar to the recovery planning applied to species with similar threats and habitat requirements. Recovery techniques include habitat protection, removal of location-specific threats (such as introduced species), and working with land managers and landowners to develop site-specific best management practices guidelines and shared stewardship opportunities.

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Figure 4. Dun Skipper distribution in British Columbia (B.C. Conservation Data Centre 2013). 6

1 COSEWIC* SPECIES ASSESSMENT INFORMATION

Date of Assessment: May 2013
Common Name (population):** Skipper *vestris* subspecies, Dun
Scientific Name:** *Euphyes vestries vestris*
COSEWIC Status: Threatened
Reason for Designation: This species has a small population found in a restricted range in southwestern British Columbia, where it occurs in moist, open habitats, including meadows, wetlands, and disturbed sites. Meadows and wetlands are declining in area and quality owing to natural succession, residential and commercial development, and invasive plants. Disturbed sites are inherently ephemeral and rapidly becoming unsuitable due to native and invasive plant succession. This is a rare species, and despite significant search effort over the last decade, few new sites have been located.
Canadian Occurrence: B.C.
COSEWIC Status History: Designated Threatened in November 2000. Status re-examined and confirmed in May 2013.

* Committee on the Status of Endangered Wildlife in Canada.
** Common and scientific names reported in this recovery plan follow the naming conventions of the B.C. Conservation Data Centre, which may be different from names reported by COSEWIC.

2 SPECIES STATUS INFORMATION

Dun Skipper (*Euphyes vestris*)		
Legal Designation:		
FRPA:[b] No OGAA:[b] No	B.C. *Wildlife Act*:[c] No	SARA Schedule: 1 - Threatened (2000)
Conservation Status[d]		
B.C. List: Blue B.C. Rank: S3 (2006)	National Rank: N3 (2013)	Global Rank: G5T4 (2006)
Other Subnational Ranks:[e] Washington (S3); Wyoming (SNR)		
B.C. Conservation Framework (CF)[f]		
Goal 1: Contribute to global efforts for species and ecosystem conservation.		Priority:[g] 4(2009)
Goal 2: Prevent species and ecosystems from becoming at risk.		Priority: 2 (2009)
Goal 3: Maintain the diversity of native species and ecosystems.		Priority: 3 (2009)
CF Action Groups: Inventory		

[a] Data source: B.C. Conservation Data Centre (2013) unless otherwise noted.
[b] No = Not listed in one of the categories of wildlife that require special management attention to address the impacts of forest and range activities on Crown land under the *Forest and Range Practices Act* (FRPA; Province of British Columbia 2002) and/or the *Oil and Gas Activities Act* (OGAA; Province of British Columbia 2008).
[c] No = not designated as wildlife under the B.C. *Wildlife Act* (Province of British Columbia 1982).
[d] S = subnational; N = national; G = global; T = refers to the subspecies level; B = breeding; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable.
[e] Data source: NatureServe (2012).
[f] Data source: B.C. Ministry of Environment (2010b).
[g] Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

3 SPECIES INFORMATION

3.1 Species Description

***Taxonomy*:** There are 4 subspecies in North America. Two Dun Skipper subspecies occur in Canada: a western population (*Euphyes vestris vestris*) found only in B.C. and an eastern population (*Euphyes vestris metacomet*) found from Alberta east to Nova Scotia (Layberry *et al.* 1998; NatureServe 2012). Only Dun Skipper, *vestris* subspecies has been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). From this point forward Dun Skipper refers to "Dun Skipper, *vestris* subspecies" unless stated otherwise.

Adults: Dun Skipper is a small butterfly (wingspan 23–32 mm) with uniform chocolate brown-purplish wings and tan fringes at the outer wing margins (Figures 1 and 2). The sexes have differing markings on the wings. Males have a black stigma (scent scale) on the forewings and the area of attachment to the body is a darker brown than the outer wings. Females have small white cloudy spots on both the fore- and hindwing dorsal surfaces, and the hindwing ventral surfaces have a pale purplish crescent. Adults sit with their hindwings laid flat and their forewings held upright. The head and thorax of adults (both sexes) is yellowish-orange (Layberry *et al.* 1998; Guppy and Shepard 2001).



Figure 1. Dun Skipper (*Euphyes vestris*) adults (male), taken July 1, 2009, adjacent to a gas pipeline right-of-way near Hope, B.C. Photograph by Denis Knopp.



Figure 2. Dun Skipper (*Euphyes vestris*) adults (male), taken July 7, 2010, adjacent to a gas pipeline right-of-way near Hope, B.C. Photograph by Denis Knopp.

Immature life stages: Dun Skipper eggs, larvae, or pupae have not been observed in B.C. and the following descriptions are based on other subspecies. Eggs are crescent-shaped, globular, and smooth and pale green when first laid (Heitzman 1965; Brown and McGuire 1983; Guppy and Shepard 2001). Before hatching eggs change to a reddish colour on top (Guppy and Shepard 2001; Pyle 2002). Larvae (14–36 mm long depending on their age) have a translucent pale green and shiny body with many fine and wavy silvery lines. A black to caramel-coloured stripe surrounds the head, and a lateral brown stripe and a small black spot is in front of the stripe (Layberry *et al.* 1998; Guppy and Shepard 2001). As larvae age, a darker green stripe appears laterally (Brown and McGuire 1983). The head is pale orange brown with dark stripes on the back. Larvae are known to form silken shelters made from rolled and curled host plant leaves

(discussed below). Pupae are various shades of yellow, brown, and light green, with a blunt, ridged edge (eNature.com 2011).

Life history: Dun Skipper flight period is from mid-May to mid-August (Layberry *et al.* 1998; Guppy and Shepard 2001; B.C. Conservation Data Centre 2013) with one brood per year (Opler and Krizek 1984) and peak activity throughout June. During the flight period, males perch approximately 1 m from the ground and wait for receptive females (Opler *et al.*, coordinators 1995). Females deposit eggs singly at the base, midway along, or under the leaf or stem of the host plant (Heitzman 1964; Guppy and Shepard 2001). Eggs hatch after approximately 7 days (Heitzman 1964).

As Dun Skipper larvae grow into the second larval instar (and later stages), they weave silk shelters from tied and rolled leaves. Larval refuge sites are found near the base of the host plant and may occur on the same host plant upon which the egg was laid, or an adjacent host plant. A larval refuge is a tubular structure constructed of 2–4 leaves of sedges or grasses (Brown and McGuire 1983). The larva joins the leaves of the plant together with silk to create a chamber for its development and protection (Heitzman 1964; Brown 1982; Brown and McGuire 1983). Larvae occupy refuge structures during development and, when not feeding, likely remain within these structures. Larvae abandon the refuge structure and construct a new one on the same or adjacent sedge or grass plants when the nearby food supplies are exhausted (Brown and McGuire 1983). Older larvae use one or more refuge structures for 24–36 days between late May and late August (Heitzman 1964; Brown and McGuire 1983). Pupation occurs within the larval silken refuge structures at the base of, presumably, the host plants. No larval structures or pupae have been observed in B.C.

3.2 Populations and Distribution

3.2.1 Global distribution

The North American range extent of Dun Skipper (all subspecies) is in question due to lack of distribution records and taxonomic uncertainty (Figure 3).

Dun Skipper (*Euphyes vestris vestris*) is at the northernmost extent of its range in southwestern B.C. and southeastern Vancouver Island. The subspecies ranges southward into the Cascade Mountains in Washington State (Figure 3; NatureServe 2012). Although there is some evidence the butterfly may occur south to northern California, there are a lack of distribution records.

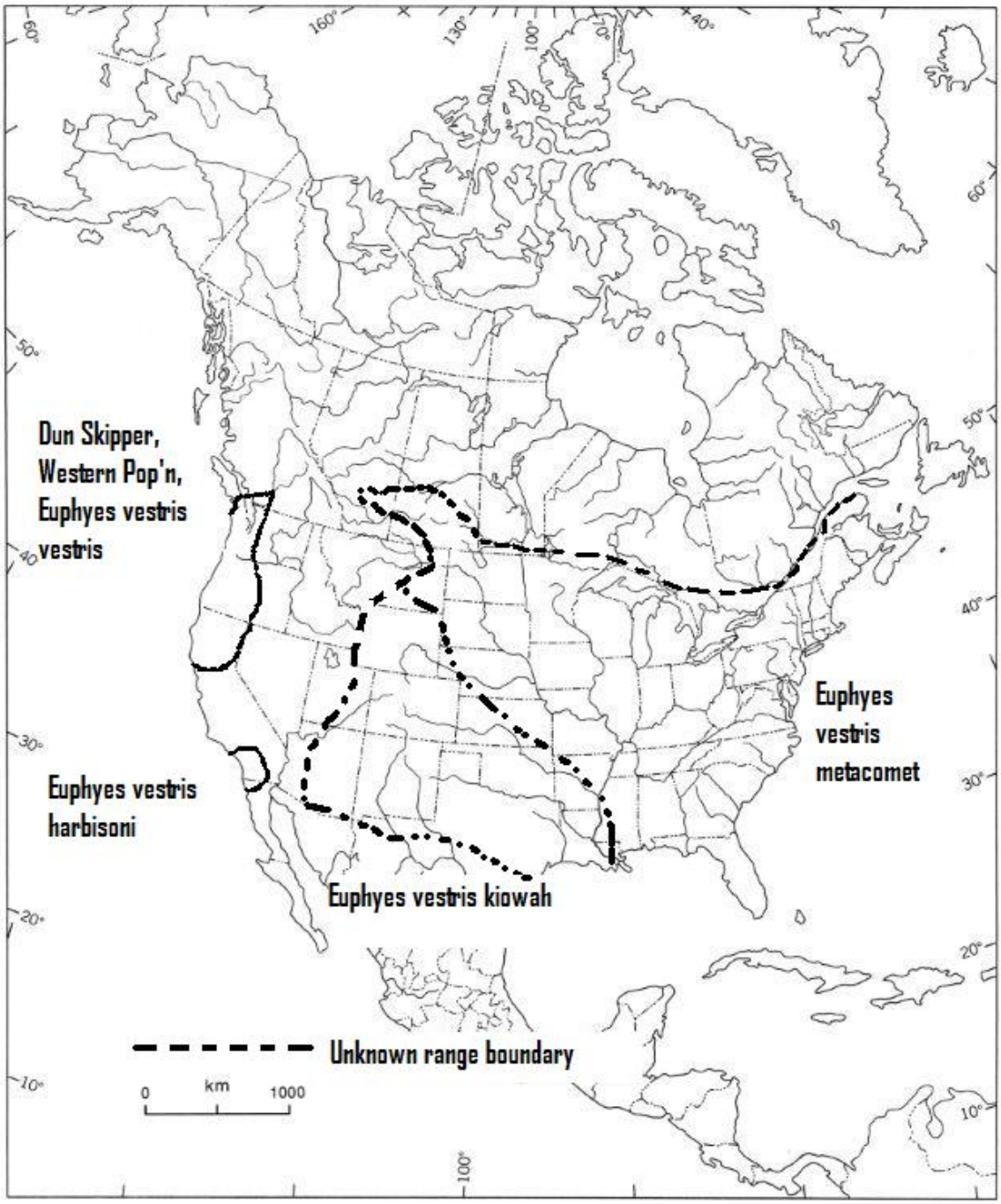


Figure 3. Dun Skipper distribution in North America. Two subspecies occur in Canada (*Euphyes vestris vestris* and *E. vestris metacomet*). The other 2 subspecies (*E. vestris kiowah* and *E. vestris harbisoni*) range in the United States and Mexico.

B.C./Canadian Distribution

Dun Skipper (*Euphyes vestris*) is restricted to B.C. within the coastal lowlands of the lower Fraser Valley, the southern Gulf Islands, and southeastern Vancouver Island (Figure 4). Within the lower Fraser Valley the species' northernmost location is Lillooet ranging south through

Boston Bar, Yale, and Hope and into the Lower Mainland area at Burns Bog. West, the species has records in Pemberton and Powell River. On Vancouver Island, Dun Skipper ranges on the eastern side of the island from the Greater Victoria area north to Courtenay/Comox. Known Gulf Island localities include Salt Spring Island, Denman Island, and Hornby Island.

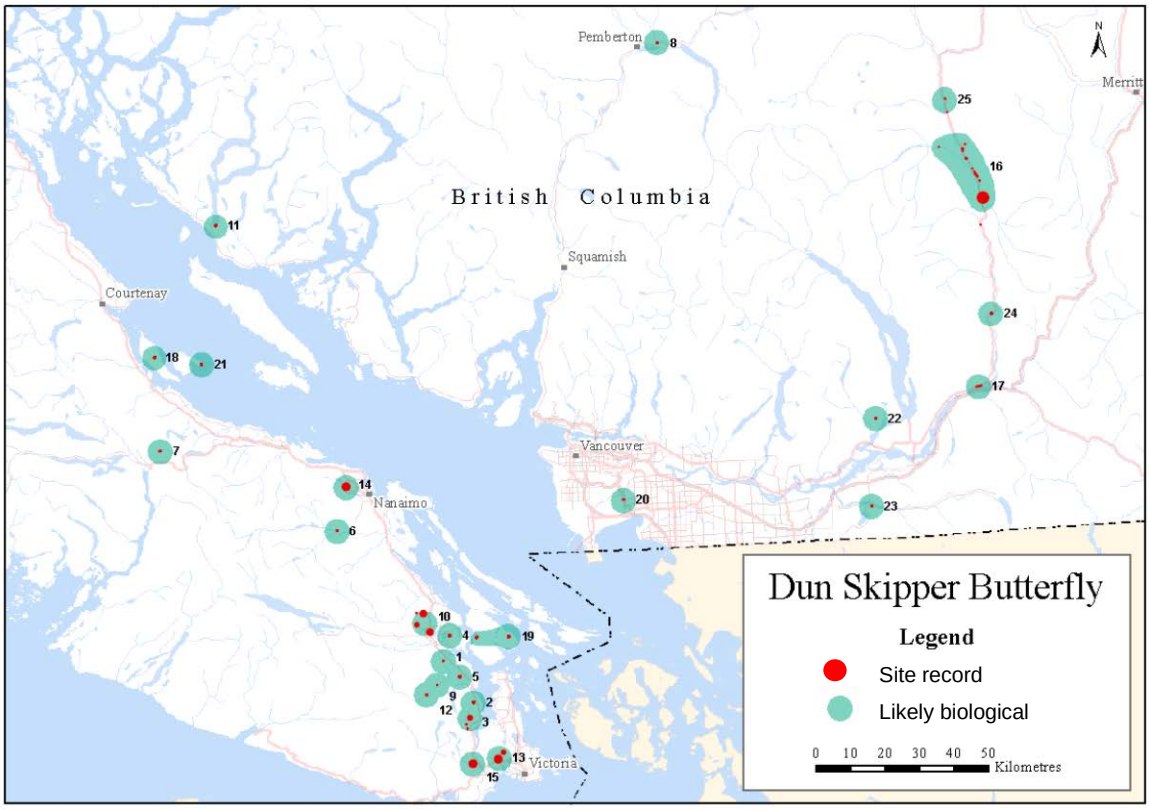


Figure 4. Dun Skipper distribution in British Columbia (B.C. Conservation Data Centre 2013).

Dun Skipper records in B.C. date from 1902 to 2012 (Table 1). Based on known records, the historic and present (combined) extent of occurrence is 32,597 km^2 (25,924 km^2 for the mainland and 6,673 km^2 for Vancouver Island and Gulf Islands).

Dun Skipper extent of occurrence without historic sites (i.e., sites known from year 2000 to present) is similar, as most historic sites have been searched and/or are within the current extent of occurrence. The northeastern edges of the range within the lower Fraser Valley have been searched, and the range extended slightly during each survey (Knopp *et al.* 2007, 2009, 2010). Yet search effort in 2010 provided substantial null data suggesting the range limit is now well defined (Knopp *et al.* 2010). The northern range limit along the Sunshine Coast may extend approximately 50 km north of Powell River to Lund (Figure 4) although habitat north of Lund is difficult to access (i.e., no road access) and assess. When assessing habitat across Georgia Strait on Vancouver Island, there is a possibility Dun Skipper may occur at Campbell River (approximately 100 km north of Comox). Search effort indicates there is less suitable habitat north of Comox towards Campbell River (Page, Lilley, Heron *et al.* 2008; Page, Lilley, Miskelly *et al.* 2008; Page *et al.* 2009). However, inventory is likely to find additional sites within small patches of suitable habitat.

Table 4. Status and description of known Dun Skipper populations in B.C. as of 2012.
All data in this table are from the B.C. Conservation Data Centre (2013). Location names are consistent with those in the BC Conservation Data Centre database.

Population[a]	Location	Population status[b]	Observations	Land ownership
1	Cowichan Station (Vancouver Island)	Extirpated (1996)	1996: One observation	Private
2	Mill Bay, Malahat Ridge (Vancouver Island)	Extirpated (1996)	1996: One seen at edge of clearcut	Private
3	Malahat, Colpman, and van Home Creeks; Spectacle Lake (Vancouver Island)	Extant	2003 - Van Home Creek: 1 seen at intersection of road and railway 1994 - Colpman Creek: 1 seen at edge of clearcut; low bush and sparse grass 1963 - Spectacle Lake: 1 collected 1956 - Spectacle Lake: 1 collected	Private; Possibly B.C. Crown land (Spectacle Lake Provincial Park collection record vague)
4	Mount Tzuhalem; Maple Bay (Vancouver Island)	Extirpated (1994)	1994: One seen in rough grass at edge of gravel road. Lots being developed along this road; this precise site may now be gone, species may still remain on Mount Tzuhalem	Private
5	Cobble Hill (Vancouver Island)	Extirpated (1995)	1995: One observed	Private
6	Nanaimo River (Vancouver Island)	Extant	2009–2011: Dun Skippers recorded 1995: None seen, “site levelled” 1988: One collected (adjacent to Nanaimo Lakes Road area)	Private (forest company)
7	Port Alberni, northeast of (Vancouver Island)	Extant	2003: 10–20 observed over a 0.2-ha logged area	Private
8	Mount Currie (Mainland)	Extant	2001: Dun Skippers observed on the lawn and flying into the tall grass in the adjacent lot	Private
9	Shawnigan Lake, west of (Vancouver Island)	Extant	2003: 7 seen on July 17; 2 seen on July 22; 1 seen on August 3. Observed at south side of Kinsol Trestle	Private (hobby farms; forest company)
10	Big Sicker Mountain; Little Sicker Mountain; Mount Prevost; Somenos Garry Oak Preserve (Vancouver Island)	Extant	2003: One Dun Skipper observed at Big Sicker Mountain. 1956 to 1978: a total of 11 were collected from Mount Prevost, Little Sicker Mountain, and Somenos Garry Oak Preserve all within about a 4-km radius of each other	Private
11	Powell River (Sunshine Coast, mainland)	Unknown; likely extant	No specific date. Suitable unchecked habitat present so may be extant	Unknown

Population[a]	Location	Population status[b]	Observations	Land ownership
12	Koksilah River (Vancouver Island)	Extant	2003: 1 butterfly seen in a clearcut	Private
13	Colquitz; Francis/King Park and Thetis Lake Park (Vancouver Island)	Extirpated (1963)	Francis/King Park: 1962: 6 butterflies collected (Shepard 2000) Thetis Lake Park: 3 butterflies collected in July of 1962 and 1963	Private (Capital Regional District)
14	Wellington (Vancouver Island)	Extirpated (1979)	1951–1979: A total of 6 specimens were collected	Private
15	Goldstream (Vancouver Island)	Extirpated (1923)	1902–1923: A total of 9 specimens collected in June/July	B.C. Crown land (Goldstream Provincial Park)
16	Boston Bar (lower Fraser Valley)	Extant (2007)	2007: 1 male and 1 female observed at 2 different sites during 6 days of targeted surveying in July and August on B.C. Crown land 2002: 11 males and 2 females were collected along the highway, and 39 were collected along the same stretch and east of the highway 1949: collection of 3 male specimens There are at least 11 sites of collection. The locations range along about 25 km of the highway	Private; First Nations; B.C. Crown land
17	Dog Mountain (lower Fraser Valley)	Extant (2007)	2007: At least 13 individuals were observed in 3 visits. 2002: 2 individuals observed along a gas pipeline crossing along highway 1918: 1 male specimen collected from Hope (habitat and location unknown)	Private; B.C. Crown land
18	Denman Island (northern Gulf Islands)	Extant (2007)	2007: Two individuals observed	Private conservation land (Denman Conservancy Association)[c]
19	Salt Spring Island; southeast (southern Gulf Islands)	Extant (2007)	2007: 1 male observed within 500 m of previous sightings 2003 and 2004: Seen each year on either side of the road 2008 and 2009: observed at Burgoyne Bay Provincial Park	Private; B.C. Crown land (Burgoyne Bay Provincial Park)
20	Burns Bog (Lower Mainland)	Extant (2004)	2004: 5 individuals observed; assume butterfly is throughout bog habitat	Private - Local government (Metro Vancouver; City of Vancouver; Municipality of Delta); Private

Population[a]	Location	Population status[b]	Observations	Land ownership
21	Hornby Island (Northern Gulf Islands)	Extant (2004)	2004: 1 individual observed	B.C. Crown land (provincial park); Private - conservation land owned by Denman Conservancy
22	Morris Lake, west of (lower Fraser Valley)	Extant (2007)	2007: 1 male observed in weedy area at the junction of logging road and Hemlock Ski Hill Road	B.C. Crown land
23	Soowahlie Indian Reserve 14 (lower Fraser Valley)	Extant (2004)	2004: One individual observed near old gravel pit	Federal (Indian Reserve)
24	Yale (lower Fraser Valley)	Extant (2001)	2001: 4 individuals observed just north of the Community of Yale	Private
25	Lytton, south of (lower Fraser Valley)	Extant (2007)	2007: 5 individuals at a highway pull off 2002: 1 individual at a roadside seep	B.C. Crown land (highway area); Possibly some private land (depending on where habitat ends)

[a] Note populations may contain more than one site within a given location and span multiple landowners.
[b] Extant (record > 2001) or Extirpated (record < 2001 or habitat gone)
[c] Habitat extends into provincial park but no observations of Dun Skipper yet recorded in park as of 2012 (J. Heron, pers. comm., 2012).

3.3 Needs of Dun Skipper

Recent surveys (2004–2010) have focused on collecting habitat and biological information, yet habitat descriptions remain vague primarily because the host plant in B.C. has not been confirmed. The historical habitat of Dun Skipper is also difficult to characterize, given the lack of information that accompanies museum collections at the Royal B.C. Museum (C. Copley, pers. comm., 2012) , the University of British Columbia Beaty Biodiversity Museum, Spencer Entomological Collection (K. Needham, pers. comm., 2012); and the Canadian National Collection of Insects, Arachnids and Nematodes (Shepard 2000a, 2000b).

3.3.1 Habitat and Biological Needs

Dun Skipper habitats are within the following biogeoclimatic zones: Coastal Douglas-fir (CDF), Coastal Western Hemlock (CWH) in the coastal areas, and Ponderosa Pine (PP) in the Boston Bar areas. This species has been observed in various habitat types, most of which are difficult to assign a specific ecosystem description. General habitat characteristics for Dun Skipper include open south to southwest slope exposures (< 15% slope); adjacent to or within open forest comprised of Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) with lowland forest components below cliffs and hillsides comprised of Douglas-fir and open deciduous woods that include bigleaf maple (*Acer macrophyllum* Pursh); and close to open, sparsely vegetated cliffs (Knopp *et al.* 2007, 2009, 2010), edges of sedge-dominated wetlands and wet grasslands (Pyle 2002). Towards the interior of the Fraser Valley, and as habitats became drier (e.g., Boston Bar, Lillooet to Pemberton), Dun Skipper has been observed on gently sloping hillsides, generally within 1 km of cliff habitat. In the most xeric sites (e.g., Lillooet) the sites were sheltered from wind and associated with moister Douglas-fir habitat (Knopp *et al.* 2007, 2009, 2010).

Dun Skipper has also been recorded within bog habitats (e.g., Burns Bog), although the species is not considered a bog specialist. Bog conditions sustain moisture for host plant longevity, and warm dry conditions that seem to be favoured by the butterfly. The butterfly has been recorded in disturbed sites including roadsides, railway right-of-ways, ditches, and power line right-of-ways; areas with spring floods, natural hot springs or seeps (Guppy and Shepard 2001), and stream banks; and habitats that appear dry but where spring floods likely occur and moist conditions sustain populations of potential host plants (B.C. Conservation Data Centre 2013). The primary correlation between these habitat types is the high wet and moist ground throughout the spring/summer, thus preventing premature host plant senescence.

Dun Skipper has been recorded from Garry oak and associated ecosystems, yet the species is not considered a Garry oak obligate (Fuchs 2000). There are records of Dun Skipper in Garry oak habitats at Somenos Garry Oak Preserve (near Duncan), Francis/King Regional Park, Thetis Lake Regional Park, and Helliwell Provincial Park (Hornby Island) (Table 1; B.C. Conservation Data Centre 2013).

Moisture regime and successional stage: Dun Skipper habitat includes sites that have been disturbed (e.g., roadside ditches, clearcuts) with seasonally wet areas with abundant host plants, partially due to the early successional stage required by the likely grass and sedge family host

plants. Undisturbed habitats with more apparent natural features include wet marshy habitats with common rush (*Juncus effusus*) plants.

Larval host plants: Dun Skipper host plants, in general, are in the sedge family (*Carex* spp.) including *Carex heliophila* Mackenzie (no English name) (Layberry *et al.* 1998; Pyle 2002) and the grass family (*Poa* spp.) (Brown and McGuire 1983). Dun Skipper (eastern population) larvae are known to feed upon non-native yellow nut-grass (*Cyperus esculentus*) (Heitzman 1965; Guppy and Shepard 2001), native San Diego sedge (*Carex spissa* Bailey) (Brown 1982; Layberry *et al.* 1998), native hairy sedge (*Carex lacustris*), and graceful sedge (*Carex gracillima*) (Layberry *et al.* 1998). Yet these plant species do not occur or are rare within B.C. (B.C. Conservation Data Centre 2013). Various species of grasses and sedges occur throughout the province within the known range of Dun Skipper (B.C. Conservation Data Centre 2013).

The matrix and dimensions of larval and nectar food plant habitat patch sizes, spatial boundaries, specific habitat characteristics, and features necessary to sustain Dun Skipper are poorly understood. Thus it may be the presence of the species' host plant(s) that determines its apparent random occupancy of a given habitat. Based on the distribution of Dun Skipper in B.C. (Figure 3), it is unlikely a single host-plant species is used. Dun Skipper is known to exhibit host plant specificity at any one locality but host polyphagy over the entire range (Shepard 2000a, 2000b).

Nectar plants: At sites within the lower Fraser Valley, Dun Skipper appears to favour nectar sources such as spreading dogbane (*Apocynum androsaemifolium*) (native plant) (Knopp *et al.* 2009, 2010) and alfalfa (*Medicago sativa*) (non-native) (Knopp *et al.* 2009). The butterfly is also known to use fireweed (*Epilobium angustifolium* L.) (native), lotus milk-vetch (*Astragalus lotiflorus*) (native), goldenrod (*Euthamia* spp. and *Solidago* spp.) (native), sweet William (*Dianthus barbatus*) (non-native), and various species of thistles (family Asteraceae; both native and non-native species) (Pyle 2002). On Denman Island, Dun Skipper was observed nectaring on oxeye daisy (*Leucanthemum vulgare*) (non-native) (Guppy *et al.* 2007).

3.3.2 Ecological Role

Dun Skipper is not likely an essential pollinator of its larval host plant or adult nectar plants, nor is it known to have other crucial ecological roles such as food-web dynamics. Small mammals, invertebrate predators, and birds likely prey upon Dun Skipper.

3.3.3 Limiting Factors

Host plant specificity and habitat specificity: Dun Skipper depends on larval host plants and without these plants the butterfly cannot complete its life cycle (see Section 3.3.1, Habitat and Biological Needs). The butterfly likely chooses nectar (adult) host plants opportunistically and preference may appear limited to the few plant species flowering during the flight period and not the specific biological preference by the butterfly. The main limiting factor for Dun Skipper is likely larval host plant availability and plant senescence (Shepard 2000a, 2000b). In early spring, host plants are just beginning to grow and thus host plant phenology likely influences larval

growth and survival. As natural forest succession occurs these resources diminish.

Limited dispersal capability: Dun Skipper does not likely have high dispersal capabilities although it has not been documented how far the species will travel between host plant patches. Isolation due to dispersal limitations may lead to decreased genetic diversity within a population, greater genetic differences among locations, inbreeding depression, and no rescue effect.

Low population density: Dun Skipper appears to not form dense colonies or be present in high populations within suitable sites.

4 THREATS

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational) (Salafsky *et al.* 2008). For purposes of threat assessment, only present and future threats are considered.[2] Threats presented here do not include biological features of the species or population such as inbreeding depression, small population size, and genetic isolation; or likelihood of regeneration or recolonization for ecosystems, which are considered limiting factors.[3]

For the most part, threats are related to human activities, but they can be natural. The impact of human activity may be direct (e.g., destruction of habitat) or indirect (e.g., invasive species introduction). Effects of natural phenomena (e.g., fire, hurricane, flooding) may be especially important when the species or ecosystem is concentrated in one location or has few occurrences, which may be a result of human activity (Master *et al.* 2009). As such, natural phenomena are included in the definition of a threat, though should be applied cautiously. These stochastic events should only be considered a threat if a species or habitat is damaged from other threats and has lost its resilience, and is thus vulnerable to the disturbance (Salafsky *et al.* 2008) such that this type of event would have a disproportionately large effect on the population/ecosystem compared to the effect it would have had historically.

[2] Past threats may be recorded but are not used in the calculation of Threat Impact. Effects of past threats (if not continuing) are taken into consideration when determining long-term and/or short-term trend factors (Master *et al.* 2009).

[3] It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species or ecosystem less likely to respond to recovery/conservation efforts.

4.1 Threat Assessment

The threat classification below is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system and is consistent with methods used by the B.C. Conservation Data Centre and the B.C. Conservation Framework. For a detailed description of the threat classification system, see the CMP website (CMP 2010). Threats may be observed, inferred, or projected to occur in the near term. Threats are characterized here in terms of scope, severity, and timing. Threat "impact" is calculated from scope and severity. For information on how the values are assigned, see Master *et al.* (2009) and table footnotes for details. Threats for Dun Skipper were assessed for the entire province (Table 2).

Table 5. Threat classification table for Dun Skipper.

Threat		Impact (calculated)	Scope (next 10 years)	Severity (10 years or 3 generations)	Timing
1	Residential & commercial development	Medium	Restricted (11–30%)	Serious (31–70%)	High – Moderate
1.1	Housing & urban areas	Medium	Restricted (11–30%)	Serious (31–70%)	High (Continuing)
1.2	Commercial & industrial areas	Low	Small (1–10%)	Moderate (11–30%)	Moderate (Possibly in the short term, < 10 yrs)
1.3	Tourism & recreation areas	Low	Small (1–10%)	Serious (31–70%)	Moderate (Possibly in the short term, < 10 yrs)
2	Agriculture & aquaculture	Low	Small (1–10%)	Moderate (11–30%)	Moderate (Possibly in the short term, < 10 yrs)
2.1	Annual & perennial non-timber crops	Low	Small (1–10%)	Moderate (11–30%)	Moderate (Possibly in the short term, < 10 yrs)
2.2	Livestock farming & ranching	Not a Threat (in the assessed timeframe)	Negligible (< 1%)	Unknown	Insignificant/Negligible (Past or no direct effect)
3	Energy production & mining	Low	Small (1–10%)	Moderate (11–30%)	Unknown
3.2	Mining & quarrying	Low	Small (1–10%)	Moderate (11–30%)	Unknown
4	Transportation & service corridors	Low	Large (31–70%)	Slight (1–10%)	Moderate (Possibly in the short term, < 10 yrs)
4.1	Roads & railroads	Low	Large (31–70%)	Slight (1–10%)	Moderate (Possibly in the short term, < 10 yrs)
4.2	Utility & service lines	Low	Small (1–10%)	Slight (1–10%)	Moderate (Possibly in the short term, < 10 yrs)
5	Biological resource use	Not a Threat	Negligible (< 1%)	Neutral or Potential Benefit ≥ 0%)	High
5.3	Logging & wood harvesting	Not a Threat	Negligible (< 1%)	Neutral or Potential Benefit ≥ 0%)	High
6	Human intrusions & disturbance	Negligible	Negligible (< 1%)	Negligible (< 1%)	Insignificant/Negligible (Past or no direct effect)
6.1	Recreational activities	Negligible	Negligible (< 1%)	Negligible (< 1%)	Insignificant/Negligible (Past or no direct

Threat		Impact (calculated)	Scope (next 10 years)	Severity (10 years or 3 generations)	Timing
					effect)
7	Natural system modifications	Low	Pervasive (71–100%)	Slight (1–10%)	High (Continuing)
7.1	Fire & fire suppression	Low	Pervasive (71–100%)	Slight (1–10%)	High (Continuing)
7.2	Dams & water management/use	Not a Threat	Small (1–10%)	Neutral or Potential Benefit	High (Continuing)
7.3	Other ecosystem modifications	Low	Small (1–10%)	Slight (1–10%)	High (Continuing)
8	Invasive & other problematic species & genes	Low	Restricted (11–30%)	Moderate (11–30%)	Moderate (Possibly in the short term, < 10 yrs)
8.1	Invasive non-native/alien species	Low	Restricted (11–30%)	Moderate (11–30%)	Moderate (Possibly in the short term, < 10 yrs)
8.2	Problematic native species	Low	Restricted (11–30%)	Moderate (11–30%)	Moderate (Possibly in the short term, < 10 yrs)
9	Pollution	Low	Small (1–10%)	Serious (31–70%)	High (Continuing)
9.3	Agricultural & forestry effluents	Low	Small (1–10%)	Serious (31–70%)	High (Continuing)
9.4	Garbage & solid waste	Not a Threat (in the assessed timeframe)	Small (1–10%)	Unknown	Insignificant/Negligible (Past or no direct effect)
10	Geological events	Low	Small (1–10%)	Extreme	Moderate (Possibly in the short term, < 10 yrs)
10.2	Earthquakes/tsunamis	Low	Small (1–10%)	Extreme	Moderate (Possibly in the short term, < 10 yrs)
11	Climate change & severe weather	Not a Threat (in the assessed timeframe)	Small (1–10%)	Slight (1–10%)	Low (Possibly in the long term, >10 yrs)
11.2	Droughts	Not a Threat (in the assessed timeframe)	Unknown	Unknown	Low (Possibly in the long term, >10 yrs)
11.4	Storms & flooding	Not a Threat (in the assessed timeframe)	Small (1–10%)	Slight (1–10%)	Low (Possibly in the long term, >10 yrs)

[a] **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.
[b] **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).
[c] **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or 3-generation timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).
[d] **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

4.2 Description of Threats

The overall province-wide Threat Impact for Dun Skipper is High.[4] While development is the most notable threat to this species, there are also several lower impact threats. The overall threat considers the cumulative impacts of multiple threats. Note that some anthropogenic disturbance of habitat currently unsuitable for the species, such as clearing of densely vegetated ditches and roadsides, is expected to result in additional areas becoming occupied, which may reduce the impact of these threats. Details are discussed below under the Threat Level 1 headings.

IUCN-CMP Threat 1. Residential & commercial development

Dun Skipper is threatened by cumulative habitat loss from urban and rural land conversion, and subsequent habitat fragmentation. Core habitats affected by development in the Lower Mainland are within the local government jurisdictions of Abbotsford, Mission, Chilliwack, Langley, Fort Langley, and Hope. On Vancouver Island, core areas include the 13 municipalities of Greater Victoria and extend up the southeastern side of Vancouver Island to the Courtenay area. Most of the large habitat patches within these areas are in private ownership (either owned by the local government or timber or development companies) and urban planning projections designate many for housing or commercial development. At present, residential and commercial development primarily threaten potential Dun Skipper habitat in Bevan, Mission, Sahtlam District, Salt Spring Island, Somenos Garry Oak Preserve, Wellington, Denman Island, Maple Bay, Spectacle Lake, and Burns Bog.

1.1 Housing & urban areas

Within the mainland range of Dun Skipper, there have been at least 73 separate housing developments in urban areas with Dun Skipper habitat (Abbotsford, Chilliwack, Agassiz, Maple Ridge, Mission, and Langley) that are ongoing as of 2011 (Greater Vancouver Real Estate 2011). These urban developments include large-scale new communities with new infrastructure, such as schools, roads, and central shopping amenities and, in some cases, golf courses and other recreational infrastructure. Most of this development has been within privately owned natural land within the Sumas Mountain and other areas of rural Abbotsford (see City of Abbotsford 2003, Vedder Mountain, and other natural areas of Chilliwack, within the lower Fraser Valley; Greater Vancouver Real Estate 2011).

Dun Skipper habitat on southeastern Vancouver Island is also threatened from urban and rural land conversion, and subsequent fragmentation of the open sparsely vegetated wetland and Garry oak ecosystem habitat. The uncertainty surrounding land use and the frequently changing land ownership increases the potential threat of habitat conversion. Within the greater Victoria area there are currently or ongoing, a minimum of 12 large-scale urban housing, commercial, or recreational facility (e.g., golf courses) developments on natural habitat totaling greater than 1550 ha that are ongoing or planned for immediate commencement, most within Colwood,

[4] The overall threat impact was calculated following Master *et al.* (2009) using the number of Level 1 Threats assigned to this species where Timing = High or Moderate. This includes 1 Medium and 7 Low (Table 2). The overall threat considers the cumulative impacts of multiple threats.

Langford, and Central Saanich (Victoria Real Estate Team 2011). These natural areas all have potential Dun Skipper habitat (as assessed through satellite imagery). These developments include large-scale new communities that include infrastructure such as schools and roads.

This threat applies directly to at least 4 populations, including potential habitat on Denman Island, where land is being subdivided and sold to individual landowners (i.e., the butterfly has been recorded from adjacent properties other than the one being developed, but the habitat types are similar).

1.2 Commercial & industrial areas

Industrial and business park expansion plans are published for some municipalities within the lower Fraser Valley (mainland), such as the *City in the Country Plan* specific to the City of Abbotsford. This plan projects the need for "1,300 acres of employment-generating industrial and business park lands over the next 20 years" with "future residential development accommodated through hillside development…not accommodated by expansion into the Agricultural Land Reserve" (City of Abbotsford 2003).

This threat applies directly to a known Dun Skipper site and habitat on private land adjacent the conserved Burns Bog Ecological Conservancy Area, as a habitat unit is not entirely within conservation land, and a parcel of private land has potential for commercial real estate (industrial park) development.

1.3 Tourism & recreational areas

The demand for tourism and recreational areas within southeastern Vancouver has increased substantially within the past decade. Natural areas continue to be developed into golf courses (e.g., Bear Mountain development [Victoria Real Estate Team 2011]), parks, and recreation facilities (e.g., outside the boundaries of Goldstream Provincial Park). Within existing parks, as well as on regional and municipal properties, recreational development potentially conflict with Dun Skipper conservation. On the northern edge of the Fraser Valley, this threat applies directly to the known Dun Skipper site at the Morris Valley Hemlock Ski Hill (population #22) where a major ski hill expansion has been proposed. BC Parks staff are aware of the Dun Skipper and incorporate this information in their trail planning to avoid potential Dun Skipper habitats in Helliwell, Denman Island, and Burgoyne Bay Provincial Parks (E. McClaren, pers. comm., 2013).

IUCN-CMP Threat 2. Agriculture & aquaculture

2.1 Annual & perennial non-timber crops

Clearing of land for agriculture is ongoing, in small amounts, on private lands throughout the range of Dun Skipper. Land clearing on agricultural land reserves is also ongoing.

2.2 Livestock farming & ranching

Detrimental impacts to Dun Skipper habitat from livestock overgrazing have been recorded on Denman Island. Trampling of sensitive wetland areas often results when livestock congregate adjacent to watercourses. The impacts of grazing are unknown; however, moderate livestock grazing may be beneficial.

IUCN-CMP Threat 3. Energy production & mining

3.2 Mining & quarrying

There is a small possibility roadside gravel extraction or quarrying could occur along the stretch of Dun Skipper sites in the Boston Bar corridor (population #16).

IUCN-CMP Threat 4. Transportation & service corridors

4.1 Roads & railroads

With increasing human population comes the need for associated transportation infrastructure and access to both new and existing urban areas. Proposed transportation routes are often planned through areas that have the least impact to existing private landowners (e.g., land owned by the local or provincial government; land currently within the provincial Agricultural Land Reserve [although the land may be privately owned]; or land through natural areas owned by one private landowner or company). These transportation routes often go through natural areas suitable for Dun Skipper.

Within the geographic range of Dun Skipper, extensive roads and other similar transportation corridors already fragment much of the remaining natural habitat. Increased roads, trails, and corridors lead to further habitat modifications through the spread of introduced species (see IUCN-CMP Threat 8.1) and increased frequency of use by humans (see IUCN-CMP Threat 6.1). This threat applies to at least 8 Dun Skipper populations (#3, 4, 6, 16, 17, 20, 22, and 25), including a site at Burns Bog (population #20), where a development and an ongoing highway expansion project (South Perimeter Road) are occurring at the bog's margins.

IUCN-CMP Threat 5. Biological resource use

5.3 Logging & wood harvesting

In some areas, forest harvesting may create open habitat for the expansion of Dun Skipper populations. For example, the open, wet, marshy clearings and logged areas of central Denman Island have provided ideal habitat for population expansion to other areas throughout the island. A provincial park has been established recently on the island, covering approximately 75 ha of regenerating (e.g., previously clearcut) forest. A carbon covenant on this property stipulates the property must allow the forest to grow for the use of carbon sequestration. Eventually, these large, open clearcuts will grow and habitat will once again become limited on Denman Island for Dun Skipper. The logging within the Dun Skipper range is thought to be negligible.

IUCN-CMP Threat 6. Human intrusions & disturbance

6.1 Recreational activities

Recreational activities within Dun Skipper habitat include hiking (e.g., Helliwell Provincial Park on Hornby Island) and horseback riding (e.g., on Denman Island). Such activities can result in degradation of habitat quality through soil compaction and can also cause accidental mortality of larvae.

Areas with particularly high recreational use include those habitats within Metro Vancouver and Fraser Valley Regional District parks and within the Capital Regional District. Hiking and related activities may also increase the spread of introduced species (see IUCN-CMP Threat 8).

Recreational use of trails for horseback riding is also prominent and likely impacts habitat (e.g., trampling of trails/edges and defecation, which increases the spread of fungus, seeds, etc.). The scope and overall impact of recreational activities as a threat are thought to be negligible.

IUCN-CMP Threat 7. Natural system modifications

7.1 Fire & fire suppression

Fire suppression is ongoing throughout the entire range of Dun Skipper. Within Garry oak and associated habitats, fire suppression has led to further forest succession within these open habitats (Garry Oak Ecosystems Recovery Team 2010), and thus a decline in potential Dun Skipper habitats.

The threat of fire is also present throughout the range of Dun Skipper, particularly within large natural tracts of land as well as areas adjacent to roadways and right-of-ways and in recreational areas where brush burning may be used as a form of fire suppression. Burns Bog periodically experiences ground fires, and although efforts are made to control blazes, fire does impact habitat. Due to the removal of vegetation, fires may adversely affect Dun Skippers by decreasing available moisture retention within habitats, increasing dehydration stress to individuals, and causing direct mortality.

7.2 Dams & water management/use

Human activity, such as ditch creation, clearing the ditch of in-water and streambank vegetation, or flushing the ditch and flooding streambank vegetation throughout the species' historical range, would appear to create habitat suitable for growth of Dun Skipper's larval and nectar host plants, while concurrently destroying other habitats.

7.3 Other ecosystem modifications

Brush clearing and mowing as forms of fire suppression occur on private and public lands throughout the species' range, particularly in areas adjacent to roadways and right-of-ways and in recreational areas. This may adversely affect Dun Skippers by decreasing available moisture retention within habitats, increasing dehydration stress to individuals, and causing direct mortality. Current mowing regimes may pose a minor threat to Dun Skipper habitat in Burgoyne Bay Provincial Park (E. McClaren, pers. comm., 2013).

IUCN-CMP Threat 8. Invasive & other problematic species & genes

8.1 Invasive non-native/alien species

Roadsides can act as corridors into natural habitats and are known to facilitate the rapid spread of introduced species (e.g., plant seeds attach to car tires and become dislodged at new locations) (Trombulak and Frissell 2000). The potential spread of introduced species along roadsides may impact local populations through competition and predation, as well as through changes to native vegetation.

Many of the sites where Dun Skipper has been recorded have become degraded and/or dominated by introduced species such as agronomic grasses and weedy forbs.

Invasive plant species such as Scotch broom (*Cytisus scoparius* L.) have the ability to fix nitrogen and are known to change vegetation and soil structure (Haubensak and Parker 2004). Invasive species legacy (resulting in long-term ecosystem impacts from prolonged invasive species growth) and increasing the nitrogen availability in the soil may encourage exotic species growth in native grasslands (Huenneke *et al.* 1990; Maron and Conners 1996). Scotch broom is also associated with suppressed native species richness (Rook *et al.* 2011) and more specifically is a high threat at Vancouver Island sites, especially to the roadside right-of-ways at Nanaimo Lakes Road (P. Lilley, pers. comm., 2010; J. Heron, pers. comm., 2011) and portions of habitat on Denman Island have abundant Scotch broom (J. Heron, pers. comm., 2010). Dun Skipper habitat at Dog Mountain (population #17), where a gas pipeline crosses along Highway 7 is now covered by invading shrubby vegetation including Himalayan blackberry (*Rubus armeniacus*) and introduced white virgin's bower (*Clematis virginiana*) (Knopp *et al.* 2010). Other sites with high invasive species presence include Hornby Island (Helliwell Provincial Park) with invasive Scotch broom, and the Spectacle Lake and Goldstream areas. Overall, most sites are likely impacted by invasive species.

Eastern Cottontail (*Sylvilagus floridanus*) and European Rabbit (*Oryctolagus cuniculus*), both introduced rabbit species, may browse host plants, but herbivory is considered a minor threat.

Invasive plants threaten Dun Skipper habitats within Helliwell Provincial Park, Denman Island Provincial Park (potential habitat, based on known occurrence in adjacent private conservation land), and Burgoyne Bay Provincial Park. Plans to remove English hawthorne from within the Dun Skipper habitat polygons mapped in 2009 (Miskelly 2009) are in place to decrease this threat within Burgoyne Bay Provincial Park (E. McClaren, pers. comm., 2013).

IUCN-CMP Threat 9. Pollution

9.3 Agricultural & forestry effluents

Agricultural and forestry effluents most likely to harm Dun Skipper and its habitat are herbicides used to control vegetation, especially the general use of herbicides to control roadside and right-of-way vegetation on commercial forestry lands. It is unclear how extensive this practice is at present within the range of Dun Skipper.

Dun Skipper is within the introduction range of European Gypsy Moth (*Lymantria dispar*), and traps to detect introductions of this moth are scattered throughout southern B.C. (B.C. Ministry of Forests, Lands and Natural Resource Operations 2013). A provincial program to detect and eradicate introductions of this moth has been ongoing since 1979 and spray has been applied in numerous areas within the range of Dun Skipper since this time (Figure 5).

If the moth is recorded in abundance (criteria are determined by the provincial Gypsy Moth Committee) ground and aerial spray of Btk (*Bacillus thuringiensis kurstaki*) are applied to control the moth. Btk is a component of commercial pesticides that use spores of a naturally occurring pathogenic bacterium to control defoliating caterpillars, although the bacterium also affects most non-target butterfly and moth larvae. Btk for European Gypsy Moth is typically applied in early April to early May, which coincides with Dun Skipper larval activity.

The area of Btk application varies yearly and depends on the extent to which gypsy moths are trapped during previous years' surveys. Since trap results are compiled over at least 2 years, should European Gypsy Moth be recorded there would likely be time to seek treatment options rather than simply broadcast aerial sprays. It is unlikely the entire Dun Skipper range would be treated for European Gypsy Moth according to October 2012 trap results; no Btk treatment is planned for 2013 (J. Burleigh, pers. comm., 2012).

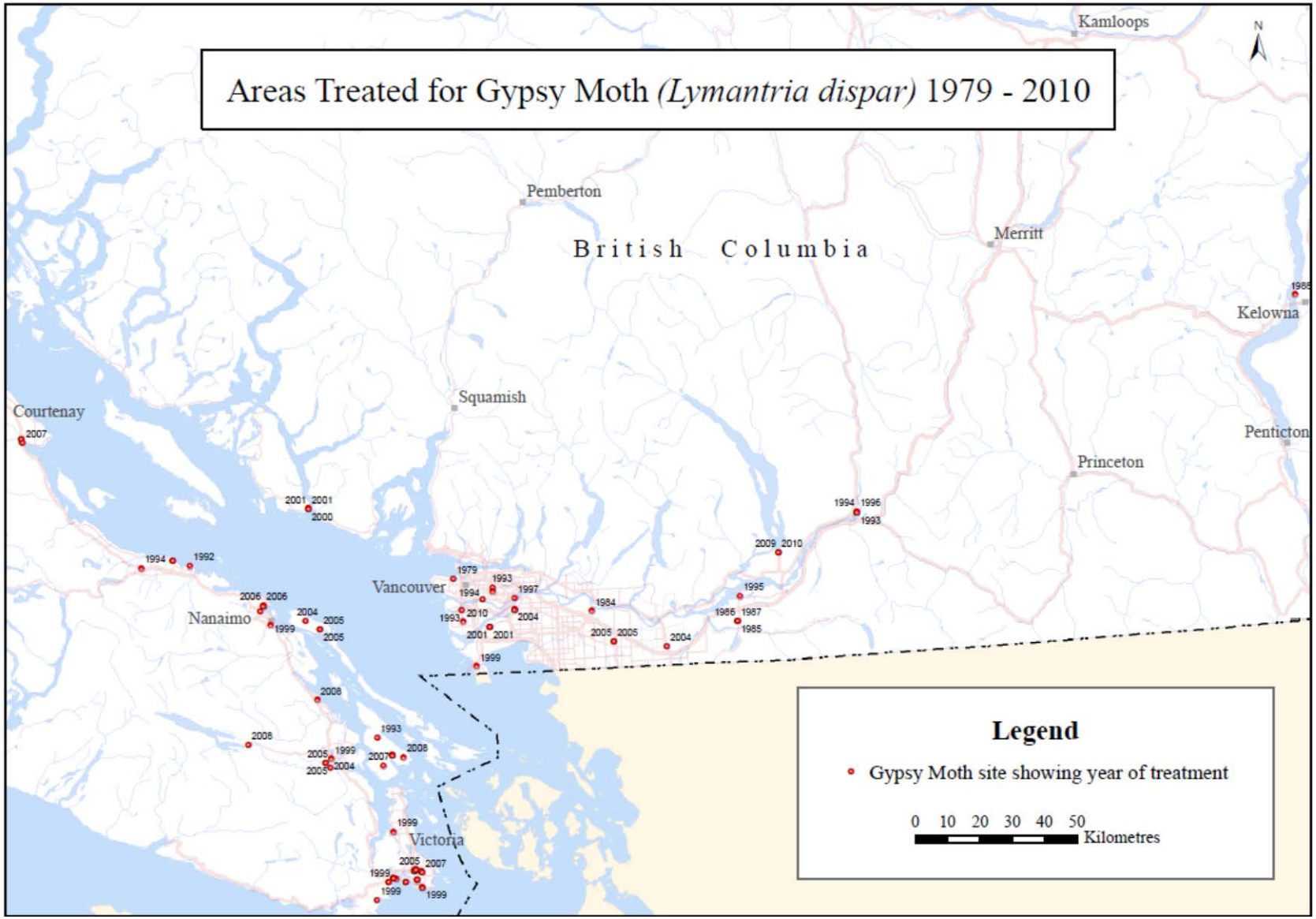


Figure 5. Gypsy Moth treatment areas 1979–2010. Note: data points are not exact and do not show the entire treatment area.

9.4 Garbage & solid waste
The City of Vancouver manages a municipal waste facility at the edge of Burns Bog. There are no records for Dun Skipper within the municipal waste site; however, there are likely impacts to the surrounding wetlands from the dump. These impacts are unknown.

IUCN-CMP Threat 10 Geological events
10.2. Earthquakes/tsunamis
Some Dun Skipper sites are within the potential flood zone should an earthquake or tsunami occur; specifically Burns Bog Ecological Conservancy Area (population #20), lowland areas of the Fraser Valley, and parts of the Greater Victoria area.

IUCN-CMP Threat 11. Climate change & severe weather
11.2 Droughts
Climate change is a potential threat to the Dun Skipper; primarily due to the impacts such change brings to the wetland ecosystems and plant communities within which the species lives. Increased summer droughts may affect habitat within Dun Skipper sites by decreasing the available site moisture that allows for suitable host plant growth. Droughts may impact host plant timing and senescence of Dun Skipper. By 2050, mean annual temperatures are expected to rise approximately 2 to 3°C (Hebda 1997). Within the Pacific Maritime Ecozone (where Dun Skipper occurs in western Canada), mean temperatures increased by 1.71°C from 1960 to 2006 (Coristine and Kerr 2011). This temperature increase could lead to increase in droughts. The effects on Dun Skipper are unknown.

11.4 Storms & flooding
Flooding could occur at Burns Bog as a result of the effects of climate change; however, it is not thought that this is likely to occur in the next 10 years.

5 RECOVERY GOAL AND OBJECTIVES

5.1 Population and Distribution Goal

The population and distribution goal is to maintain the current populations for Dun Skipper as well as maintain its distribution throughout its range in British Columbia

5.2 Rationale for the Population and Distribution Goal

The population and distribution goal was set to ensure that Dun Skipper does not become Endangered. Dun Skipper is likely to remain Threatened as it has a restricted range in B.C. It is unlikely that new populations will be found that would extend its range (D. Knopp, pers. comm., 2013) such that this species could be downlisted to Special Concern.

The population and distribution goal for Dun Skipper cannot be quantified due to knowledge gaps–population size is unknown at all sites. Studies to date have primarily been surveys focused on recording new sightings and habitat information. Most sightings are of 1–2 individuals (Table 1; B.C. Conservation Data Centre 2013), suggesting it may require multiple surveys over

multiple years at the same site before it is detected. Estimating populations is difficult due to the low detection rate for the species, which makes surveys labour-intensive and logistically difficult.

5.3 Recovery Objectives

1. To identify and prioritize Dun Skipper habitat throughout the species' range in B.C.
2. To secure protection[5] for Dun Skipper habitats within the species' range.
3. To assess and reduce threats to all known Dun Skipper sites in B.C.
4. To address knowledge gaps (e.g., population size, host plant requirements) that will enable quantitative population and distribution objectives to be set.

6 APPROACHES TO MEET OBJECTIVES

6.1 Actions Already Completed or Underway

The following actions have been categorized by the action groups of the B.C. Conservation Framework (B.C. Ministry of Environment 2010b). Status of the action group for this species is given in parentheses.

Compile Status Report (complete)

- COSEWIC report completed (Shepard 2000b). Update report in progress (April 2013).

Send to COSEWIC (complete)

- Dun Skipper designated Threatened (Shepard 2000b). Reassessed by COSEWIC in May 2013 as Threatened.

Planning (in progress)

- B.C. Recovery Plan completed (this document, 2013).

Inventory (in progress)

From 2001 to 2011 inventory for Dun Skipper has focused on southeastern Vancouver Island (Guppy and Fischer 2001; Page, Lilley, Heron *et al.* 2008; Page, Lilley, Miskelly *et al.* 2008; Page *et al.* 2009; Page and Lilley 2009; J. Heron, pers. observation, 2012); Denman Island (Guppy *et al.* 2007; Page *et al.* 2007; Page, Lilley, Heron *et al.* 2008), Hornby Island (Page *et al.* 2007), Salt Spring Island, Galiano Island, Mayne Island, and Gulf Islands National Park Reserve (Guppy 2008). On the southwestern mainland of B.C., search effort has specifically focused on the edges of the species' known range (e.g., Pemberton, Lillooet, and Boston Bar) with the intent

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

to confirm the edges of the species range on the mainland (Knopp *et al.* 2007, 2009, 2010). Species-specific search effort took place in 2007 and 2009–2011 and amounted to at least 1129 hours, at least 1660.7 km of walking transects, and 4847 km of driving (assessing habitat by slowly traveling logging roads, stopping when good habitat is observed, and completing surveys within such habitat). Additional boat surveys within Harrison and Pitt Lakes have also been completed (62 km by slowly traveling along shorelines, stopping when good habitat is observed, and completing surveys in such habitat; Parkinson *et al.* 2009).

- Search effort for Dun Skipper throughout Metro Vancouver parks in the lower Fraser Valley has not yielded any records other than at Metro Vancouver Burns Bog Ecological Conservancy Area.
- Inventory of Dun Skipper in Burgoyne Bay Provincial Park (Miskelly 2009).

Habitat Protection and Private Land Stewardship (in progress)

- Dun Skippers occur on 14 sites managed under the provincial forestry land base. These areas could be potential Wildlife Habitat Areas under the *Forest and Range Practices Act*. Dun Skipper is currently not listed in the Species at Risk category under this act; however, it is certainly a candidate for this designation and is recommended for inclusion as such.
- Existing mechanisms that afford habitat protection for Dun Skipper are listed in Table 3.

Table 6. Existing mechanisms that afford habitat protection for Dun Skipper.

Existing regulatory and other protection mechanisms that afford habitat protection	Threat[a] or concern addressed	Site
Legal provisions of the B.C. *Parks Act* and B.C. *Ecological Reserves Act* • Park managers and staff are aware of the species and its habitat needs at Helliwell Provincial Park (E. McClaren, pers. comm., 2013) and Burgoyne Bay Provincial Park (R. Annschild, pers. comm., 2010; C. Retzer Miller, pers. comm., 2010).	1.1 1.2 1.3 6.1 8.1	Helliwell Provincial Park (Hornby Island, 2004), Somenos Garry Oak Preserve (1976), Burgoyne Bay Provincial Park (2008 and 2009). Presence in Goldstream and Spectacle Lake Provincial Parks is unconfirmed.
Regional and municipal owned land • These governments are aware of the species and its habitat needs (; M. Fuchs, pers. comm., 2003–2010; M. Merkens, pers. comm., 2005–2010).	1.1 1.2 1.3 6.1 8.1	Francis/King Regional Park (1962) and Thetis Lake Regional Park (both Capital Regional District parks), and Burns Bog Ecological Conservancy Area (Metro Vancouver Park).
Conservation covenants on Denman Island • Contain habitat where Dun Skipper has been observed.	1.1 1.2 1.3 8.2	Denman Island Conservancy private conservation lands: Central Park (59.5 ha) and property owned by the Denman Conservancy named "Settlement Lands" (160 ha) (Denman Conservancy Association 2010; A. Fyson, pers. comm., 2010).
Legal provisions of the federal *Species At Risk Act*		Recorded from two federal Indian Reserves: Sho-ook IR 5 and Soowahlie IR 14.

[a] Threat numbers according to the IUCN-CMP classification (see Table 2 for details).

6.2 Recovery Planning Table

Table 7. Recovery planning table for Dun Skipper.

Actions to meet objectives	Threat [a] or concern addressed	Priority[b]
Objective 1. To identify and prioritize Dun Skipper habitat throughout the species' range in B.C.		
Complete spatial mapping of all suitable Dun Skipper habitats within the B.C. range using information in habitat description. Delineate and label these spatial areas into sites. Include known sites in this spatial mapping.	Knowledge Gap	Essential
Create a habitat suitability rating system that categorizes Dun Skipper sites as high, medium, or low for inventory and/or monitoring. This will enable sites to be compared for presence/absence of certain correlating habitat elements and assist with habitat suitability rating as well as describing survival/recovery habitat.	Knowledge Gap	Essential
From spatial mapping: • prioritize sites for Dun Skipper inventory based on habitat suitability rating, previous/ongoing inventory, or known records; • categorize sites by habitat protection measure options based on land tenure (e.g., level of government, private, agricultural lands) and other pertinent information.	Knowledge Gap	Essential
Work with South Coast Conservation Program to contact private landowners with high priority sites and request for inventory.	Knowledge Gap	Essential
Inventory high priority habitat on federal and provincial Crown land within the range of Dun Skipper. This will inform and ideally prevent land from being disposed, or forest activities from impacting populations on these lands.	Knowledge Gap	Essential
Objective 2. To secure protection for Dun Skipper habitats within the species' range.		
Where Dun Skipper is recorded on Crown lands (federal and provincial), initiate protection measures under existing legislation and government policy.	All	Essential
Recommend Dun Skipper to be listed as a species at risk[c] under the *Forest and Range Practices Act* and the *Oil and Gas Activities Act*.	3.2 5.3	Essential
Work with municipalities to use existing environmental protection tools under current legislation (e.g., Sensitive Development Permit Areas, Riparian Areas Regulation). In addition, collaboratively work together to outline and formulate new environmental protective tools that are specific to each local government, to enable locally led protection for private land within each jurisdiction (e.g., establish wording to assist with bylaws, determine Sensitive Development Permit Areas, and develop pesticide restrictions).	All	Essential
Work with South Coast Conservation Program to contact private landowners regarding stewardship options and other protective measures at sites where inventory resulted in Dun Skipper occurrences. Combine information with other species at risk habitat needs, and define priority sites for stewardship and protection opportunities.	Knowledge Gap	Necessary
Work with South Coast Conservation Program, Garry Oak Ecosystems Recovery Team, additional non-government organizations, as well as government partners, to increase public understanding and knowledge of Dun Skipper and associated threats to the species. (e.g., prepare a fact sheet or at-risk brochure): • promote the inclusion of the species in interpretive materials by local government bodies and by provincial and national parks within the species' potential range; • provide information on the species at the B.C. Conservation Data Centre website, other provincial websites on species at risk, and the	6.1 8.1 9.3	Necessary

Actions to meet objectives	Threat [a] or concern addressed	Priority[b]
federal agencies responsible for species at risk; • develop and present workshops on conservation and restoration of remnant forest ecosystems in the lower Fraser Valley lowlands and southern Vancouver Island.		
Spatially map areas that are protected through stewardship and after 5 years of stakeholder engagement, evaluate this approach.	Knowledge Gap	Necessary
Work with staff of parks and protected areas to ensure Dun Skipper is integrated into park management planning activities. These include actions such as signage, vegetation management options around occupied habitats, and identification training for parks staff.	6.1 7.1 7.3 8.1 9.3	Essential
Amend provincial park management plans to include management practices that enable the protection of Dun Skipper habitat.	6.1 7.1 7.3 8.1 9.3	Essential
Objective 3. To assess and reduce threats to all known Dun Skipper sites in B.C.		
When completing inventory, attempt to list, quantify, and rate threats to habitat at each known site through standard protocol thereby assessing reasons Dun Skipper may or may not be present within certain habitats. Use this site-specific threat information to inform best management practices and advice during environmental assessments.	Knowledge gap All	Essential
Overlay spatial information that shows flood information, forest fire information, immediate development applications (e.g., *Water Act* approval applications, sensitive ecosystems, and other relevant environmental information) onto completed spatial mapping of all suitable Dun Skipper habitats within the B.C. range. This will reveal habitats that may be more vulnerable to these related threats and allow for a more accurate estimation of impact should one of these threats occur.	1.1 1.2 1.3 7.1 11.2 11.4	Beneficial
Investigate distribution and habitat use patterns of Dun Skipper in relation to potential Gypsy Moth spray.	Knowledge gap 9.3	Beneficial
Work with land developers to ensure that they include the needs of Dun Skipper in land use plans for urban and rural areas containing high priority habitats.	1.1 1.2 1.3	Essential
Specific management practices guidelines for Dun Skipper for each landowner or land manager, specific to the threats of the site have been drafted by 2016.	All	Essential
In parks and recreational areas, identify site-specific threats to minimize damage to Dun Skipper habitat caused by erosion and destruction of vegetation (e.g., fire management prevention or suppression activities); restrict intensive recreational activities use within known occupied habitats; and implement invasive species removal/management programs.	6.1 7.1 8.1 9.3	Essential
As part of long-term monitoring program, assess changes in habitat use and distribution due to the effects of climate change (e.g., more frequent drought).	11.2	Beneficial

Actions to meet objectives	Threat [a] or concern addressed	Priority[b]
Objective 4. To address knowledge gaps (e.g., habitat requirements, biological needs, and ecological factors) that currently prevent quantitative population and distribution objectives from being established.		
Develop monitoring program at known sites. Investigate the vegetative habitat components of each site, and determine what habitat attributes are favoured by Dun Skipper. Gather information on, for example, movements, subsequent threats (e.g., invasive species competition), and other factors. Investigate and observe the butterfly and its natural history (e.g., host plants).	Knowledge gap	Necessary

[a] Threat numbers according to the IUCN-CMP classification (see Table 2 for details).

[b] Essential (urgent and important, needs to start immediately); Necessary (important but not urgent, action can start in 2–5 years); or Beneficial (action is beneficial and could start at any time that was feasible).

[c] Listed species require special management attention to address the impacts of forest and range activities and/or the impacts of oil and gas activities on Crown land as described in the Identified Wildlife Management Strategy (Province of British Columbia 2004).

7 INFORMATION ON HABITAT NEEDED TO MEET RECOVERY GOAL

Threats to Dun Skipper habitat have been identified. To help meet the population and distribution goal for this species, it is recommended that specific habitat attributes be identified for Dun Skipper. In addition, it is recommended that locations of survival/recovery habitat be geospatially described on the landscape to mitigate habitat threats and to facilitate the actions for meeting the population and distribution goal.

7.1 Description of Survival/Recovery Habitat

Information on habitat requirements for Dun Skipper is provided in Section 3.3.1 and provides a partial description of the biophysical attributes of survival/recovery habitat. Note the specific moisture levels, plant information, and/or species composition is unknown and requires further study. Additional work needs to be done so that survival/recovery for Dun Skipper habitat in B.C. can be spatially described using maps (see Section 7.2).

At minimum, survival/recovery habitat should include:

- the known area of occupancy of the species and the associated potential error from geographic positioning system (GPS) units (uncertainty may range up to 25 m depending on the GPS unit accuracy)
- adjacent suitable habitat. This should extend to a minimum of 50 m from the occupied area and uncertainty to maintain minimum constituent microhabitat properties where the butterflies are found (based on average edge effects distances in coastal forests) (Kremsater and Bunnell 1999). Unsuitable habitat (e.g., parking lot, works yard, or maintenance facility) found within this polygon should be excluded.

Survival/recovery habitat may also include the entire portion of the habitat that is associated with, and is integral to, the production and maintenance of suitable habitat conditions, and that provides ecological context for occupied microhabitats.

7.2 Studies Needed to Describe Survival/Recovery Habitat

General habitat requirements are known for Dun Skipper (see Section 3.3.1). However, biophysical attributes of survival/recovery habitat for Dun Skipper should include a minimum density of larval and nectar host plants. It is recommended that outstanding work required to quantify specific habitat requirements for the species be completed and that the survival/recovery habitat be geospatially described at each known location to facilitate the actions for meeting the population and distribution goal.

Table 8. Studies needed to describe survival/recovery habitat to meet the population and distribution goal for Dun Skipper.

Description of activity	Outcome/rationale	Timeline
Conduct habitat assessments that record descriptive habitat measures at known Dun Skipper sites (e.g., slope, aspect, vegetative components, soil type).	• Enable comparison of sites for habitat values	2013–2018
Conduct mark–recapture studies at sites with high known abundance.	• Gain a better understanding of home range, spatial habitat use, etc.	2013–2018
Spatially define habitat polygons at Dun Skipper sites (with suitable habitat and higher abundance counts) using plant community classifications and other existing resources for describing habitat attributes.	• Enable spatially defined habitat at each site, to direct actions to minimize threats.	2013–2018
Define habitat use by life history stage.	• Clarify and quantify components of habitat that are used at different life stages, and thus survival/recovery habitat for different life stages.	2013–2018
Map Dun Skipper habitat using information gained through surveys (e.g., using standard protocol for gathering habitat information).	• Maps of survival/recovery habitat	2013–2018

8 MEASURING PROGRESS

The successful implementation of recovery actions for Dun Skipper involves monitoring of populations and habitat trends through time. Dun Skipper has an annual life cycle thus population sizes may vary substantially from year to year and overall population (on a scale of decades) may vary within areas of suitable habitat. Population monitoring will allow for an indication of possible decline at a given site, changes in area of extent at a given site, and whether the number of extant populations is stable or increasing. The recovery plan will be reviewed in 5 years to assess progress and to identify additional approaches or changes that may be required to achieve recovery.

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution goal and recovery objectives. Performance measures are listed below for each objective.

Measurables for Objective 1:

- Spatial mapping of potential Dun Skipper habitat within its B.C. range is completed by 2016.
- Identification and inventory of 5% of potential habitat within the species' range is completed each year.

Measurables for Objective 2:

- Habitat protection plan, including stewardship recommendations, developed for known Dun Skipper locations by 2016.
- Dun Skipper has been recommended for listing as a species at risk under the provincial *Forest and Range Practices Act* and the *Oil and Gas Activities Act* by 2016.
- Stewardship agreements and/or covenants for 25% of known Dun Skipper sites have been established on local government/private lands by 2019.

Measurables for Objective 3:

- Development of management practice guidelines for Dun Skipper that are specific to the threats of a site for each landowner or land manager have been drafted by 2016.
- Impact of the main threats to the Dun Skipper sites have been addressed and mitigation initiated by 2016.

Measurable for Objective 4:

- Studies addressing knowledge gaps have been initiated by 2016. Specifically host plant(s), threats to site(s) from natural succession, and invasive species.

9 EFFECTS ON OTHER SPECIES

In addition to Dun Skipper, approximately 379 provincially listed (Red- or Blue-listed) species at risk inhabit the coastal lowlands of southeastern Vancouver Island and the lower Fraser Valley (B.C. Conservation Data Centre 2013); more than 115 of these species have been assessed by COSEWIC (COSEWIC 2013; B.C. Conservation Data Centre 2013).

Coordinated, ecosystem-based approaches are needed to ensure Dun Skipper recovery activities are compatible with recovery activities for other species and ecosystems within its range. Stewardship activities that result in protection or public awareness of the conservation values of Dun Skipper habitat are expected to benefit all wild native species that use these ecosystems. The protection and/or suitable management of key areas will help to restore these ecosystems over the long term. There are no negative impacts anticipated as a result of recovery efforts for this species.

Survey and habitat assessments for Dun Skipper may increase knowledge about other butterfly species at risk within similar habitats and overlapping geographic range including Taylor's Checkerspot (*Euphydryas editha taylori*) (SARA-listed Endangered 2012). This species occurs in similar habitats on Denman Island.

The lowland ecosystems of the Lower Mainland and southern Vancouver Island are overall at risk from urban and rural development, fragmentation, and ecological changes from introduced species. Dun Skipper habitats are important for many species, including additional at-risk arthropods. These ecosystems would benefit from a detailed evaluation of habitat quality and threats facing them from human activities, and habitat work for Dun Skipper will benefit this ecosystem as a whole.

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Appendix 1. IUCN threats to each biological population.

Population	CDC [a] occurrence name	1.1	1.2	1.3	2.1	2.2	3.2	4.1	4.2	7.1	7.3	8.1	8.2	9.3	9.4	10.2	11.2	11.4
Number of populations affected by threat		**4**	**1**	**1**	**1**	**1**	**1**	**8**	**4**	**25**	**20**	**25**	**25**	**25**	**1**	**1**	**25**	**1**
1	Cowichan Station (Vancouver Island)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
2	Mill Bay, Malahat Ridge (Vancouver Island)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
3	Malahat, Colpman and van Home Creeks; Spectacle Lake (Vancouver Island)	1	0	0	0	0	0	1	0	1	1	1	1	1	0	0	1	0
4	Mount Tzuhalem; Maple Bay (Vancouver Island)	0	0	0	0	0	0	1	0	1	1	1	1	1	0	0	1	0
5	Cobble Hill (Vancouver Island)	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
6	Nanaimo River (Vancouver Island)	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	1	0
7	Port Alberni, northeast of (Vancouver Island)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
8	Mount Currie (Mainland)	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
9	Shawnigan Lake, west of (Vancouver Island)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
10	Big Sicker Mountain; Little Sicker Mountain; Mount Prevost; Somenos (Vancouver Island)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
11	Powell River (Sunshine Coast, mainland)	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	1	0
12	Koksilah River (Vancouver	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	1	0

Population	CDC [a] occurrence name	1.1	1.2	1.3	2.1	2.2	3.2	4.1	4.2	7.1	7.3	8.1	8.2	9.3	9.4	10.2	11.2	11.4
Number of populations affected by threat		**4**	**1**	**1**	**1**	**1**	**1**	**8**	**4**	**25**	**20**	**25**	**25**	**25**	**1**	**1**	**25**	**1**
	Island)																	
13	Colquitz; Francis/ King Park and Thetis Lake Park (Vancouver Island)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
14	Wellington (Vancouver Island)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
15	Goldstream (Vancouver Island)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
16	Boston Bar (lower Fraser Valley)	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	1	0
17	Dog Mountain (lower Fraser Valley)	0	0	0	0	0	0	1	0	1	1	1	1	1	0	0	1	0
18	Denman Island (northern Gulf Islands)	1	0	0	1	1	0	0	0	1	1	1	1	1	0	0	1	0
19	Salt Spring Island; southeast (southern Gulf Islands)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
20	Burns Bog (Lower Mainland)	0	1	0	0	0	0	1	1	1	0	1	1	1	1	1	1	1
21	Hornby Island (northern Gulf Islands)	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	1	0
22	Morris Lake, west of (Lower Fraser Valley)	0	0	1	0	0	0	1	1	1	1	1	1	1	0	0	1	0
23	Soowahlie Indian Reserve 14 (lower Fraser Valley)	0	0	0	0	0	1	0	0	1	0	1	1	1	0	0	1	0
24	Yale (lower Fraser Valley)	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	1	0
25	Lytton, south of (lower Fraser Valley)	0	0	0	0	0	0	1	0	1	1	1	1	1	0	0	1	0

[a] CDC = B.C. Conservation Data Centre.