

# Recovery Strategy for the Cliff Paintbrush (*Castilleja rupicola*) in Canada

## Cliff Paintbrush



2017



Government  
of Canada

Gouvernement  
du Canada

Canada

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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](http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1)<sup>1</sup>.

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<sup>1</sup> <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

# RECOVERY STRATEGY FOR THE CLIFF PAINTBRUSH (*Castilleja rupicola*) 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 Strategy for Cliff Paintbrush (Castilleja rupicola) 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 Cliff Paintbrush in Canada consists of two parts:

Part 1 – Federal Addition to the *Recovery Strategy for Cliff Paintbrush (Castilleja rupicola) in British Columbia* prepared by Environment and Climate Change Canada.

Part 2 – *Recovery Strategy for Cliff Paintbrush (Castilleja rupicola) in British Columbia*, prepared by the Cliff Paintbrush Recovery Team for the British Columbia Ministry of Environment.

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Part 2 – *Recovery Strategy for Cliff Paintbrush (Castilleja rupicola) in British Columbia*, prepared by the Cliff Paintbrush Recovery Team for the British Columbia Ministry of Environment.

**Part 1 – Federal Addition to the *Recovery Strategy for Cliff Paintbrush* (*Castilleja rupicola*) 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 \(1996\)](#)<sup>2</sup> 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 Species at Risk Public Registry.

The Minister of Environment and Climate Change is the competent minister under SARA for the Cliff Paintbrush 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 as per section 39(1) of SARA. SARA section 44 allows the Minister to adopt all or part of an existing plan for the 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 strategy for the Cliff Paintbrush (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 Cliff Paintbrush 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.

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area<sup>3</sup> be described

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

<sup>3</sup> 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*

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.

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*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 Strategy for Cliff Paintbrush (Castilleja rupicola) in British Columbia* (Part 2 of this document, referred to henceforth as “the provincial recovery strategy”) and/or to provide updated or additional information.

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. The section “Existing and Recommended Approaches to Habitat Protection”, and other statements in the provincial recovery strategy referring to protection of survival/recovery habitat may not directly correspond to federal requirements. 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.

The provincial recovery strategy for Cliff Paintbrush contains a short statement on socio-economic considerations. As a socio-economic analysis is not required under Section 41(1) of SARA, the “Socio-economic Considerations” section of the provincial recovery strategy is not considered part of the federal recovery strategy for this species.

### 1. Species Status Information

This section replaces the species status summary for Cliff Paintbrush (Table 2 in the provincial recovery strategy).

Legal Status: SARA Schedule 1 (Threatened) (2006)

**Table 1.** Conservation Status for Cliff Paintbrush (NatureServe 2014; B.C. Conservation Framework 2014).

| Global (G) Rank* | National (N) Rank                  | Sub-national (S) Rank                                                                               | COSEWIC Designation | B.C. List | B.C. Conservation Framework        |
|------------------|------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------|-----------|------------------------------------|
| G3G4             | Canada (N3),<br>United States (N3) | <b>Canada:</b><br>British Columbia (S3)<br><b>United States:</b><br>Oregon (S3)<br>Washington (SNR) | Threatened (2005)   | Blue      | Highest priority: 3 under goal 1** |

\* Rank 1-critically imperiled; 2-imperiled, 3-vulnerable to extirpation or extinction; 4-apparently secure; 5-secure; H-possibly extirpated; NR-status not ranked

\*\* 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

## 2. Population and Distribution

This section replaces the information summary for known records of Cliff Paintbrush in British Columbia (Table 1 in the provincial recovery strategy).

The updated information summary below (Table 2) describes the distribution and abundance of recorded populations<sup>4</sup> in Canada, all occurring at high-elevation sites of the Chilliwack and Skagit River drainages in the Cascade Range of southwestern B.C. Excepting the additional Mount Outram record (Population #16), all population numbers in this section align with those provided in the provincial recovery strategy. The Mount Outram population was observed in 2006 and 2008 (B.C. Conservation Data Centre 2014); the 2008 survey estimated 120 plants. The addition of the Mount Outram record increases the estimated total population in Canada from 250 to approximately 370 plants.

Of the 16 recorded populations, 13 are considered extant, two are historical records, and one is of unknown status. Populations #1 and #2 (historical status) have not been observed in over 100 years and may be extirpated. Population #4 (unknown status) was not rediscovered during surveys in 2003. An additional subpopulation reported from Cheam Peak in 2007 (Population #3, subpopulation 2) is also of unknown status, requiring verification of location and extent of occurrence.

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<sup>4</sup> "Populations" are characterized as being separated by >1 km, and "sub-populations" represent records of individuals, or patches of individuals, that are within 1 km of each other unless otherwise noted.

**Table 2.** Summary of Cliff Paintbrush populations in British Columbia, Canada. Location, last observation (Last Obs.), elevation, abundance, and status are shown for each population (Popn) and subpopulation (subpopn), as appropriate.

| Popn | Location                                                          | Last Obs. | Elevation   | Abundance                                  | Status <sup>5</sup>      |
|------|-------------------------------------------------------------------|-----------|-------------|--------------------------------------------|--------------------------|
| 1    | Tomyhoi Peak                                                      | 1901      | unknown     | unknown                                    | Historical               |
| 2    | Mt. Brunswick - Coast Mtn. Range                                  | 1912      | unknown     | unknown                                    | Historical               |
| 3    | Cheam Peak (subpopn. 1)                                           | 2006      | 1829-2100 m | >20 plants                                 | Extant                   |
|      | Cheam Peak (subpopn. 2)                                           | 2007      | 2050 m      | "several plants in bloom"                  | Unknown (Unverified)     |
| 4    | Finlayson Peak, Skagit Valley Provincial Park (SVPP) (subpopn. 1) | 1975      | 2150-2200 m | "few plants"                               | Unknown (Failed to find) |
|      | Whitworth Peak, SVPP(subpopn. 2)                                  | 1988      | 2150-2200 m | "few plants"                               | Unknown (Failed to find) |
|      | Whitworth Peak South (Unnamed mountain), SVPP (subpopn. 3)        | 1988      | 2150-2200 m | unknown                                    | Unknown (Failed to find) |
| 5    | Mount Lindeman, Chilliwack Lake Provincial Park (CLPP)            | 1984      | 1981 m      | "few plants"                               | Extant                   |
| 6    | Marmot Mountain, SVPP                                             | 2003      | 2020-2032 m | 1 plant/ 1 m <sup>2</sup>                  | Extant                   |
| 7    | Mt. Brice, SVPP                                                   | 2003      | 2120-2167 m | 3 plants/ 5 m <sup>2</sup>                 | Extant                   |
| 8    | Mt. Rideout (Silvertip Mountain)                                  | 2003      | 2150-2180 m | 2 plants/ 2 m <sup>2</sup>                 | Extant                   |
| 9    | Klesilkwa Mountain                                                | 1992      | 1950 m      | "few plants"                               | Extant                   |
| 10   | Church Mountain                                                   | 1984      | unknown     | "few plants"                               | Extant                   |
| 11   | Thompson Peak                                                     | 1984      | >2000 m     | "few plants"                               | Extant                   |
| 12   | Mt. Liumchen, Liumchen Ecological Reserve                         | 1984      | 1700-1800 m | "few plants"                               | Extant                   |
| 13   | Mt. McGuire                                                       | 1999      | 1600-2000 m | "locally abundant"                         | Extant                   |
| 14   | Foley Peak                                                        | 1999      | 1800-2200 m | "few plants"                               | Extant                   |
| 15   | MacDonald Peak, CLPP                                              | 2006      | 1848-1878 m | small patch (30 x 30 cm), scattered plants | Extant                   |
| 16   | Mount Outram                                                      | 2010      | 1990-2100 m | 120 plants                                 | Extant                   |

<sup>5</sup> As per Natureserve (2014) the status of Cliff Paintbrush population/subpopulations is as follows: Extant – Population has been recently verified (<40 years); Historical – Recent information verifying the continued existence of the population is lacking (i.e. records are >40 years); Unknown (failed to find) – The population has not been found despite a search by an experienced observer but appropriate habitat still remains at the site.

### 3. Population and Distribution Objectives

This section replaces the “Recovery Goal” section in the provincial recovery strategy.

Environment and Climate Change Canada has determined the Population and Distribution Objective for Cliff Paintbrush in Canada is:

*To maintain the abundance of Cliff Paintbrush at all known locations throughout its range in Canada, which includes any new populations and/or subpopulations that are identified.*

#### Rationale:

Abundance and distribution information for this species shows thirteen extant populations restricted to high-elevation sites of the Chilliwack and Skagit River drainages in the Cascade Range of southwestern B.C. Current knowledge suggests that Cliff Paintbrush is naturally rare in B.C. with an estimated population of 370 plants (COSEWIC 2005, Conservation Data Centre 2014). One population of “unknown” status was not reconfirmed during surveys conducted in 2003. Targeted surveys at this location for this population (#4) are recommended to determine whether it is still extant. An additional subpopulation reported from Cheam Peak in 2007 (Population #3, subpopulation 2) is also of unknown status, requiring verification of location and extent of occurrence. As Cliff Paintbrush habitat is often inaccessible, it is possible that additional populations exist and may be discovered with a continued survey effort. Cliff Paintbrush has a restricted geographic range and is naturally rare on the landscape and will likely always remain rare within Canada. With only 13 known extant populations in Canada, it is important that all known populations including any re-confirmed historical, and/or newly discovered sites (i.e., plants/populations that may be found during future inventories) are maintained.

### 4. Critical Habitat

This section replaces the “Identification of the species’ critical habitat” section in the provincial recovery strategy.

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. A primary consideration in the identification of critical habitat is the amount, quality, and locations of habitat needed to achieve the population and distribution objectives.

The 2009 provincial recovery strategy for Cliff Paintbrush noted that critical habitat could not be identified at that time (nor is it required in the provincial process), owing to a lack of information on habitat and area requirements for the species. Environment and Climate Change Canada has reviewed the available information and concluded that sufficient information is available to identify critical habitat at this time. More precise

boundaries may be mapped, and additional critical habitat may be added in the future if additional information supports the inclusion of areas beyond those currently identified.

Critical habitat can only be partially identified at this time. Critical habitat cannot yet be identified for population #4 (i.e., all three subpopulations at Finlayson Peak, Whitworth Peak, and Whitworth Peak south) owing to unknown “extant” status and location uncertainty. For similar reasons, critical habitat cannot yet be completely identified for Cheam Peak (i.e. Population #3, subpopulation 2). A schedule of studies (Section 6.2) outlines the activities required to identify additional critical habitat necessary to support the population and distribution objectives for the species. The identification of critical habitat will be updated when the information becomes available, either in a revised recovery strategy or action plan(s).

#### **4.1 Identification of the Species’ Critical Habitat**

##### **Geospatial location of areas containing critical habitat**

Cliff Paintbrush is found at high elevations within the Chilliwack and Skagit River drainages of southwestern British Columbia. Critical habitat is identified for thirteen extant populations of Cliff Paintbrush; these are linked with the population numbers provided in section 2 (and the provincial recovery plan, except for the added Mount Outram population):

- Cheam Peak (Population #3; Figure 1)
- Mount Lindeman (Population #5; Figure 2)
- Marmot Mountain (Population #6; Figure 3)
- Mount Brice (Population #7; Figure 4)
- Mount Rideout (Population #8; Figure 5),
- Klesilkwa Mountain (Population #9; Figure 6)
- Church Mountain (Population #10; Figure 7),
- Thompson Peak (Population #11; Figure 6)
- Liumchen Mountain (Population #12; Figure 7),
- Mount McGuire (Population #13; Figure 7)
- Foley Peak (Population #14; Figure 1)
- MacDonald Peak (Population #15; Figure 2),
- Mount Outram (Population #16; Figure 8),

The area containing critical habitat for Cliff Paintbrush is based on three additive components: (1) the area occupied by individual plants or patches of plants, including the associated potential location error from Global Positioning System (GPS) units (ranging from 5 m to 25 m uncertainty distance); (2) a 50 m (i.e., critical function zone distance<sup>6</sup>) to encompass immediately adjacent areas; and, (3) the entire portion of

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<sup>6</sup> Critical function zone distance has been defined as the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g., critical light, moisture, humidity levels necessary for survival). Existing research provides a logical basis for applying a minimum critical function zone distance of 50 m for all rare plant species occurrences (see: [http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6A845288-1#\\_Toc285808423](http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6A845288-1#_Toc285808423)).

distinct ecological features<sup>7</sup> which are associated with, and are integral to, Cliff Paintbrush individual plants or patches of plants. Distinct ecological features for Cliff Paintbrush are the sparsely vegetated rocky slopes on which they occur.

### **Biophysical attributes of critical habitat**

Within the areas identified as containing critical habitat, critical habitat is identified wherever the following biophysical attributes occur:

- sparse vegetation cover (not forested)
- above 1600 m in elevation
- exposed habitats with gravelly or stony soils and/or crevices, such as:
  - rocky ridges, outcrops;
  - dry to mesic cliffs;
  - exposed slopes;
  - scree or talus slopes.

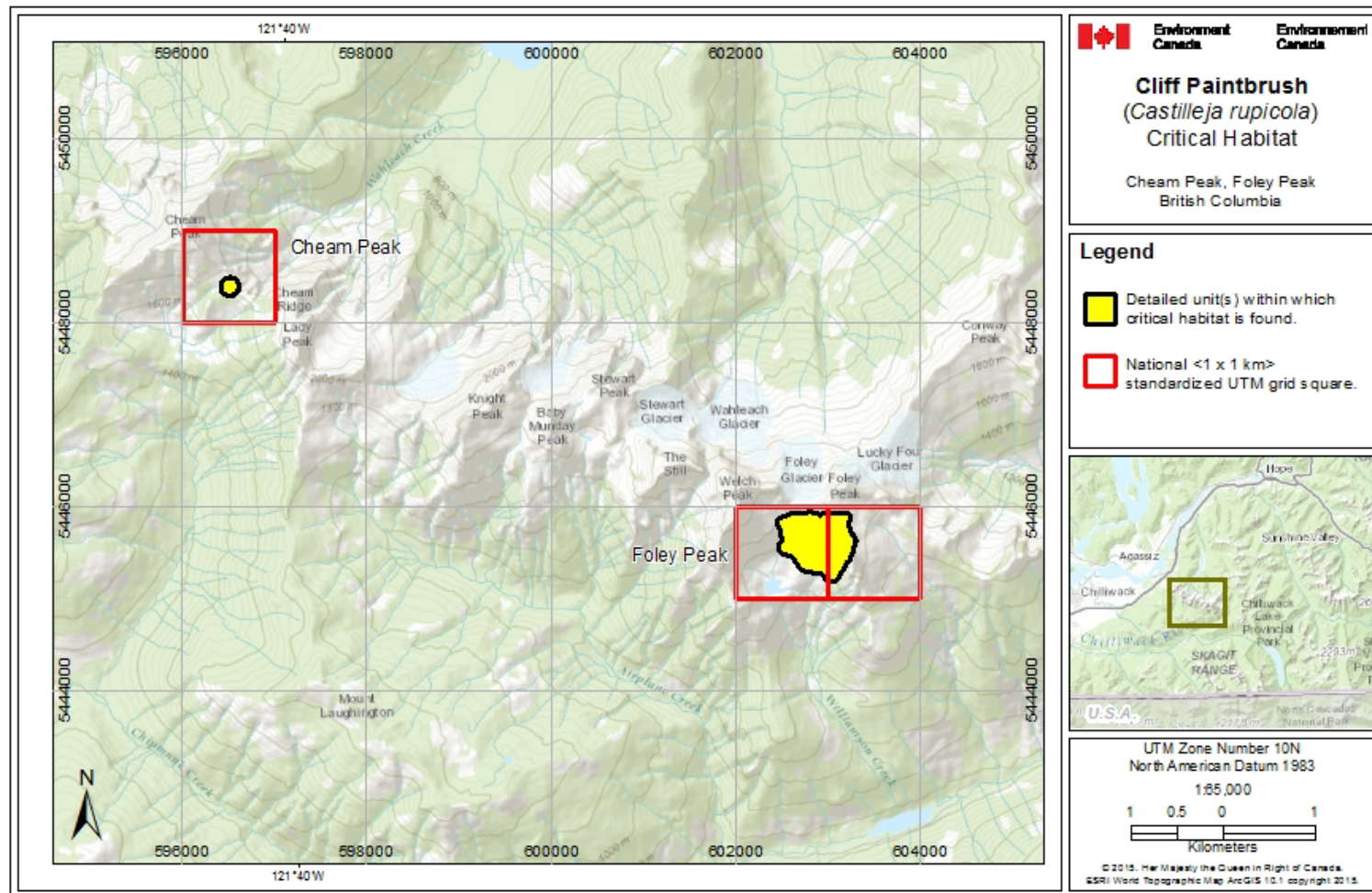
A critical function zone of 50 m around any extant individual plant or patch of plants is also identified as critical habitat, even in portions of habitat where the biophysical attributes (as described above) are not met.

The areas containing critical habitat for Cliff Paintbrush (totalling 687.6 ha) are presented in Figures 1-8. Critical habitat for Cliff Paintbrush in Canada occurs within the shaded yellow polygon(s) (unit(s)) shown on each map, where the biophysical attributes described in the above section are present. Within these polygons, unsuitable habitat such as forested and/or dense-shrub communities, and elevations below 1600 m<sup>8</sup>, are not identified as critical habitat, unless they occur within the 50 m critical function zone of individual plant(s) (as described above). Existing anthropogenic features (e.g., active roads or trails) do not possess the biophysical attributes required by Cliff Paintbrush and they are not 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.

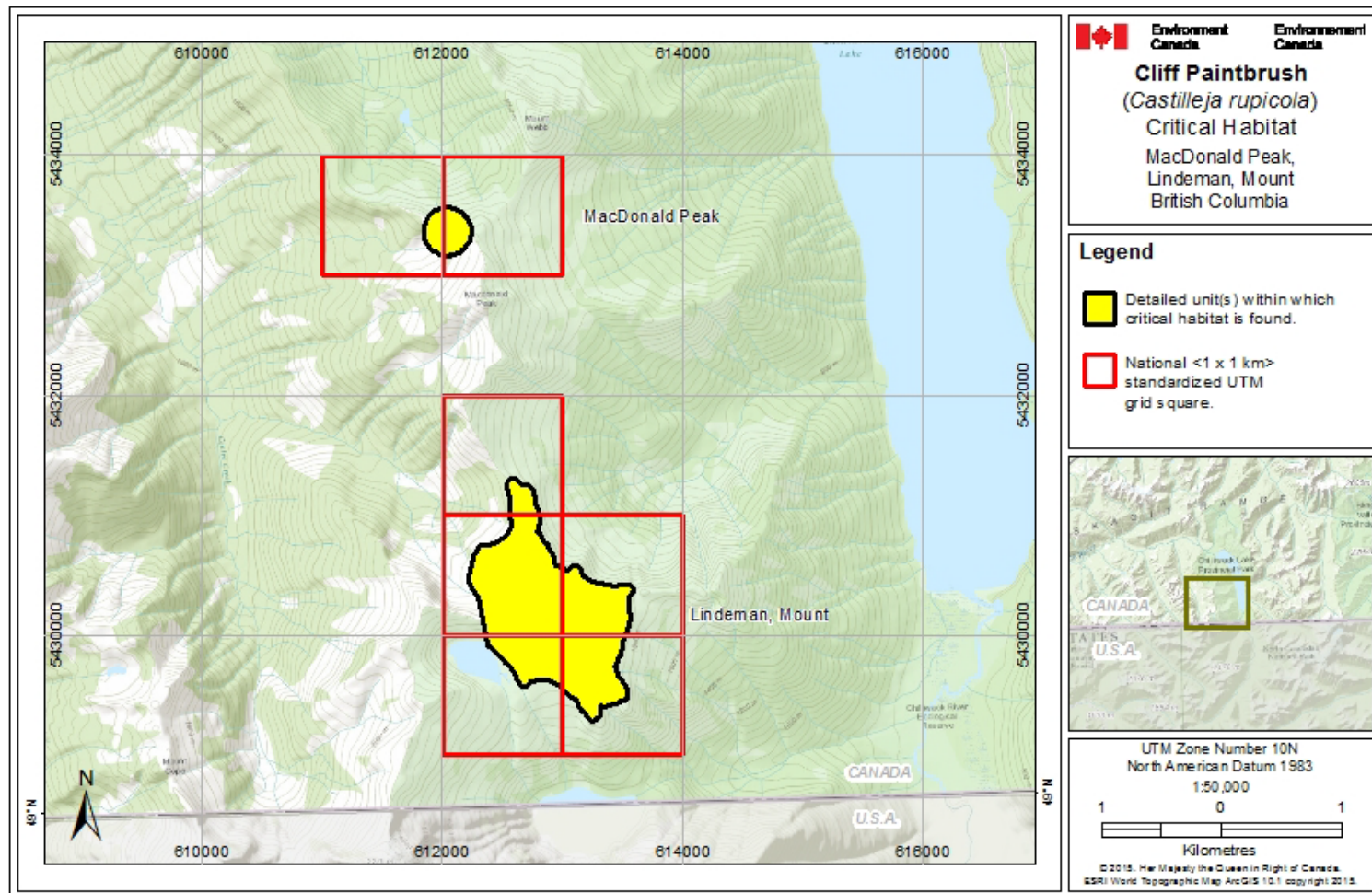
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<sup>7</sup> "Distinct" ecological features are here referred to as those that are distinguishable at a scale relevant to the critical habitat identification (through use of detailed ecosystem mapping or aerial photos), which, at that scale, appear as ecologically contiguous features with relatively distinct boundaries (e.g., cliffs, banks, or slopes, drainage basins, seepage plateaus, or distinct vegetation assemblages), and which comprise the context for a species occurrence. Cliff Paintbrush has been identified at a "site" level scale (1:15,000 scale of reference).

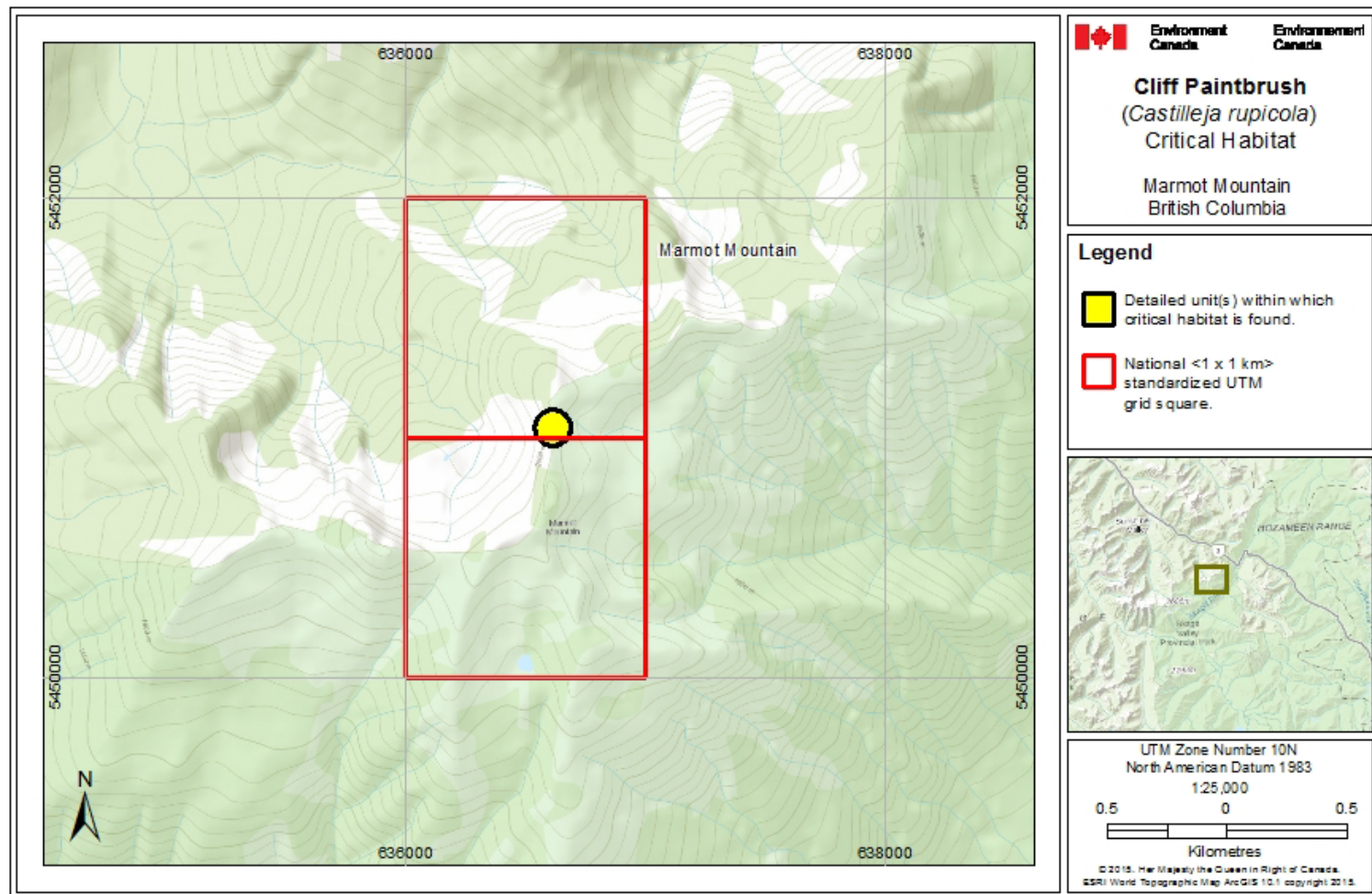
<sup>8</sup> Cliff Paintbrush has been recorded from approximately 1600 m to 2300 m in elevation, in the subalpine to alpine vegetation zones.



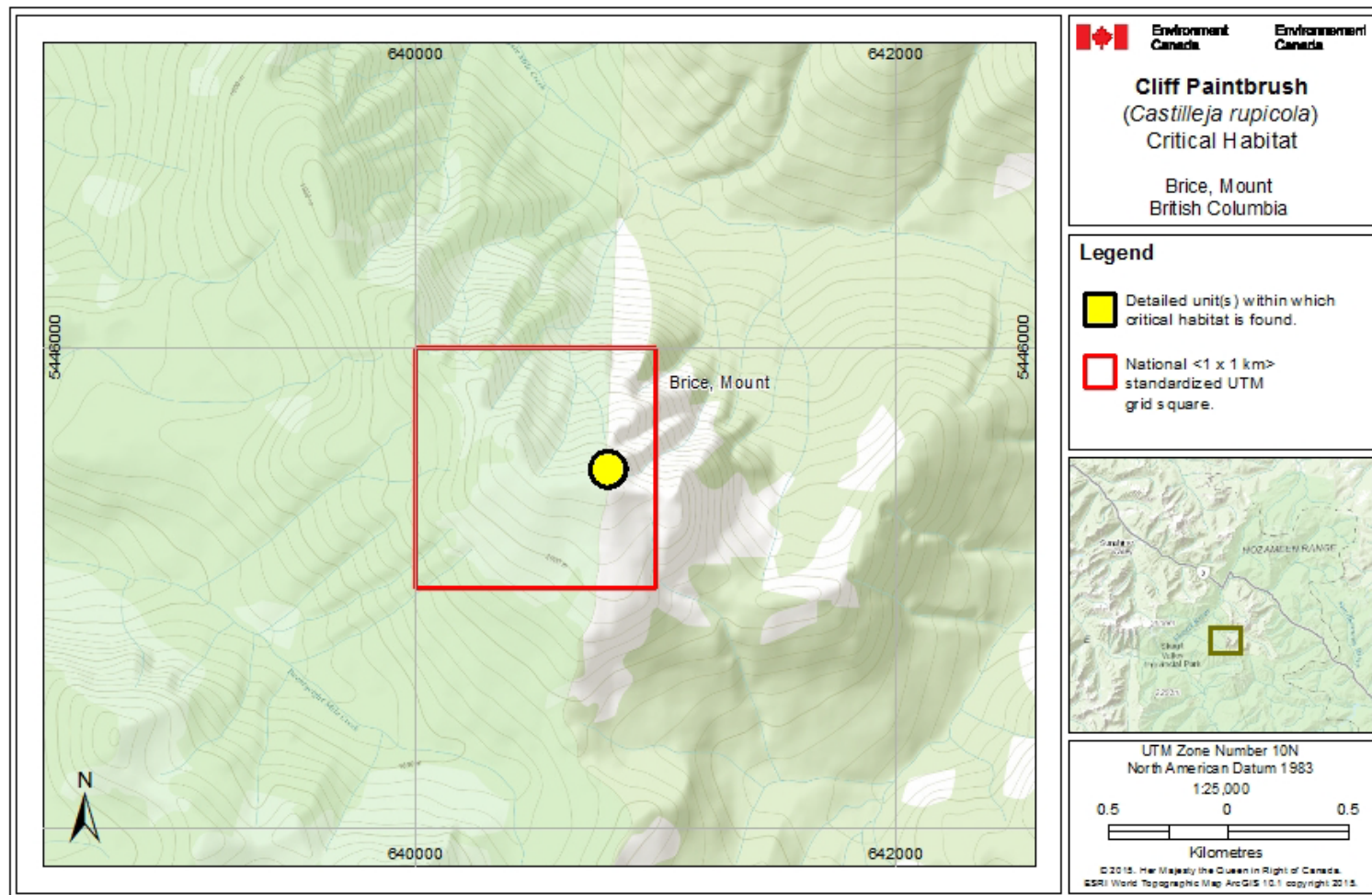
**Figure 1.** Critical habitat for Cliff Paintbrush in Canada is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 4.1 are met. The detailed polygons show the area within which critical habitat is found at Cheam Peak (Population #3; 3.1 ha), and Foley Peak (Population #14; 47.1 ha). The 1 km x 1 km UTM grid overlay (red outline) shown on this figure is part of a standardized national grid system used to indicate the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.



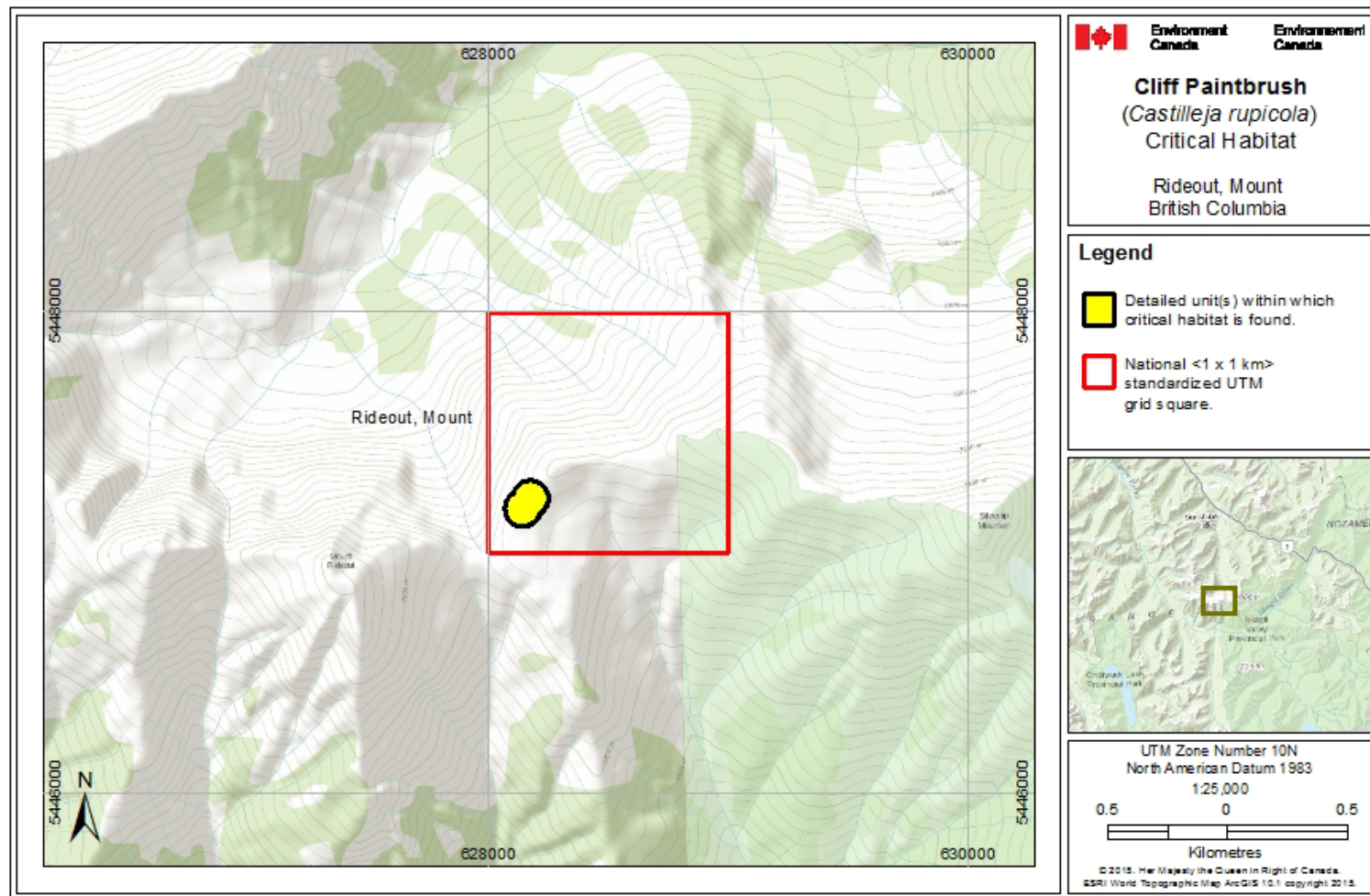
**Figure 2.** Critical habitat for Cliff Paintbrush in Canada is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 4.1 are met. The detailed polygons show the area within which critical habitat is found at MacDonal Peak (Population #15; 12.5 ha) and Mount Lindeman (Population #5; 141.4 ha). The 1 km x 1 km UTM grid overlay (red outline) shown on this figure is part of a standardized national grid system used to indicate the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.



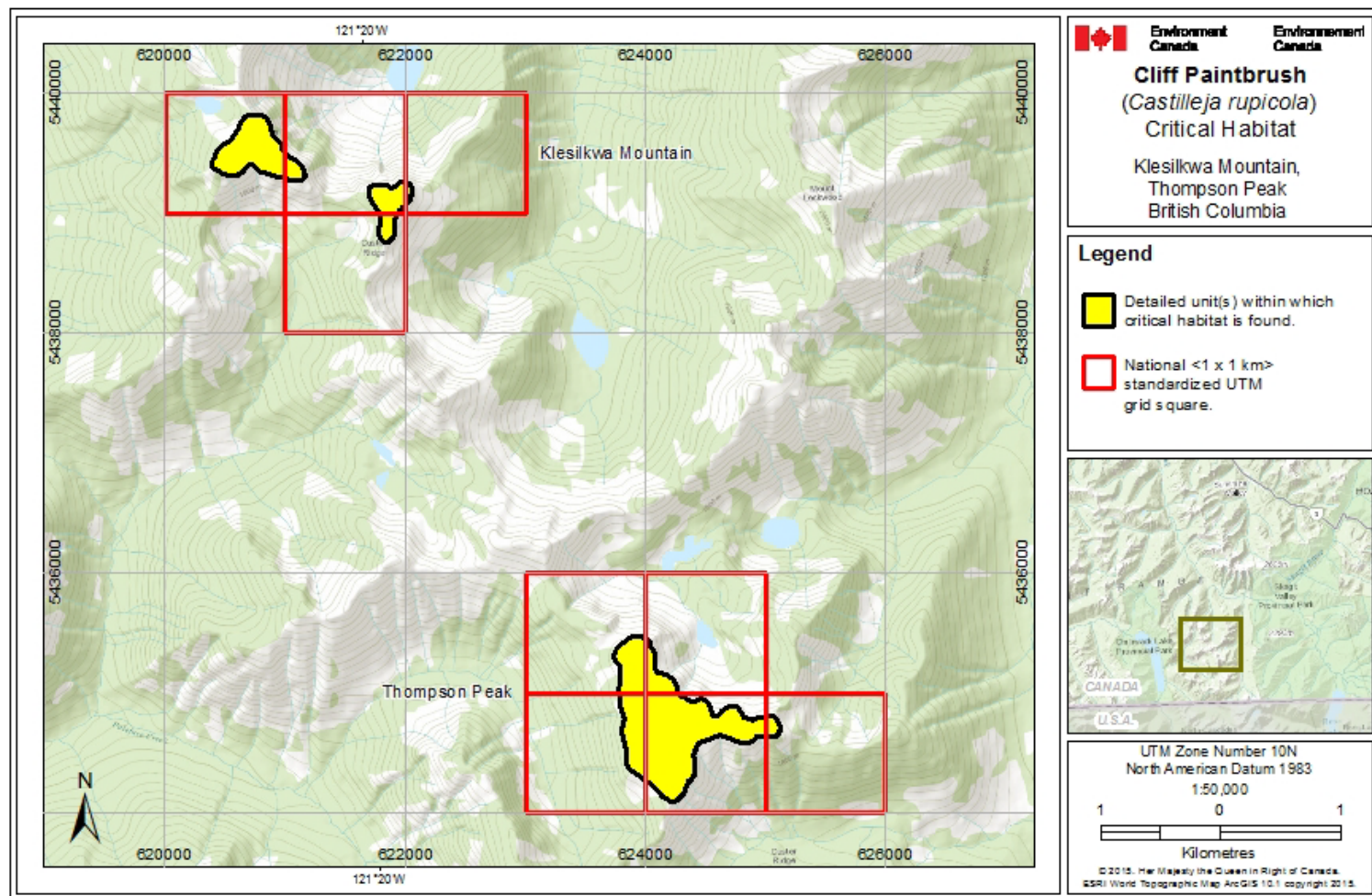
**Figure 3.** Critical habitat for Cliff Paintbrush in Canada is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 4.1 are met. The detailed polygon shows the area within which critical habitat is found at Marmot Mountain (Population #6; 1.8 ha). The 1 km x 1 km UTM grid overlay (red outline) shown on this figure is part of a standardized national grid system used to indicate the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.



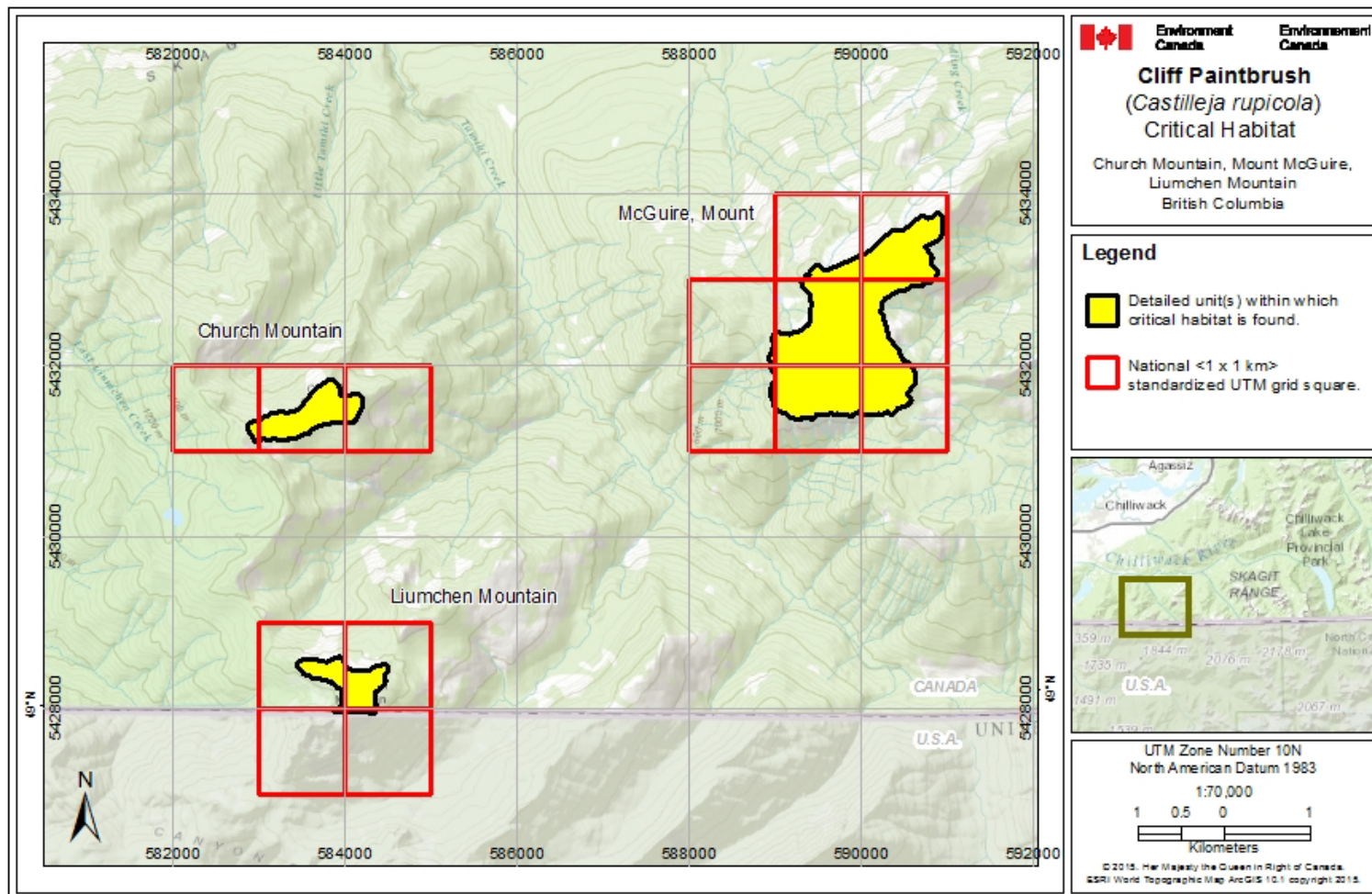
**Figure 4.** Critical habitat for Cliff Paintbrush in Canada is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 4.1 are met. The detailed polygon shows the area within which critical habitat is found at Mount Brice (Population #7; 1.8 ha). The 1 km x 1 km UTM grid overlay (red outline) shown on this figure is part of a standardized national grid system used to indicate the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.



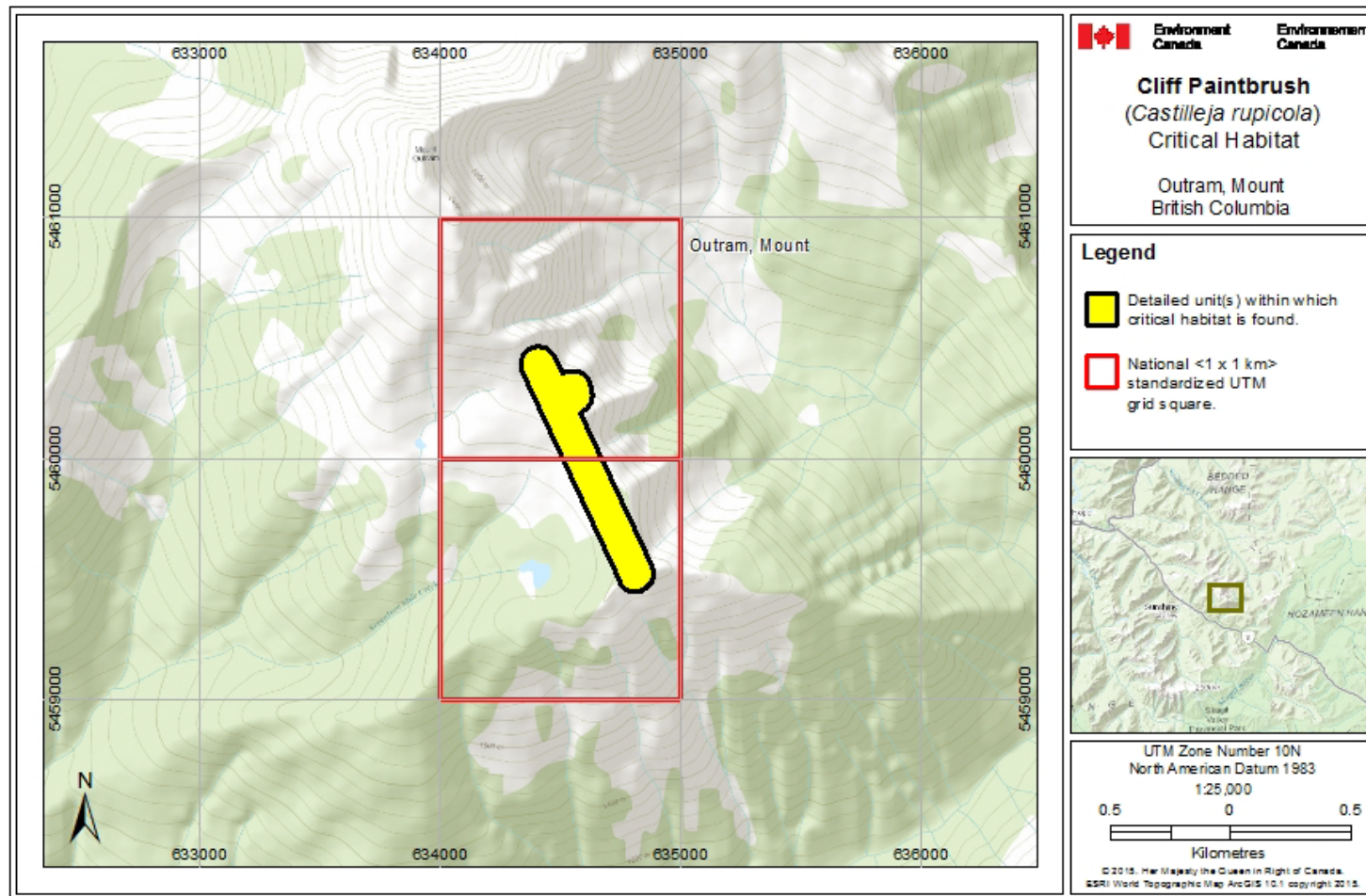
**Figure 5.** Critical habitat for Cliff Paintbrush in Canada is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 4.1 are met. The detailed polygon shows the area within which critical habitat is found at Mount Rideout (Population #8; 2.5 ha). The 1 km x 1 km UTM grid overlay (red outline) shown on this figure is part of a standardized national grid system used to indicate 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 Cliff Paintbrush in Canada is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 4.1 are met. The detailed polygons show the area within which critical habitat is found at Klesilkwa Mountain (Population #9; 33.3 ha), and Thompson Peak (Population #11; 77.6 ha). The 1 km x 1 km UTM grid overlay (red outline) shown on this figure is part of a standardized national grid system used to indicate 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 Cliff Paintbrush in Canada is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 4.1 are met. The detailed polygons show the area within which critical habitat is found at Church Mountain (Population #10; 45.2 ha), Liumchen Mountain (Population #12; 34.9 ha), and Mount McGuire (Population #13; 268.9 ha). The 1 km x 1 km UTM grid overlay (red outline) shown on this figure is part of a standardized national grid system used to indicate 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 Cliff Paintbrush in Canada is represented by the yellow shaded polygons (units) where the criteria and methodology set out in Section 4.1 are met. The detailed polygon shows the area within which critical habitat is found at Mount Outram (Population #16; 17.4ha). The 1 km x 1 km UTM grid overlay (red outline) shown on this figure is part of a standardized national grid system used to indicate the general geographic area within which critical habitat is found in Canada. Areas outside of the shaded yellow polygons do not contain critical habitat.

## 4.2 Schedule of Studies to Identify Critical Habitat

This section replaces the “Recommended schedule of studies to identify critical habitat” section in the provincial recovery strategy.

The following schedule of studies (Table 3) outlines the activity required to complete the identification of critical habitat for Cliff Paintbrush; population numbers align with those provided in section 4.

**Table 3.** Schedule of Studies to Identify Critical Habitat for Cliff Paintbrush.

| Description of activity                                                                                                                                                                                                                                         | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Timeline  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Conduct targeted, comprehensive surveys in areas of suitable habitat within the proximity of the observations of Cliff Paintbrush at Population #4 and Population #3 (subpopulation 2) to determine if these records are extant and to identify their location. | Critical habitat could not be identified for one population (comprised by three subpopulations) and one additional subpopulation owing to their “unknown” status, and/or the high location uncertainty associated with records. Recent, comprehensive, targeted surveys are lacking. Without further information on the status and location of these populations, it is unknown whether there is sufficient critical habitat identified for Cliff Paintbrush. | 2017-2022 |

## 4.3 Activities Likely to Result in 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.

The provincial recovery strategy indicates that Cliff Paintbrush is not currently exposed to any specific threats because of their relatively isolated, high subalpine and alpine locations. Activities corresponding with potential future threats include those related to resource extraction (e.g., mining or gravel extraction, and/or road-building for resource extraction including logging), and recreational use (e.g., development of hiking trails), however at this time there are no known activities occurring that are likely to result in the destruction of critical habitat.

## 5. Measuring Progress

The performance indicator presented below provides a way to define and measure progress towards achieving the population and distribution goal set out in the provincial recovery plan:

- The population size and abundance of Cliff Paintbrush has been maintained (or is naturally increasing) at all known locations, including any new discovered locations, throughout its range in Canada.

In addition to this performance indicator, the performance measures set out in the provincial recovery plan (Table 3) will provide pertinent information to assess interim progress towards the ultimate population and distribution goal.

## 6. Statement on Action Plans

This section replaces the “Statement on Action Plans” section in the provincial recovery strategy.

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

## 7. Effects on the Environment and Other Species

This section replaces the “Effects on Other Species” section in the provincial recovery strategy.

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\*](#)<sup>9</sup>. 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<sup>10</sup> (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 recovery measures proposed are not expected to negatively affect any other species. It is likely that efforts to conserve Cliff Paintbrush will indirectly benefit other species in the area. Also, surveys to confirm existing and potential new populations of Cliff Paintbrush may have a positive effect by identifying additional locations for other possible species at risk in the area which are listed in Appendix A of the provincial

<sup>9</sup> [www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1](http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1)

<sup>10</sup> [www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1](http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1)

recovery strategy. Recovery planning activities for Cliff Paintbrush will be implemented with consideration for all co-occurring species at risk, such that there are no negative impacts to these species or their habitats.

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**Part 2 – *Recovery Strategy for Cliff Paintbrush (Castilleja  
rupicola) in British Columbia* prepared by the Cliff Paintbrush  
Recovery Team for the British Columbia Ministry of  
Environment.**

## Recovery Strategy for cliff paintbrush (*Castilleja rupicola*) in British Columbia



Prepared by the Cliff Paintbrush Recovery Team



Ministry of  
Environment

March 2009

## About the British Columbia Recovery Strategy Series

This series presents the recovery strategies that are prepared as advice to the province of British Columbia on the general strategic approach required to recover species at risk. The Province prepares recovery strategies to meet 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 recovery strategy?

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

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

### What's next?

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

### For more information

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

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

# **Recovery Strategy for cliff paintbrush (*Castilleja rupicola*) in British Columbia**

**Prepared by the Cliff Paintbrush Recovery Team**

**March 2009**

## **Recommended citation**

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Ross Vennesland

## **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>>

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## Disclaimer

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

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

The responsible jurisdictions and all members of the recovery team 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 recovery team.

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

## RECOVERY TEAM MEMBERS

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Cliff Paintbrush Recovery Team

## RESPONSIBLE JURISDICTIONS

The British Columbia Ministry of Environment is responsible for producing a recovery strategy for cliff paintbrush under the *Accord for the Protection of Species at Risk in Canada*. Environment Canada's Canadian Wildlife Service participated in the preparation of this recovery strategy.

## ACKNOWLEDGEMENTS

The original strategy was prepared by Kathleen Wilkinson for the Cliff Paintbrush Recovery Team. The team would like to acknowledge the help of the following in preparing this recovery strategy: Josh Brokaw (Assistant Curator, Marion Ownbey Herbarium, Washington State University); Adolf Ceska (Botanist and Environmental Consultant, Victoria, BC); Brenda Costanzo (Plants at Risk Biologist, Ecosystems Branch, B.C. Ministry of Environment, Victoria, BC); Mark Egger (Botanist, Seattle, WA); Matt Fairbarns (Botanist and Environmental Consultant, Victoria, BC); Lisa Fox (Fraser Valley Conservancy, Abbotsford, BC); David Giblin (Herbarium Collections Manager, University of Washington, Seattle, WA); Tanya Harvey (Botanist, Eugene, OR); Ted Lea (Vegetation Ecologist, Ecosystems Branch, B.C. Ministry of Environment, Victoria, BC); Frank Lomer (Botanist and Environmental consultant, New Westminster, BC); Lucy Reiss (Species at Risk Biologist, Canadian Wildlife Service, Environment Canada, Delta, BC); Shyanne Smith (Recovery Group Implementation Co-ordinator, Garry Oak Ecosystem Recovery Team, Victoria, BC); Katrina Stipek (B.C. Conservation Data Centre, Victoria, BC); Ross Vennesland (Species at Risk Recovery Specialist, Parks Canada, Vancouver, BC); Sue Vrilakas (Botany Data Manager, Oregon Natural Heritage Information Center, Portland, OR); and Kym Welstead (Species at Risk Biologist, B.C. Ministry of Environment, Surrey, BC).

## EXECUTIVE SUMMARY

Cliff paintbrush is currently listed as Threatened under the *Species at Risk Act* and is known in Canada to be restricted to 15 populations in southwestern British Columbia including two historic records – one from the Coast Mountains and one from the Chilliwack River drainage of the Cascades Mountain Range. In 2005, the number of individuals in the province was estimated at fewer than 250 plants. Cliff paintbrush also occurs in Washington and Oregon, where it is more common and widespread.

Cliff paintbrush is a short, herbaceous perennial that occurs in rock crevices; on rocky ridges and slopes, talus, and scree at high elevations in the subalpine to primarily alpine vegetation zones. The plant is likely a facultative parasite, and likely on different host species. Cliff paintbrush is believed to be pollinated by hummingbirds and bees. Reproduction is solely by seeds, which are likely dispersed by wind, birds, and small mammals.

Potential threats to this species include resource extraction, recreational use, and climate change.

The long-term goal is to enable the persistence and maintenance of self-sustaining populations of cliff paintbrush with limited occurrence in the Cascade Mountain Range of British Columbia.

The objectives are to:

1. Confirm the presence and the population sizes at all current known locations and determine if additional populations exist in the Cascade Mountains by 2012.
2. Determine level of threat to populations by 2012 and establish mitigation measures as needed.
3. Address knowledge gaps relating to species biology, particularly reproductive success, and habitat requirements; and establish population trends through monitoring by 2013.

No critical habitat can be identified for cliff paintbrush in Canada at this time. It is expected that critical habitat will be proposed following the completion of outstanding work required to quantify specific habitat and area requirements for the species, further research on the biology of the species, and monitoring of the populations to determine population trends. Consultation with affected landowners and organizations will also be necessary.

An action plan will be completed by 2013.

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## BACKGROUND

### Species Assessment Information from COSEWIC

**Date of Assessment:** March 2005

**Common Name (population):** cliff paintbrush

**Scientific Name:** *Castilleja rupicola*

**COSEWIC Status:** Threatened

**Reason for designation:** A perennial of restricted occurrence found on cliffs, rock outcrops and ridges at high elevations. The small, fragmented populations consist of scattered individuals, likely fewer than 250 plants, which are exceptionally vulnerable to stochastic events.

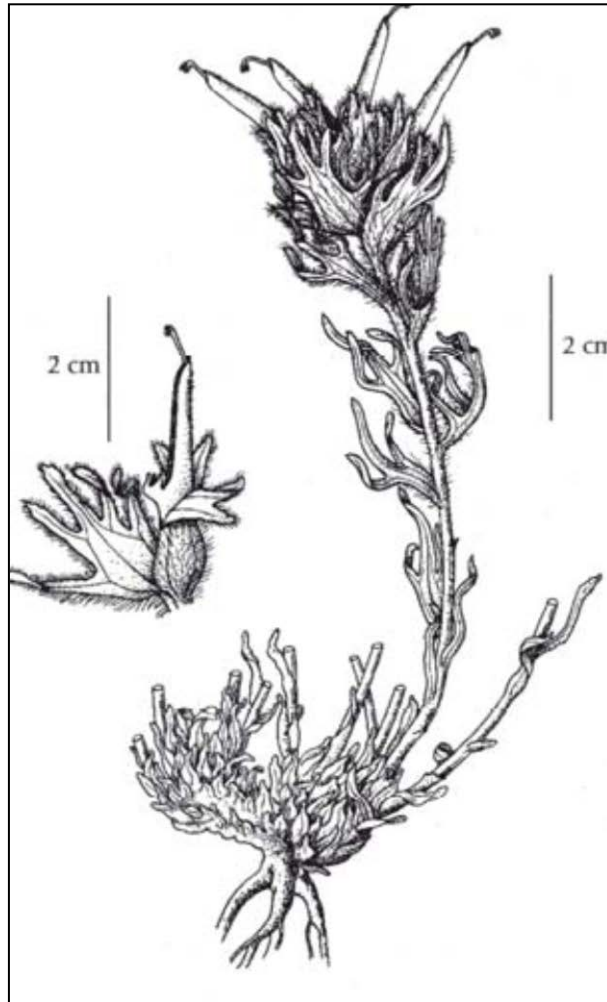
**Canadian Occurrence:** British Columbia

**COSEWIC Status History:** Designated Threatened in May 2005. Assessment is based on a new status report.

### Description of the Species

The cliff paintbrush is a multi-stemmed, herbaceous perennial, growing 10–20 cm in height from a slightly woody base (Figure 1). Each stem is unbranched and sparsely covered with long, soft, curly hairs. Leaves are alternate, and most are divided into 3–5 (sometimes 7) narrow, somewhat spreading lobes. The lower leaves are occasionally undivided. The relatively few flowers occur in compact clusters at the top of the stems. Each greenish flower has four stamens, and is 25–45 mm long, with a short-hairy beak-like upper lip that is the same length or longer than the tube at the base, and a much shorter, three-toothed and thickened lower lip. Below, the flowers are much shorter, usually deeply five-lobed bright scarlet or crimson bracts that have both short and long hairs. Each calyx is 15–25 mm long, long-hairy, with two main lobes that are subdivided into two short (1–5 mm long) blunt to sharp segments. The fruit is a capsule that contains many net-veined seeds.

Two other species of paintbrush occur in the same area, but small-flowered paintbrush (*Castilleja parviflora*) usually has purple to pinkish or white bracts that are three-lobed above the middle, rather than deeply five-lobed; and the crimson bracts of alpine paintbrush (*Castilleja rhexifolia*) are unlobed.



**Figure 1.** Illustration of cliff paintbrush. Line drawing by Elizabeth Stephen in Pojar 2000, with permission. Source: COSEWIC 2005.

## Populations and Distribution

With the exception of one historical record from British Columbia's Coast Range, the only known locations for cliff paintbrush are in the Cascade Mountains from central Oregon through Washington and into southwestern British Columbia (Figure 2).

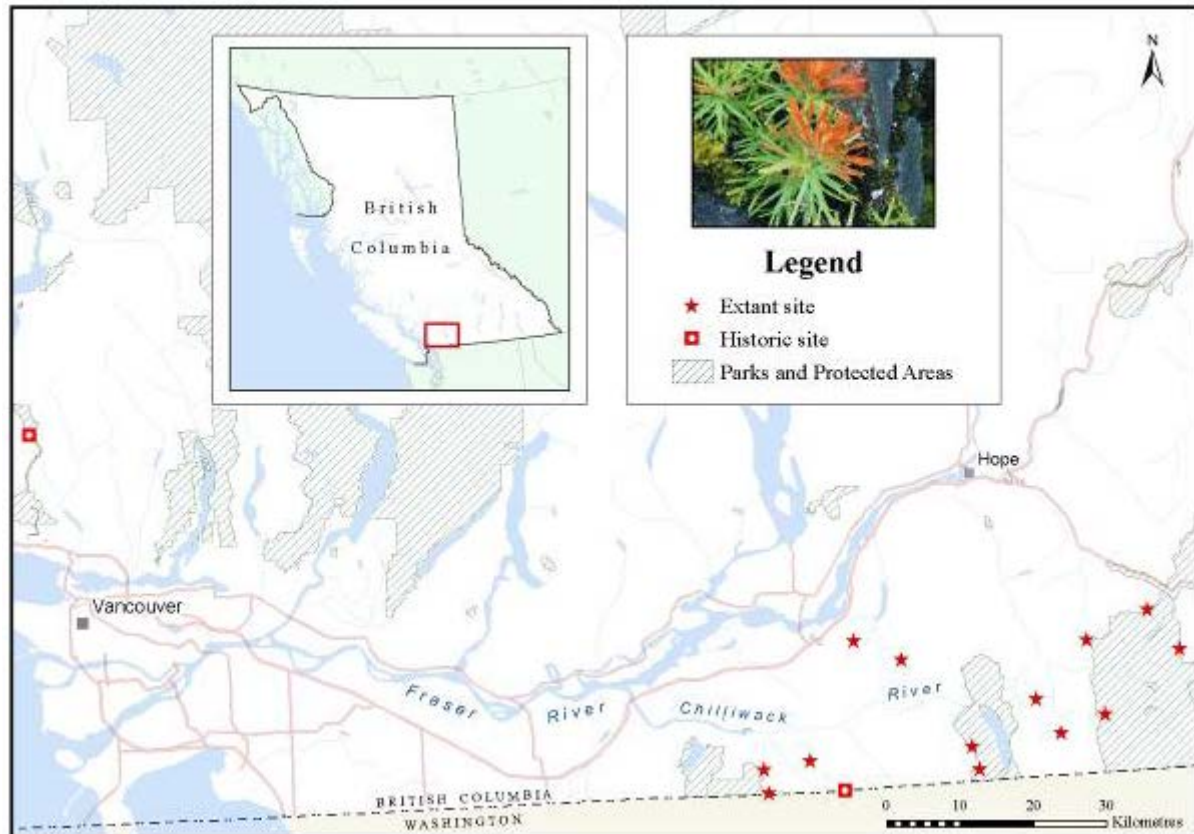
In Washington the plant is currently listed as SNR (status not yet assessed) by NatureServe (NatureServe 2008), but the species is listed as common in the western North Cascade Range (Douglas 1971; Taylor and Douglas 1995) and is considered uncommon but not rare in the state (Egger, pers. comm., 2007; Giblin, pers. comm., 2007). The plant is widely distributed in Washington, threats are minimal, and the population trend is likely stable (Egger, pers. comm. 2007; Giblin, pers. comm. 2007).



**Figure 2.** North American and global range of cliff paintbrush highlighted in grey. Source: COSEWIC 2005.

In Oregon, cliff paintbrush is more prevalent than was previously believed, there is a low level of threat, and populations appear to be stable (Vrilakas, pers. comm., 2007). The species is now considered to be of conservation concern but not currently threatened or endangered. NatureServe ranks this species in Oregon as S3 (vulnerable to extirpation or extinction; NatureServe 2008).

Approximately 15% of the global distribution of the plant occurs within Canada, all in British Columbia. Known Canadian populations are restricted to the Chilliwack and Skagit River drainages plus one historical occurrence in the Coast Mountains above Lion's Bay (Table 1; Figure 3). The latter population has not been relocated since the initial observation from 1912, and is potentially extirpated. The total extent of occurrence of extant populations in Canada was estimated at  $<1000 \text{ km}^2$  and area of occupancy at  $200\text{--}300 \text{ m}^2$ . Numbers in the province were estimated at less than 250 plants (COSEWIC 2005).



**Figure 3.** British Columbia locations for cliff paintbrush.

**Table 1.** Known records for cliff paintbrush in British Columbia.

| <b>Population number</b> | <b>Location</b>                                  | <b>Date observed</b>             | <b>Population/subpopulation numbers</b>              | <b>Habitat</b>                                                                                                            | <b>Elevation</b> | <b>Land ownership</b>           |
|--------------------------|--------------------------------------------------|----------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------|
| 1                        | Tomyhoi Peak                                     | 1901 (historical)                | Unknown                                              | Unknown                                                                                                                   | Unknown          | Unknown                         |
| 2                        | Mt. Brunswick, Coast Mtn. Range                  | 1912 (historical)                | Unknown                                              | Unknown                                                                                                                   | Unknown          | Cypress Provincial Park?        |
| 3                        | Mt. Cheam                                        | (1) 1954<br>(2) 1981<br>(3) 2006 | (1) Unknown<br>(2) Unknown<br>(3) At least 20 plants | (1) South slope; rocky, open<br>(2) Exposed outcrop crevices on mountain slope<br>(3) Exposed steep rocky slope, S-facing | 1829-2100 m      | Provincial Crown Land           |
| 4                        | Finlayson Peak, Whitworth Peak, Unnamed Mountain | (1) 1975<br>(2) 1988<br>(3) 1988 | (1) Few plants<br>(2) Few plants<br>(3) Unknown      | (1) Mountainside below peak<br>(2) SE slopes<br>(3) Rocky alpine peak and ridge                                           | 2150-2200 m      | Skagit Valley Provincial Park   |
| 5                        | Mount Lindeman                                   | 1984                             | Few plants                                           | Unknown                                                                                                                   | 1981 m           | Chilliwack Lake Provincial Park |
| 6                        | Marmot Mountain                                  | 2003                             | 1 plant/1m <sup>2</sup>                              | Sparsely vegetated moist scree, 20% slope, SW aspect<br>rocky alpine ridge                                                | 2020-2032 m      | Skagit Valley Provincial Park   |
| 7                        | Mt. Bryce                                        | 2003                             | 3 plants /5 m <sup>2</sup>                           | Sparsely vegetated rocky peak, sheltered rocky outcrops, slope 40%, NW aspect                                             | 2120-2167 m      | Skagit Valley Provincial Park   |
| 8                        | Mt. Rideout                                      | 2003                             | 2 plants /2 m <sup>2</sup>                           | Alpine scree/fine talus, slope 5%, SW aspect                                                                              | Unknown          | Provincial Crown Land           |
| 9                        | Klesilkwa Mountain                               | 1992                             | Few plants                                           | Alpine scree/fine talus, N slope                                                                                          | 1950 m           | Provincial Crown Land           |
| 10                       | Church Mountain                                  | 1984                             | Few plants                                           | Subalpine south limestone cliff                                                                                           | Unknown          | Provincial Crown Land           |
| 11                       | Thompson Peak                                    | 1984                             | Few plants                                           | Unknown                                                                                                                   | Above 2000 m     | Provincial Crown Land           |
| 12                       | Mt. Liumchen                                     | (1) 1974<br>(2) 1984             | (1) 1 plant<br>(2) Few plants                        | (1) Gravelly soil below limestone ridgetop<br>(2) Base of cliffs on SE slopes                                             | 1700–1800 m      | Provincial Crown Land           |

|    |                |                                  |                                                          |                                                                                                                                   |             |                                 |
|----|----------------|----------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------|
| 13 | Mt. McGuire    | (1) 1984<br>(2) 1997<br>(3) 1999 | (1) Few plants<br>(2) Occasional<br>(3) Locally abundant | (1) On SE slopes; in scree and at base of cliffs<br>(2) On scree slopes above treeline<br>(3) On steep rocky ridge; rock crevices | 1600-2000 m | Provincial Crown Land           |
| 14 | Foley Peak     | 1999                             | Few plants                                               | Dry, exposed, rocky alpine 40% slope; SW aspect                                                                                   | 1800-2200 m | Provincial Crown Land           |
| 15 | Macdonald Peak | 2006 – new since Status Report   | Small patch 30 × 30 cm; scattered plants                 | Granite slab cliff, rocky ledge in high subalpine, N slope                                                                        | 1848-1878 m | Chilliwack Lake Provincial Park |

Since the COSEWIC assessment and status report was prepared in 2005, cliff paintbrush has been recorded at one new location at Macdonald Peak, and re-discovered at one historic location on Mt. Cheam (see Table 1).

Detailed population information is unavailable for most recorded occurrences; however, based on the known records, the British Columbia population numbers appear to be very small. The available data for the populations range from noted as from one to three plants, scattered, or a “few” plants for all except two populations. The latter were described as being “locally abundant” and as “at least 20 plants observed” (CDC 2006). The alpine habitats occupied by the plant are quite isolated and remote from the major anthropogenic disturbances that have adversely affected so many rare species. It is therefore expected that populations in the province are relatively stable, similar to the situation in Washington and Oregon. However, it is not possible to determine the rate of change in geographic distribution and/or population trend in British Columbia based on limited existing data.

Current status of the species is summarized in Table 2. Cliff paintbrush is a priority 3 species under goals 1 and 3 of the B.C. Conservation Framework (see <http://www.env.gov.bc.ca/conservationframework/> for details).

**Table 2.** Status ranks of cliff paintbrush.

| Location         | Rank           | Source            |
|------------------|----------------|-------------------|
| Global           | G3             | Nature Serve 2008 |
| United States    | N2N3           | Nature Serve 2008 |
| Washington       | SNR            | Nature Serve 2008 |
| Oregon           | S3             | Nature Serve 2008 |
| Canada           | N2N3           | BC CDC 2008       |
| British Columbia | S2, Red-listed | BC CDC 2008       |

## Needs of the cliff paintbrush

### Habitat needs

The primary source for the following information is the COSEWIC status report (2005).

Cliff paintbrush is found in the Alpine Tundra and Mountain Hemlock biogeoclimatic zones of British Columbia (Province of B.C. 1991). The plant occurs at moderate to high elevation (from approximately 1600 to 2300 m) in the subalpine to alpine zones, and inhabits rocky ridges, outcrops, and crevices, exposed slopes, dry to mesic cliffs, scree, and talus, with various aspects.

Cliff paintbrush grows primarily on gravelly or stony soils derived from volcanic igneous rock (Figure 4), although it was noted as growing on or adjacent to limestone rock on two of the occurrences provided by the B.C. Conservation Data Centre (2006). Associated species include woolly pussytoes (*Antennaria lanata*), alpine paintbrush (*Castilleja rhexifolia*), golden fleabane (*Erigeron aureus*), Davidson's penstemon (*Penstemon davidsonii* var. *menziesii*), spreading phlox (*Phlox diffusa*), villous cinquefoil (*Potentilla villosa*), spotted saxifrage (*Saxifraga bronchialis*), Lyall's goldenweed (*Tonestus lyallii*), dwarf snow willow (*Salix nivalis*), moss campion (*Silene acaulis*), and spike trisetum (*Trisetum spicatum*).

Climatic conditions for the region are characterized by warm, dry summers and wet winters, with abundant snow at higher elevations.

There does not appear to be a lack of suitable habitat for the plant within its range in British Columbia, although microhabitat preferences have not been determined.



**Figure 4.** Alpine habitat of cliff paintbrush (Copyright Mark Egger).

### Biological needs

Cliff paintbrush is likely a facultative parasite, but the host species are unknown. Many *Castilleja* species parasitize plants from a wide range of species (Heckard 1962; Ceska, pers. Comm., 2007; Egger, pers. comm., 2007) which suggests that some grasses may act as hosts in some B.C.

locations. Based on observations of the *Castilleja* genus as a whole, plants appear to be more vigorous, with earlier flowering if they are growing as a parasite on another plant (Heckard 1962; Egger, pers. comm., 2007). However, in many observed occurrences, such as in rock crevices, the cliff paintbrush does not appear to be parasitic.

As noted in the COSEWIC status report (2005), the plant likely requires cross-pollination and may be pollinated by bees or hummingbirds. Egger (pers. comm., 2007) indicates that Rufous Hummingbirds (*Selasphorus rufus*) are likely pollinators in Washington, and this may be the case in British Columbia as well. Reproduction appears to be solely by seeds, which are likely dispersed by gravity, wind, birds, and small mammals.

### **Ecological role**

The ecological role played by cliff paintbrush is unknown. Given its small numbers in British Columbia it seems unlikely that it is an important food source for pollinating insects or herbivores, or is a significant colonizer of new or disturbed sites.

### **Limiting factors**

No definitive information is available on biologically limiting factors for the cliff paintbrush.

The isolated occurrences and extremely small number of plants noted at many sites (B.C. CDC 2006) may limit reproductive success. Although most plants observed in British Columbia are described as healthy (Ceska, pers. comm., 2007; Lomer, pers. comm., 2007; Smith, pers. comm., 2007), almost no quantitative data is available regarding number of flowering stems, fruit and seed production, germination rate, and seedling survival. The small population sizes may subject the population to decreased genetic diversity and decreased population viability (Schaal and Leverich 2004), although research by Ellstrand and Elam (1993) suggests that species with a history of small, persistent population size are less susceptible. Small populations are also susceptible to catastrophic loss of individuals through random natural events.

Because the cliff paintbrush is at the extreme northern limit of its range in southern British Columbia, cold temperatures and growing seasons occasionally cut short by inopportune frosts may contribute to low numbers. As previously stated, the plant is more abundant in Washington and Oregon. Although the plant is capable of producing many seeds in the United States (Hitchcock et al. 1984), this may not be the case in British Columbia. Even if many seeds are produced it is possible there is low seed germination and/or seedling survival.

The availability of pollinators at a critical time may be a limiting factor, but this is regarded as unlikely, at least in Washington, for the cliff paintbrush (Giblin, pers. comm., 2007).

Other limiting factors potentially include herbivory and loss of populations from avalanches because the species occupies steep slopes in the alpine and subalpine.

## Threats

There is no evidence to indicate that cliff paintbrush populations and their habitat are currently exposed to any significant threats because of their relatively isolated, high subalpine and alpine locations. There are some potential threats, however, and these are described below.

### Resource extraction

Although the relatively isolated high-elevation rocky sites where the cliff paintbrush occurs would not be subject to direct impacts from logging, the Crown land could be considered for mineral mining or gravel extraction in the future. If site access improves in the future the threat free status could change. For example, if logging roads are extended close to plant locations, or if mining of high-elevation sites takes place.

### Recreational use

Although all recorded populations of cliff paintbrush are situated in areas used for recreation (including four in Skagit Valley Provincial Park, two in Chilliwack Lake Provincial Park, and one possibly in Cypress Provincial Park), several of these locations are inaccessible except by helicopter. Other populations may be reached by hiking strenuous trails with considerable elevation gain. It is therefore considered unlikely that trampling and picking of flowers and other disturbance to habitat by outdoor recreationists is a significant threat to the species at this time.

### Climate change

The only threat identified by the cliff paintbrush assessment and Status Report (COSEWIC 2005) was climate change, because it may cause habitat alteration. There appears to be a trend for summers to become warmer and drier within the species range. With longer growing period, population sizes may increase and/or the species may extend its range farther north. It is difficult to speculate on the effect increased winter rainfall and more extreme weather events (as is predicted in coastal B.C.) will have on the plant and its habitat. The effects of climate change on likely pollinator species (hummingbirds and bees) are also unknown.

## Actions Already Completed or Underway

A recovery team has been established for the cliff paintbrush and the species is incorporated into the South Coast Conservation Program (<http://www.sccp.ca>), a landscape-level conservation initiative covering the south coast of British Columbia. Because there are no significant threats, no species-specific actions have been undertaken to protect the cliff paintbrush in British Columbia.

## Knowledge Gaps

Little information is available on the cliff paintbrush in British Columbia. The species has been recorded from only 13 extant locations and, for many records, there is little or no information on numbers, habitat, associated species, or factors affecting the plant at the site.

Therefore, the following knowledge gaps are considered for the species at this time:

- Presence of additional populations
- Microhabitat and microclimatic requirements
- Reproductive capacity of populations
- Population trends
- Short- and long-term land-use plans for sites where cliff paintbrush occurs
- Pollinator species, their habitat requirements, and population trends
- Degree of parasitism and host species
- If augmentation of populations through *ex situ* propagation is considered at any time in the future, knowledge of propagation requirements would be useful. These have been described for other species of *Castilleja* (Guppy 1997), but not specifically for the cliff paintbrush.

## RECOVERY

### Recovery Feasibility

Recovery of the cliff paintbrush is considered feasible, based on technical and biological considerations.

**Table 3.** Recovery feasibility.

| Criteria                                                                                                                                    | Comments                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Are individuals capable of reproduction currently available to improve the population growth rate or population abundance?               | Yes. Observers indicate that at least some plants appeared healthy and were producing seed (Ceska, pers. comm., 2007; Lomer, pers. comm., 2007). |
| 2. Is sufficient suitable habitat available to support the species or could it be made available through habitat management or restoration? | Yes. Sufficient habitat appears to be currently available to support the species.                                                                |
| 3. Can significant threats to the species or its habitat be avoided or mitigated through recovery actions?                                  | Yes. There are no known significant threats to the species at this time. Potential threats can be avoided or mitigated.                          |
| 4. Do the necessary recovery techniques exist and are they demonstrated to be effective?                                                    | Yes. Necessary, effective recovery techniques exist to recover the species.                                                                      |

### Recovery Goal

The long-term goal is to enable the persistence and maintenance of self-sustaining populations of cliff paintbrush with limited occurrence in the Cascade Mountain Range of British Columbia.

### Rationale for the Recovery Goal

The species occurs as small, isolated populations in British Columbia where it is at the northern limits of its range and current knowledge suggests that the plant is naturally rare in B.C. Because the historical record from the Mt. Brunswick (Coast Mountains) has not been re-located, this location is not included in the recovery efforts. Maintaining multiple populations will help to mitigate the effects of catastrophic loss at any one site, which in this case could result from such factors as demographic collapse, avalanches, or herbivory. It does appear possible to maintain

most existing populations where they are currently found, simply by ensuring that they are not under threat from human activities. Active manipulation, such as propagation or transplanting, is not recommended at this time.

## Recovery Objectives

The objectives are designed to achieve the long-term goal of persistence and maintenance of the species within its limited occurrence in the Cascade Mountain Range of B.C.

1. Confirm the presence and the population sizes at all current known locations and determine if additional populations exist in the Cascade Mountains by 2012.

**Rationale:** Many sites where cliff paintbrush have been recorded were visited only once, sometimes many years ago, and information on population size and/or habitat conditions is incomplete or lacking (see Table 1). To ensure the persistence of populations, it must be determined if they are extant.

2. Determine level of threat to populations by 2012 and establish mitigation measures as needed.

**Rationale:** Projected land use should be determined for all known sites to determine whether there will be future threats to the species from such activities as extension of logging roads and mineral exploration. If threats exist, tenure appropriate threat mitigation measures should be applied.

3. Address knowledge gaps relating to species biology, particularly reproductive success and habitat requirements; and establish population trends through monitoring by 2013.

**Rationale:** This information will assist in updating the population and distribution objectives and, combined with inventory results, could result in a change of status for the plant in Canada. It will also assist with an assessment of the potential impacts of climate change on cliff paintbrush and its potential survival in Canada over a longer time period.

## Approaches Recommended to Meet Recovery Objectives

Table 4 summarizes the recommended recovery approaches to achieve the objectives.

## Recovery planning table

Table 4. Recovery planning table for cliff paintbrush.

| Priority  | Obj. no. | Threat or need addressed              | Broad strategy                 | Recommended approaches to meet recovery objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------|----------|---------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Necessary | 1        | Knowledge gap                         | Inventory                      | <ul style="list-style-type: none"> <li>Examine known recorded sites to determine if cliff paintbrush is still present; record habitat conditions and population numbers.</li> <li>Conduct a targeted inventory of potential habitat to see if the plant occurs in additional locations in the Cascade Mountains.</li> </ul>                                                                                                                                                                                                                                                                                                                         |
| Necessary | 2        | Resource extraction, recreational use | Determine level of threat      | <ul style="list-style-type: none"> <li>Determine proposed land use and potential threats affecting the plant and its habitat, and suggest appropriate mitigation options.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Necessary | 2        | Resource extraction, recreational use | Communication and coordination | <ul style="list-style-type: none"> <li>Explore regulatory options to protect the species on Crown lands.</li> <li>Ensure that appropriate government departments and agencies (e.g., ministries of Environment, Agriculture and Lands, Forests and Range, Energy Mines and Petroleum Resources, Fraser Valley Regional District) are aware of plant's locations and need for protection.</li> <li>For populations within provincial parks, ensure that protection strategies for the plant are included in park management plans.</li> <li>Provide signage that rare species are present at sites that are accessible by recreationists.</li> </ul> |
| Necessary | 3        | Knowledge gap, demographic collapse   | Monitoring, research           | <ul style="list-style-type: none"> <li>Conduct surveys every 2-5 years over a 10- or 15-year period to determine population viability and help determine population trends.</li> <li>Determine microhabitat characteristics (soil and climatic conditions).</li> <li>Determine levels of parasitism and potential host plants.</li> </ul>                                                                                                                                                                                                                                                                                                           |

## Performance Measures

Table 5 outlines the recommended performance measures to evaluate progress in achieving recovery objectives.

**Table 5.** Performance measures to evaluate recovery objectives.

| Objective | Broad approach                 | Performance measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | Inventory                      | <ul style="list-style-type: none"> <li>• Additional populations are found or locations are considered low potential.</li> <li>• Presence of known populations is confirmed and population sizes are known.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 2         | Communication and coordination | <ul style="list-style-type: none"> <li>• Protection has been provided for known populations if required.</li> <li>• Appropriate government agencies (Ministry of Forests and Range; Ministry of Energy, Mines and Petroleum Resources) and agencies are aware of the plant's locations, need for protection, and protection measures are in place.</li> <li>• Strategies for protecting the plant in provincial parks are included in park management plans.</li> <li>• Signs indicating that rare plant species are present are erected at sites accessible by recreationists.</li> <li>• Proposed land use is known for all populations and potential threats are identified.</li> </ul> |
| 3         | Inventory                      | <ul style="list-style-type: none"> <li>• All known populations confirmed as extant or not present at the time of the survey.</li> <li>• More detail provided regarding habitat conditions and population sizes.</li> <li>• Above information is used to help predict high-potential sites for additional surveys.</li> </ul>                                                                                                                                                                                                                                                                                                                                                               |
| 3         | Research                       | <ul style="list-style-type: none"> <li>• Clearer understanding of viability of known populations.</li> <li>• Standardized monitoring provides information on species biology and microhabitat requirements.</li> <li>• Based on information provided through inventory, monitoring, and reporting of results, a population trend emerges for cliff paintbrush.</li> </ul>                                                                                                                                                                                                                                                                                                                  |

## Critical Habitat

### Identification of the species' critical habitat

No critical habitat can be identified for cliff paintbrush in Canada at this time. It is expected that critical habitat will be proposed following the completion of outstanding work required to quantify specific habitat and area requirements for the species, further research on the biology of the species, and monitoring of the populations to determine population trends. Consultation with affected landowners and organizations will also be necessary.

The general habitat characteristics (high alpine rocky slopes, ridges, crevices, scree, gravelly soil) are known for cliff paintbrush. However, many sites where the plant has been recorded have

been visited only once, sometimes many years ago or during an unusually unfavourable growing season (BC CDC 2006), and information on population extent of occurrence and/or detailed habitat conditions is incomplete or lacking (see Table 1). In addition, it is quite possible that additional populations exist within the Cascade Mountain range.

### Recommended schedule of studies to identify critical habitat

Table 6 outlines activities to more fully delineate critical habitat and the anticipated outcomes from these activities. Further detail on methodology for these activities can be found in Table 4.

**Table 6.** Schedule of studies to identify critical habitat.

| Activity                                                                              | Rationale/outcome                                                                                                                                                                                                           | Completion date |
|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 1. Re-survey existing populations                                                     | <ul style="list-style-type: none"> <li>Determine extent of occurrence and fill in information gaps regarding population numbers and habitat conditions using BC Conservation Data Centre Rare Plant Survey forms</li> </ul> | 2012            |
| 2. Identify additional populations through targeted surveys of high-potential habitat | <ul style="list-style-type: none"> <li>Determine extent of occurrence and add to knowledge regarding overall population numbers, habitat conditions</li> </ul>                                                              | 2012            |
| 3. Characterize microhabitat conditions during above surveys                          | <ul style="list-style-type: none"> <li>Add to knowledge of soil conditions, microclimate, and hydrology to determine plant physiological tolerances</li> </ul>                                                              | 2012            |
| 4. Assess species biological requirements                                             | <ul style="list-style-type: none"> <li>Gain knowledge of life history including dispersal ability</li> </ul>                                                                                                                | 2012            |
| 5. Map critical habitat for each extant population                                    | <ul style="list-style-type: none"> <li>Using results obtained from Activities 1-4 allows for mapping more quantitatively defined critical habitat</li> </ul>                                                                | 2012            |
| 6. Monitor to assess population viability and population trends                       | <ul style="list-style-type: none"> <li>Results obtained determine which populations are likely to be viable over the long term and critical habitat is modified as necessary</li> </ul>                                     | 2012            |

### Existing and Recommended Approaches to Habitat Protection

All known populations of cliff paintbrush occur on provincial Crown land: four of these are situated in Skagit Valley Provincial Park and two are in Chilliwack Lake Provincial Park. Provincial parks fall under the administration of the B.C. *Park Act* (Queens Printer 1996). Within provincial parks, natural resources, including plants, cannot be removed, damaged, or disturbed except as authorized by a park use permit. Strategies for protecting cliff paintbrush should be included in relevant park management plans.

None of the other populations are currently protected, but the species has the potential to be added to the list of species for protection under the provincial *Wildlife Amendment Act* (2004).

If protection of all populations is not considered feasible, an alternative approach could be to prioritize locations for protection based on criteria such as numbers of plants present, connectivity of the population to other locations of the species, productivity of the habitat, and significance of the location for maintaining the species distribution.

Appropriate provincial government departments, ministries of Environment, Agriculture and Lands, Forests and Range, Energy, Mines and Petroleum Resources, and the Fraser Valley Regional District should be made aware of the plant's locations, need for protection, and protection measures that are proposed or in place.

## **Effects on Other Species**

No negative effects are anticipated on non-target species, natural communities, or ecological processes as a result of the recommended recovery activities. Protecting sites under legislative tools may have a beneficial effect by preserving habitat for additional species, natural communities, and ecological processes. Also, surveys to confirm existing and potential new populations of cliff paintbrush may have a positive effect by identifying additional locations for other species at risk. Appendix A lists species at risk that may occur in habitat similar to cliff paintbrush.

## **Socioeconomic Considerations**

The high-elevation alpine locations where the cliff paintbrush occurs are not currently slated for any form of industrial use and therefore recommended recovery objectives are not anticipated to cause any socioeconomic impacts at this time. If known locations are protected and no recreational use is allowed, this will have a low to moderate impact on recreational users.

## **Recommended Approach for Recovery Implementation**

It may be possible to combine recovery planning for this species with efforts to recover other plant species at risk that occupy a similar habitat in the Cascades Mountain range under the South Coast Conservation Program. These species are listed in Appendix A. At this time, however, a single-species approach to recovery is recommended for the cliff paintbrush.

For successful implementation in protecting species at risk there will be a strong need to engage in stewardship on a variety of land tenures. Stewardship involves the voluntary cooperation of landowners to protect species at risk and the ecosystems they rely on. It is recognized in the preamble to the federal *Species at Risk Act* (SARA) that “stewardship activities contributing to the conservation of wildlife species and their habitat should be supported”. It is recognized in the Bilateral Agreement on Species at Risk, between British Columbia and Canada that: “stewardship by land and water owners and users is fundamental to preventing species from becoming at risk and in protecting and recovering species that are at risk” and that “cooperative, voluntary measures are the first approach to securing the protection and recovery of species at risk”.

## **Statement on Action Plans**

A recovery action plan will be completed by 2013.

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### **Personal Communications**

Adolf Ceska, January 2007. Private Consultant and Botanist, Victoria, BC.

Mark Egger, January 2007. Botanist, Seattle, WA.

David Giblin, January 2007. Herbarium Collections Manager, University of Washington, Seattle, WA.

Frank Lomer, January 2007. Private Consultant and Botanist, New Westminster, BC.

Shyanne Smith, January 2007. Botanist, Victoria, BC.

Susan Vrilakas, January 12, 2007. Botany Data Manager, Oregon Natural Heritage Information Program.

## APPENDIX A

Species at Risk with high potential to occur in similar locations as cliff paintbrush.

| Scientific name                                      | Common name                   | Provincial status | B.C. list | COSEWIC designation | B.C. Conservation Framework |      |
|------------------------------------------------------|-------------------------------|-------------------|-----------|---------------------|-----------------------------|------|
|                                                      |                               |                   |           |                     | Priority                    | Goal |
| <i>Anemone drummondii</i> var. <i>drummondii</i>     | Alpine anemone                | S2S3              | Blue      | n/a                 | 3                           | 3    |
| <i>Cryptogramma cascadiensis</i>                     | Cascade parsley fern          | S2S3              | Blue      | n/a                 | 3                           | 3    |
| <i>Draba lonchocarpa</i> var. <i>thompsonii</i>      | Lance-fruited draba           | S2S3              | Blue      | n/a                 | 3                           | 3    |
| <i>Elmera racemosa</i> var. <i>racemosa</i>          | Elmera                        | S2S3              | Blue      | n/a                 | 3                           | 3    |
| <i>Epilobium glaberrimum</i> ssp. <i>fastigiatum</i> | Smooth willowherb             | S2S3              | Blue      | n/a                 | 3                           | 3    |
| <i>Polemonium elegans</i>                            | Elegant Jacob's-ladder        | S2S3              | Blue      | n/a                 | 3                           | 3    |
| <i>Smelowskia ovalis</i>                             | Short-fruited smelowskia      | S2S3              | Blue      | n/a                 | 3                           | 3    |
| <i>Viola purpurea</i> var. <i>venosa</i>             | Purple-marked yellow violet   | S1S3              | Red       | n/a                 | 2                           | 3    |
| <i>Asplenium adulterinum</i>                         | Corrupt spleenwort            | S2S3              | Blue      | n/a                 | 2                           | 1    |
| <i>Papilio indra</i>                                 | Indra Swallowtail             | S1                | Red       | n/a                 | 1                           | 3    |
| <i>Aplodontia rufa</i>                               | Mountain Beaver               | S3                | Blue      | Special Concern     | 4                           | 2    |
| <i>Gulo gulo</i> ssp. <i>luscus</i>                  | Wolverine, <i>luscus</i> ssp. | S3                | Blue      | Special Concern     | 2                           | 2    |
| <i>Ursus arctos</i>                                  | Grizzly Bear                  | S3                | Blue      | Special Concern     | 2                           | 2    |