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

Recovery Strategy for the Tweedy's Lewisia (*Lewisiopsis tweedyi*) in Canada

Tweedy's Lewisia

2021

Government of Canada
Gouvernement du Canada
Canada

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Non-official version
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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[1].

Cover illustration: © Amber Saundry

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[1] www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

RECOVERY STRATEGY FOR THE TWEEDY'S LEWISIA (*Lewisiopsis tweedyi*) IN CANADA

2021

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

In the spirit of cooperation of the Accord, the Government of British Columbia has given permission to the Government of Canada to adopt the *Recovery Plan for Tweedy's Lewisia (*Lewisiopsis tweedyi*) in British Columbia* (Part 2) under Section 44 of the *Species at Risk Act.* Environment and Climate Change Canada has included an addition which completes the SARA requirements for this recovery strategy.

The federal recovery strategy for the Tweedy's Lewisia in Canada consists of two parts:

Part 1 – Federal Addition to the *Recovery Plan for Tweedy's Lewisia (*Lewisiopsis tweedyi*) in British Columbia* prepared by Environment and Climate Change Canada.

Part 2 – *Recovery Plan for Tweedy's Lewisia (*Lewisiopsis tweedyi*) in British Columbia prepared by the British Columbia* Ministry of Environment.

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Part 1 – Federal Addition to the *Recovery Plan for Tweedy's Lewisia (*Lewisiopsis tweedyi*) in British Columbia*, prepared by Environment and Climate Change Canada

Preface

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

The Minister of Environment and Climate Change is the competent minister under SARA for the Tweedy's Lewisia 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 plan for Tweedy's Lewisia (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 Tweedy's Lewisia and Canadian society as a whole.

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

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

[2] www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding.html#2

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

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

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

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

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

Additions and Modifications to the Adopted Document

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

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

1. Species Status Information

This section replaces the information on SARA legal designation for Tweedy's Lewisia in Canada (in section 2 of the provincial recovery plan).

The legal designation of Tweedy's Lewisia on SARA Schedule 1 is Endangered (2018).

2. Critical Habitat

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 2015 provincial recovery plan for Tweedy's Lewisia includes a written description of survival and recovery habitat (section 7.1). Environment and Climate Change Canada accepts the description of survival and recovery habitat provided in the provincial recovery plan, as the basis for critical habitat identification in the federal recovery strategy, with modification (as follows) to address specific requirements of SARA. 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.

2.1 Identification of the Species' Critical Habitat

Geospatial location of areas containing critical habitat

Critical habitat is identified for the two known populations[4] of Tweedy's Lewisia within Canada, both of which occur within E.C. Manning Provincial Park in British Columbia:

- Castle Creek (Figure 1)
- Pinewood Creek (Figure 1)

The area containing critical habitat for Tweedy's Lewisia is based on three additive components:

1. the area occupied[5] 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 as relevant to each record);
2. a 50 m distance (i.e., critical function zone[6]) to encompass immediately adjacent areas; and,
3. the entire portion of distinct ecological features[7] which are associated with, and are integral to, Tweedy's Lewisia individual plants or patches of plants. Distinct ecological features for Tweedy's Lewisia are the sparsely vegetated rocky slopes in open coniferous forests or unforested sites where they occur.

Biophysical attributes of critical habitat

Critical Habitat is identified as a critical function zone of 50 m around any extant plant occurrence, including all biophysical attributes listed below, as well as any other natural features associated with the occurrence.

Key attributes of habitats that are suitable for Tweedy's Lewisia include:

Suitable habitat conditions:

- Unforested rocky outcrops on south-facing slopes OR;
- Open coniferous forests on south-facing slopes which may include any of the following tree species:

[4] "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.
[5] "Areas occupied" are determined by best available point and/or occurrence polygon information (e.g., provincial element occurrence data and other reports).
[6] 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 suggesting a minimum critical function zone distance of 50 m is identified as critical habitat for all rare plant species occurrences (see: Rationale for decision tree hierarchy).
[7] "Distinct" ecological features are here referred to as those features 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 that comprise the context for a species' occurrence. Tweedy's Lewisia has been identified at a "site" level scale (1:15,000 scale of reference).

- Ponderosa Pine (*Pinus ponderosa*);
- Whitebark Pine (*Pinus albicaulis*);
- Subalpine Fir (*Abies lasiocarpa*) and;
- Douglas-fir (*Pseudotsuga menziesii*).

Suitable ground conditions:

- Rapidly drained soils (generally of granite or basalt in origin) and/or crevices, AND;
- Sparsely vegetated shrub and herbaceous cover which may include any of the following species:
    - Prairie Saskatoon (*Amelanchier alnifolia* var*. alnifolia*);
    - Falsebox (*Paxistima myrsinites*);
    - Shrubby Penstemon (*Penstemon fruticosus* var*. fruticosus*);
    - Parsley Fern (*Cryptogramma acrostichoides*);
    - Round-leaved Alumroot (*Heuchera cylindrica*);
    - Brandegee's Desert-parsley (*Lomatium brandegeei*);
    - Tufted Phlox (*Phlox caespitosa*);
    - Spotted Saxifrage (*Saxifraga bronchialis* ssp*. austromontana*);
    - Lance-leaved Stonecrop (*Sedum lanceolatum* var*. lanceolatum*) and;
    - Compact Selaginella (*Selaginella densa*).

The areas containing critical habitat for Tweedy's Lewisia (totalling 15.2 ha) are presented in Figure 1. Critical habitat for Tweedy's Lewisia in Canada occurs within the shaded yellow polygon(s) (unit(s)), where the biophysical attributes described in the above section are present. Within these polygons, unsuitable habitat such as existing anthropogenic features (e.g. active roads or trails), and elevations above 1,650 m and below 1,400 m, do not possess the biophysical attributes required by Tweedy's Lewisia and they are not identified as critical habitat. The 1 km × 1 km Universal Transverse Mercator (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. The critical habitat identified is sufficient to meet the population and distribution objectives; therefore a schedule of studies is not required.

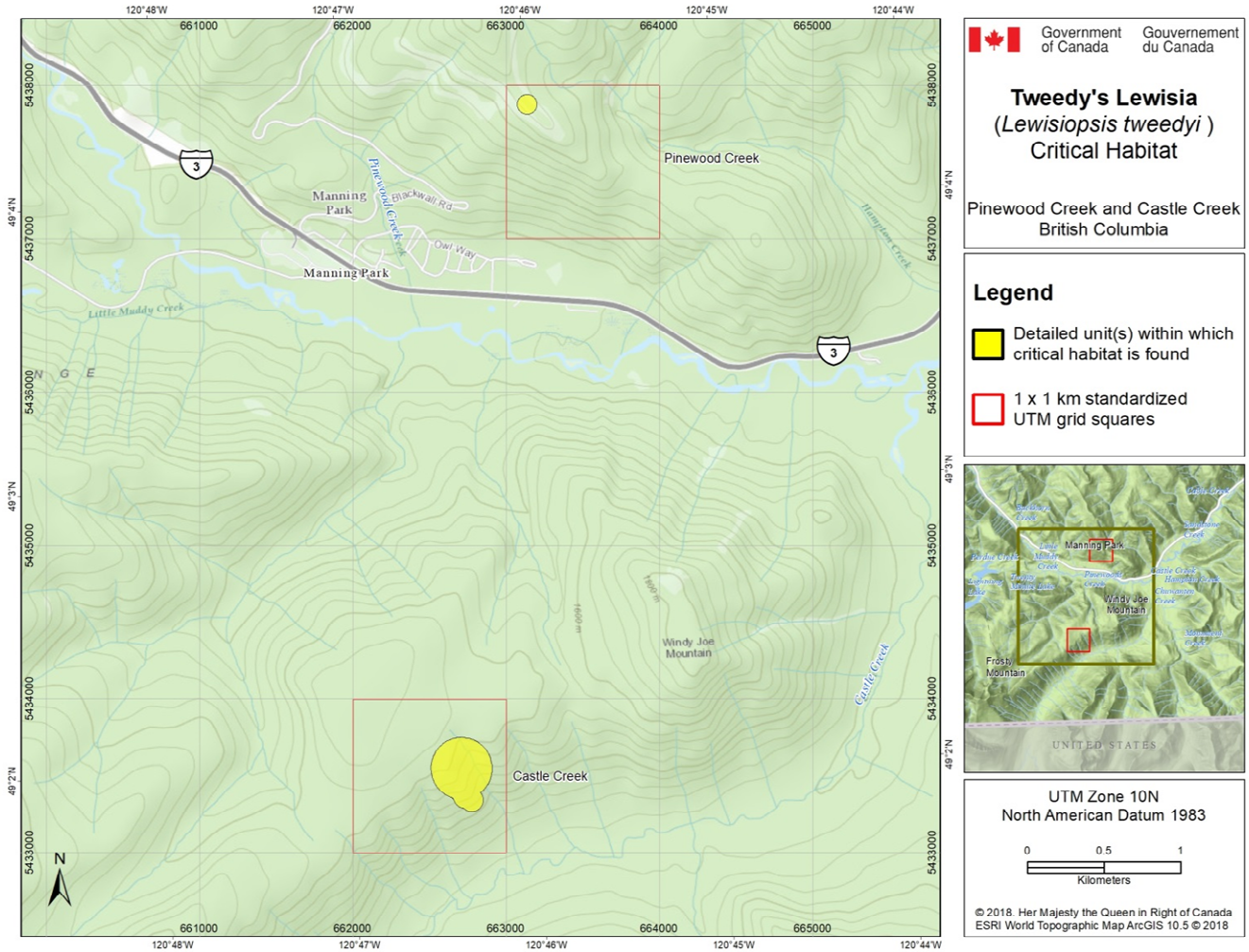

Figure 1. Critical habitat for Tweedy's Lewisia in Canada is represented by the yellow shaded polygons (units), in accordance with the criteria and methodology set out in section 1.1. The detailed polygons show a total of 15.2 ha containing critical habitat at Pinewood Creek (1.2 ha) and Castle Creek (14.0 ha). The 1 km × 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area containing critical habitat. Areas outside of the shaded yellow polygons do not contain critical habitat.

2.2 Examples of 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 plan provides a description of limitations and potential threats to Tweedy's Lewisia. There are very few activities expected to occur that are likely to destroy the critical habitat of Tweedy's Lewisia, since all extant populations occur in one Provincial Park. Nonetheless, certain human activities could potentially contribute to destroying the species' critical habitat.

Activities described in Table 1 include those likely to cause destruction of critical habitat for Tweedy's Lewisia, however, destructive activities are not limited to those listed.

Table 1. Examples of activities likely to result in destruction of critical habitat for Tweedy's Lewisia.

Description of activity	**Rationale**	**Additional Information including related IUCN-CMP threat[8]**
Hiking or recreational use outside of existing trails or roads to the extent that attributes of critical habitat are negatively impacted or destroyed.	Trampling and trail creation causes destruction of critical habitat via compaction or disturbance of the substrate to the extent that it is no longer suitable for Tweedy's Lewisia.	Threat #6.1. Both populations have individual plants adjacent to hiking trails.

3. Statement on Action Plans

One or more action plans for Tweedy's Lewisia will be posted on the Species at Risk Public Registry by 2026.

4. Effects on the Environment and Other Species

This section replaces "Section 8: Effects on Other Species" in the provincial recovery plan.

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental*

[8] Threat classification is based on the International Union for the Conservation of Nature-Conservation Measures Partnership (IUCN-CMP; Open Standards 2014)

Assessment of Policy, Plan and Program Proposals[9]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the Federal Sustainable Development Strategy's[10] (FSDS) goals and targets.

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

The recovery measures proposed are not expected to negatively affect any other species. It is likely that efforts to conserve Tweedy's Lewisia will indirectly benefit other species in the area.

5. References

COSEWIC. 2013. COSEWIC assessment and status report on the Tweedy's Lewisia *Lewisiopsis tweedyi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 22 pp.

Open Standards. 2014. Threats taxonomy. Available: http://cmp-openstandards.org/using-os/tools/threats-taxonomy/ (Accessed December 2017).

[9] www.canada.ca/en/impact-assessment-agency/programs/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals.html
[10] www.fsds-sfdd.ca/index.html#/en/goals/

Part 2 – *Recovery Plan for Tweedy's Lewisia (*Lewisiopsis tweedyi*) in British Columbia*, prepared by the British Columbia Ministry of Environment

Recovery Plan for Tweedy's Lewisia (*Lewisiopsis tweedyi*) in British Columbia

Prepared by B.C. Ministry of Environment

BRITISH COLUMBIA | Ministry of Environment

April 2015

About the British Columbia Recovery Strategy Series

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

What is recovery?

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

What is a provincial recovery document?

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

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

What's next?

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

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

For more information

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

Recovery Plan for Tweedy's Lewisia (*Lewisiopsis tweedyi*) in British Columbia

Prepared by B.C. Ministry of Environment

April 2015

Recommended citation

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Cover illustration/photograph

Don Martyn

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>

Disclaimer

This recovery plan has been prepared by the B.C. Ministry of Environment, 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 Tweedy's lewisia 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 plan. The B.C. Ministry of Environment encourages all British Columbians to participate in the recovery of Tweedy's lewisia.

ACKNOWLEDGEMENTS

This document was drafted by Brenda Costanzo (B.C. Ministry of Environment [MOE]). Data and advice were provided by Marta Donovan and Jenifer Penny (MOE). Additional assistance was provided by Peter Fielder (MOE), Matt Fairbarns (Consultant), Katrina Stipec (MOE), Leah Westereng (MOE), and Byron Woods (B.C. Ministry of Forests, Lands and Natural Resource Operations). Additional comments and review by Kella Sadler (Environment Canada, Canadian Wildlife Service, Pacific and Yukon Region) and Paul Johanson (Environment Canada, Canadian Wildlife Service, National Capital Region).

EXECUTIVE SUMMARY

Tweedy's lewisia (*Lewisiopsis tweedyi*) is a perennial herb that grows from a thick taproot. Evergreen fleshy leaves form a rosette or basal cluster from which arise multiples stems of 2–5 salmon, yellow-pink, or white flowers with 7–9 petals. This species is found in open coniferous forests on dry south-facing slopes, and on unforested sites between 1400 and 1650 metres in elevation.

Tweedy's lewisia (*Lewisiopsis tweedyi*) was designated as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as it exists in Canada only in two small subpopulations and has declined 30% in recent years. The greatest threat is from recreational activities. It is not yet listed on Schedule 1 of the *Species at Risk Act* (SARA).[1] In British Columbia, Tweedy's lewisia is ranked S1 (critically imperiled) by the Conservation Data Centre and is on the provincial Red list. The B.C. Conservation Framework ranks Tweedy's lewisia as a priority 1 under goal #3 (to maintain the diversity of native species and ecosystems). Recovery is considered to be biologically and technically feasible.

The population and distribution goal is to maintain stable or increasing populations throughout its range in British Columbia.

The following are the recovery objectives:

1. protect[2] all known populations of Tweedy's lewisia throughout the B.C. range;
2. monitor trends in population size and distribution at all known locations; and
3. determine if it is feasible and appropriate to augment[3] populations.

RECOVERY FEASIBILITY SUMMARY

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

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

[1] The COSEWIC assessment will be reviewed by the Governor in Council who may, on the recommendation of the Minister, make a decision to amend the List to include this species on Schedule 1 of SARA.
[2] Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.
[3] Augmentation is defined as adding new individuals to an existing population to increase the number of individuals and/or the genetic diversity of the population. This may be done by propagating genetic stock from the receptor site *ex situ* or by adding genetic material from other locations if the existing population is suffering from demographic collapse due to inbreeding (Maslovat 2009).

YES. There are individuals capable of reproducing sexually available now. The length of time that Tweedy's lewisia seed remains viable in the soil varies. The maximum known viability of these seeds is 24 months.

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

   YES. Sufficient habitat to support the species is available in the moist warm subzone of the Engelmann Spruce–Subalpine Fir biogeoclimatic zone (ESSFmw). Tweedy's lewisia requires a specific microhabitat type: dry, south-facing slopes that are rapidly drained and either shady for part of the day or that have the roots shaded by rocks.

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

   YES. The main threat of recreational activities (trampling by hikers) can be mitigated as both of the extant locations occur in a provincial park and can be mitigated in the parks management plan.

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

   YES. Recovery techniques such as propagation exist to increase or restore extant population numbers if deemed necessary.

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1 COSEWIC* SPECIES ASSESSMENT INFORMATION

Assessment Summary: November 2013
Common :** Tweedy's Lewisia
Scientific :** *Lewisiopsis tweedyi*
Status: Endangered
Reason for designation: This showy perennial plant is known only from Washington and British Columbia. It exists in Canada and has two small subpopulations and has undergone a decline of up to 30% in recent years, possibly due to plant collecting. The small population size and potential impact from changes in moisture regimes due to climate change place the species at on-going risk.
Occurrence: British Columbia
Status History: Designated Endangered in November 2013

* Committee on the Status of Endangered Wildlife in Canada.

**** Common and scientific names reported in this recovery plan follow the naming conventions of the British Columbia Conservation Data Centre, which may be different from names reported by COSEWIC.

2 SPECIES STATUS INFORMATION

Tweedy's lewisia[a]		
Legal Designation:		
FRPA:[b] No OGAA:[b] No	B.C. *Wildlife Act:*[c] No	SARA:[d] No
Conservation Status[e]		
B.C. List: Red B.C. Rank: S1 (2011)	National Rank: N1 (2011)	Global Rank: G3 (2013)
Other Subnational Ranks:[f] WA (S3)3		
B.C. Conservation Framework (CF)[g]		
Goal 1: Contribute to global efforts for species and ecosystem conservation.		Priority:[h] 3 (2010)
Goal 2: Prevent species and ecosystems from becoming at risk.		Priority: 6 (2010)
Goal 3: Maintain the diversity of native species and ecosystems.		Priority: 1 (2010)
CF Action Groups:	Compile Status Report; Inventory; Planning; List under *Wildlife Act*; Send to COSEWIC; Habitat Protection; Habitat Restoration; Private Land Stewardship	

[a] Data source: B.C. Conservation Data Centre (2014) unless otherwise noted.
[b] No = not listed in one of the categories of wildlife that requires special management attention to address the impacts of forest and range activities on Crown land under the *Forest and Range Practices Act* (FRPA; Province of British Columbia 2002) and/or the impacts of oil and gas activities on Crown land under the *Oil and Gas Activities Act* (OGAA; Province of British Columbia 2008).
[c] No = not designated as wildlife under the B.C. *Wildlife Act* (Province of British Columbia 1982).
[d] No = not on any Schedules under the *Species at Risk Act* (SARA; Government of Canada 2002). The COSEWIC assessment will be reviewed by the Governor in Council who may, on the recommendation of the Minister, make a decision to amend the List to include this species on Schedule 1 of SARA.
[e] S = subnational; N = national; G = global; T = refers to the subspecies level; B = breeding; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable. U.S. data from NatureServe (2014).
[f] Data source: NatureServe (2014).
[g] Data source: B.C. Ministry of Environment (2010).
[h] Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

3 SPECIES INFORMATION

3.1 Species Description

Tweedy's lewisia is a perennial vascular plant that grows from a large, thick reddish taproot with a branched crown of several stems 10–20 cm tall and approximately 20 cm in diameter. Leaves are evergreen, oblong to widely egg-shaped, 10–20 cm long and 1–5 cm wide with a thick stalk approximately 5 cm long. Stems may have 1–2 reduced leaves only. The infloresence is a loose terminal cluster with small bracts and bearing 2–5 flowers on stalks 2–5 cm long. The two sepals are ovate, 9–10 mm in length; petals are 7–9 salmon-pink to yellowish, sometimes white and 2.5–4 cm long. The 12–25 stamens are about half as long as the petals. Fruit is an egg-shaped capsule 7–10 mm with 12–35 seeds (Hershkovitz 1992; Douglas *et al*. 1999).

3.2 Populations and Distribution

Tweedy's lewisia is endemic to Washington State in the Wenatchee Mountains and the counties of Okanogan, Chelan, and Kittitas, and to south-central British Columbia where it is only found in E.C. Manning Provincial Park at the north-central edge of the Cascade Mountain Range (COSEWIC 2013; Figure 1; Table 1). In British Columbia, Tweedy's lewisia is only known from two known locations approximately 5 km from one another (Figure 2).

Figure 1. Tweedy's lewisia distribution in North America (brown polygon) (COSEWIC 2013).

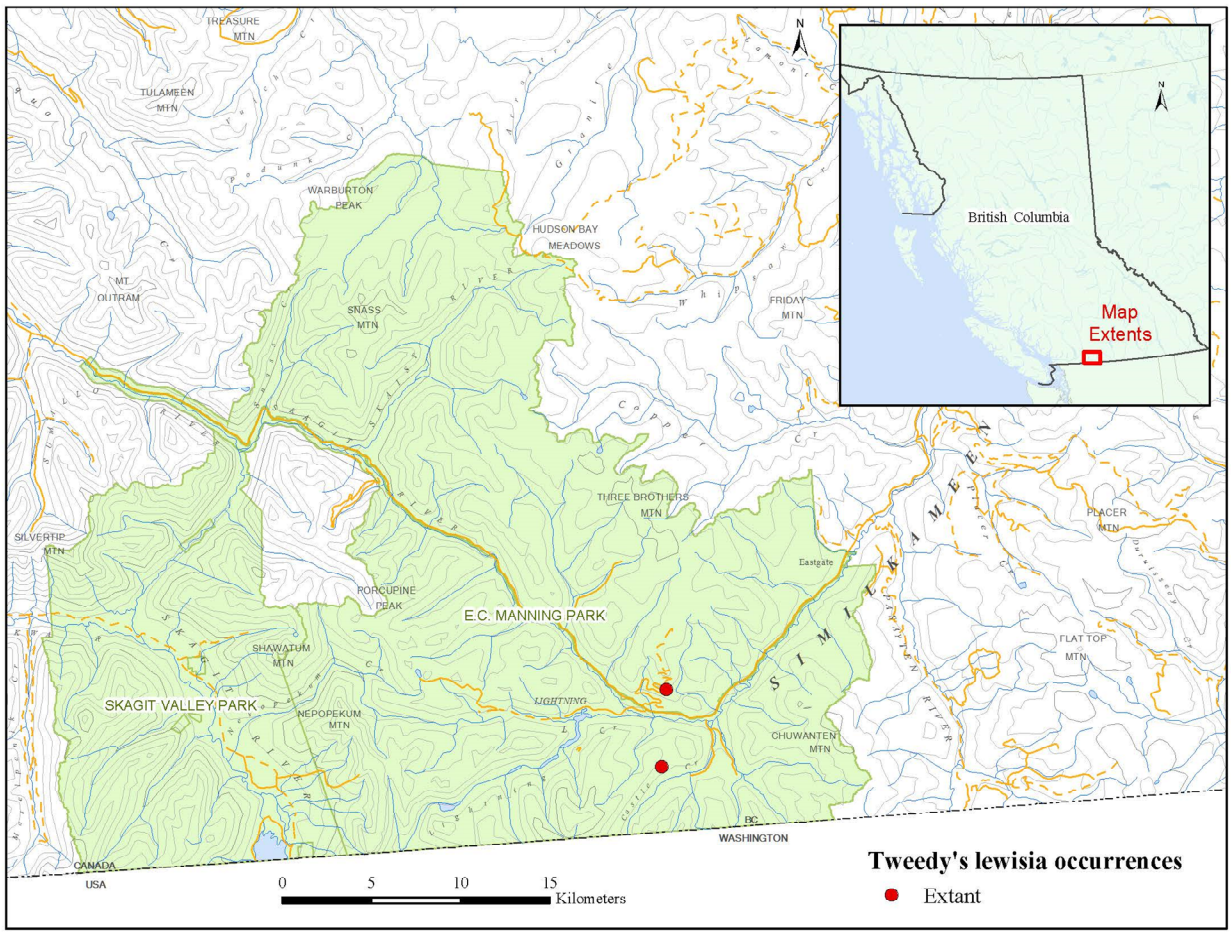

Figure 2. Tweedy's lewisia distribution in British Columbia. Two known extant occurrences are shown (red dots) Castle Creek is the most southerly population, and Pinewood Creek the most northerly population.

Table 1. Status and description of Tweedy's lewisia populations in B.C.

Population	Status and description	Land tenure
Castle Creek	2012; 106 mature plants over 5000 m^2	provincial park
Pinewood Creek (Dry Ridge Trail)	2012; 1 mature flowering plant and several small juvenile plants	provincial park

3.3 Habitat and Biological Needs of Tweedy's Lewisia

In British Columbia, the species is found in open coniferous forests on dry south-facing slopes as well as unforested sites in the moist warm Engelmann Spruce–Subalpine Fir Biogeoclimatic subzone (ESSFmw). In E.C. Manning Provincial Park, Tweedy's lewisia is found in a microclimate of warm, exposed rocky outcrops and crevices where conifer needle duff accumulates (F. Lomer, pers. comm., 2004). Associated tree species are subalpine fir (*Abies lasiocarpa*), lodgepole pine (*Pinus contorta*), whitebark pine (*Pinus albicaulis*), and Douglas-fir (*Pseudotsuga menziesii*). Shrub and herbaceous cover is sparse (COSEWIC 2013). The B.C.

Conservation Data Centre (2014) records include the following understory species at the two populations: prairie saskatoon (*Amelanchier alnifolia* var. *alnifolia*); falsebox (*Paxistima myrsinites*); shrubby penstemon (*Penstemon fruticosus* var. *fruticosus*); parsley fern (*Cryptogramma acrostichoides*); round-leaved alumroot (*Heuchera cylindrica* var. *cylindrica);* Brandegee's lomatium (*Lomatium brandegeei);* tufted phlox (*Phlox caespitosa*); spotted saxifrage *(Saxifraga bronchialis* var. *austromontana);* lance-leaved stonecrop *(Sedum lanceolatum* var. *lanceolatum);* and compact selaginella *(Selaginella densa).* Elevation range in British Columbia for this species is between 1400 and 1650 m (COSEWIC 2013).

Tweedy's lewisia requires soils that are fast draining so that the roots do not rot during excessive moisture, and moisture is also required for seed set (COSEWIC 2013).

Tweedy's lewisia is visited by pollinators such as bees and or syrphid flies, among others, but also may be self-fertile. Seeds may be partly dispersed by ants (COSEWIC 2013).

3.4 Ecological Role

The ecological role is currently unknown for this species.

3.5 Limiting Factors

Tweedy's lewisia seeds remain viable for up to 24 months. Seeds may germinate either in the first or second year of seed, when conditions are favourable.

4 THREATS

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational) (adapted from Salafsky *et al.* 2008). For purposes of threat assessment, only present and future threats are considered.[4] Threats do not include limiting factors,[5] which are presented in Section 3.5.

For the most part, threats are related to human activities, but they can also be natural. The impact of human activity may be direct (e.g., destruction of habitat) or indirect (e.g., invasive species introduction). Effects of natural phenomena (e.g., fire, flooding) may be especially important when the species is concentrated in one location or has few occurrences, which may be a result of human activity (Master *et al.* 2012). As such, natural phenomena are included in the definition

[4] Past threats may be recorded but are not used in the calculation of Threat Impact. Effects of past threats (if not continuing) are considered when determining long- and/or short-term trend factors (Master *et al.* 2012).
[5] It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species less likely to respond to recovery/conservation efforts.

of a threat, though they should be considered cautiously. These stochastic events should only be considered a threat if a species or habitat is damaged from other threats and has lost its resilience. In such cases, it is vulnerable to the disturbance (Salafsky *et al.* 2008) such that these types of events would have a disproportionately large effect on the population compared to the effect they would have had historically.

4.1 Threat Assessment

The threat classification below is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system and is consistent with methods used by the B.C. Conservation Data Centre. For a detailed description of the threat classification system, see the Open Standards website (Open Standards 2014). Threats may be observed, inferred, or projected to occur in the near term. Threats are characterized here in terms of scope, severity, and timing. Threat "impact" is calculated from scope and severity. For information on how the values are assigned, see Master *et al.* (2012) and table footnotes for details. Threats for Tweedy's lewisia were assessed for the entire province[6] (Table 2).

Table 2. Threat classification table for Tweedy's lewisia.

Threat #	Threat description	Impact[a]	Scope[b]	Severity[c]	Timing[d]	Population(s) or location(s) or site(s)
5	Biological resource use	Unknown	Large	Unknown	Moderate	
5.2	Gathering terrestrial plants	Unknown	Large	Unknown	Moderate	Castle Creek (2007)
6	Human intrusions & disturbance	Low	Small	Moderate	High	
6.1	Recreational activities	Low	Small	Moderate	High	Dry Ridge Trail; small percentage of plants at Castle Creek are near trail
11	Climate change & severe weather	Unknown	Pervasive	Unknown	Unknown	
11.1	Habitat shifting & alteration	Unknown	Pervasive	Unknown	Unknown	All
11.2	Droughts	Unknown	Pervasive	Unknown	Unknown	All

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

[6] Herbivory by American pika (*Ochotona princeps*), Mule Deer (*Odocoileu hemionus*) and elk (*Cervus canadensis*) has been documented in Washington State; 10-80% of Tweedy's lewisa foliage was lost to herbivores (COSEWIC 2013). Loss of leaf material decreases a plant's potential ability to photosynthesize and reproduce. Not reported as a threat for B.C. at present.

4.2 Description of Threats

The overall province-wide Threat Impact for this species is Low.[7] The greatest threat is from recreational activity (Table 2). Details are discussed below under the Threat Level 1 headings.

IUCN-CMP Threat 4. Transportation & service corridors (past threat - not calculated)

4.1 Roads & railroads
A past threat of road building may have affected the population at Dry Ridge Trail; however, no new roads are anticipated to be developed in the future.

IUCN-CMP Threat 5. Biological resource use (impact unknown)

5.2 Gathering terrestrial plants
Plant collecting (i.e., by botany enthusiasts or other plant collectors) is suspected to have caused a decrease in the population at Castle Creek in 2007 (COSEWIC 2013). Plant collecting may continue to be a threat at both Castle Creek and Dry Ridge Trail sites in the future. However, part of the Castle Creek population is inaccessible to most hikers; despite suspected declines relating to collection, there has been no documented collecting of this plant. As well, the plant is readily available in the nursery trade, which may mitigate its interest to plant collectors. The impact of this threat is unknown.

IUCN-CMP Threat 6. Human intrusions & disturbance (impact low)

6.1 Recreational activities
Tweedy's lewisia plants are near Dry Ridge Trail (approximately 200 m off the trail), and the Castle Creek trail runs through the population with plants on either side of that trail (M. Fairbarns, pers. comm., 2015). Therefore, it is likely that plants may be subject to trampling if hikers wander off the trail. Currently, trampling by humans is the greatest known threat to the species, although the impact is considered to be low.

IUCN-CMP Threat 11. Climate change & severe weather (impact unknown)

11.1 Habitat shifting & alteration
Successional changes could occur due to climate change, such as the infilling of habitat due to encroachment of trees or shrubs, but this will be incremental due to the lack of soil and the rocky nature of the site. However, as this is a high-elevation species it is therefore more likely subject to climate change impacts than other species. Although the impact of this threat is unknown, this should be tracked in the short-term.

[7] The overall threat impact was calculated following Master *et al*. (2012) using the number of Level 1 Threats assigned to this species where Timing = High or Moderate. This includes 1 Low threat (Table 2). The overall threat considers the cumulative impacts of multiple threats.

11.2 Droughts

Tweedy's lewisia could be subjected to higher drought stress due to less snowpack at mid-elevations and less summer soil moisture due to climate change. The impact of this threat is unknown.

5 RECOVERY GOAL AND OBJECTIVES

5.1 Recovery (Population and Distribution) Goal

The recovery (population and distribution) goal is to maintain stable or increasing populations throughout its range in British Columbia.

5.2 Rationale for the Recovery (Population and Distribution) Goal

The overall goal is to maintain stable or increasing populations. This includes the known extant populations as well as any populations that are found in the future. It is likely that the species will always be Endangered due to its naturally rare occurrence in only two locations within British Columbia. There is no information to confirm that the species was previously more widespread, therefore an objective to actively increase the number of populations, which may allow for down-listing of the species, is not appropriate. There has been a decline in abundance of individuals at the two small populations (up to 30% in recent years), and the causes of the decline may be reversible (COSEWIC 2013). However, there has been no decline in extent of occurrence (8 km^2), index of area of occupancy (8 km^2), number of locations, or number of subpopulations. The recovery goal is deemed feasible through threat mitigation, and augmentation of existing populations (where feasible, and/or where threat mitigation is not effective) to maintain plant abundance at populations and prevent further loss. There is uncertainty around the historic baseline number of mature individuals and population trends, as well as the number of mature individuals required for the persistence of the population. Owing to the above-mentioned uncertainty in both historic and current population size and distribution, the population and distribution goal is not explicitly quantified and/or qualified at this time.

5.3 Recovery Objectives

The following are the recovery objectives:

1. protect[8] all known populations of Tweedy's lewisia throughout the B.C. range;
2. monitor trends in population size and distribution at all known locations; and
3. determine if it is feasible and appropriate to augment[9] populations.

[8] Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.
[9] Augmentation is defined as adding new individuals to an existing population to increase the number of individuals and/or the genetic diversity of the population. This may be done by propagating genetic stock from the receptor site

6 APPROACHES TO MEET RECOVERY OBJECTIVES

6.1 Actions Already Completed or Underway

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

Compile Status Report (complete)
- COSEWIC report completed (COSEWIC 2013). Update due 2023.

Send to COSEWIC (complete)
- Tweedy's lewisia assessed as Endangered (COSEWIC 2013). Re-assessment due 2023.

Planning (complete)
- B.C. Recovery Plan completed (this document, 2015).

Inventory (in progress)
- Inventory has been completed at one location in 2012.

Habitat Protection (in progress)
- Two known locations occur in a provincial park and have some protection through the legal provisions of the B.C. *Park Act*. The management plan for E.C. Manning Provincial Park and Cascade Recreation Area (B.C. Ministry of Environment 2004) includes the protection of rare and endangered plant and animal species as one of the primary roles of the park.

Table 3. Existing mechanisms that afford habitat protection for Tweedy's lewisia

Existing habitat protection	Threat[a] or concern addressed	Site
B.C. *Park Act*	5.2; 6.1	Dry Ridge Trail and Castle Creek

6.2 Recovery Planning Table

Table 4. Recovery planning table for Tweedy's lewisia

Objective	Actions to meet objectives	Performance measures	Threat[a] or concern addressed	Priority[b]
1	• Encourage land managers to steward and	• Populations maintained • Mortality has been reduced	5.2; 6.1	Necessary

ex situ or by adding genetic material from other locations if the existing population is suffering from demographic collapse due to inbreeding (Maslovat 2009).

	manage lands for the persistence of the species • Develop and implement site best management practices for mitigating threats	• Awareness and assistance by land managers in the protection and recovery of the species has been increased		
2	• Design a monitoring program (every 5 years) to determine population trends • Monitor populations to assess the effects of threats • Monitor populations where best management practices have been instituted and evaluate abundance as a proxy for effectiveness	• Data on population sizes and reproduction status for determining population trends • Status of populations and effectiveness of recovery actions have been assessed • Impacts of threats to the species have been determined	Knowledge gap Knowledge gap	Beneficial Beneficial
3	• Determine feasibility of augmentation • Investigate propagation methodologies • If determined feasible, augmentation at extant populations	• Research on feasibility has been completed • Propagation methodologies have been determined • Augmentation at extant locations has occurred	Knowledge gap	Beneficial

[a] Threat numbers according to the IUCN-CMP classification (see Table 2 for details).
[b] Essential (urgent and important, needs to start immediately); Necessary (important but not urgent, action can start in 2–5 years); or Beneficial (action is beneficial and could start at any time that was feasible).

7 SPECIES SURVIVAL AND RECOVERY HABITAT

Survival/recovery habitat is defined as the habitat that is necessary for the survival or recovery of the species. This is the area where the species naturally occurs or depends on directly or indirectly to carry out its lifecycle processes or formerly occurred and has the potential to be reintroduced.

7.1 Description of Survival/Recovery Habitat

The species habitat has been described in Section 3.3 based on the current knowledge of the habitat occupied by the species. Additional work required to fulfill habitat knowledge gaps are included in the recovery planning table (Table 4). Although some aspects of the species' habitat requirements require further study, the following describes the biophysical attributes of survival/recovery habitat based on our best available information:

- open coniferous forests on dry south-facing slopes and also on unforested sites;
- moist warm Engelmann Spruce–Subalpine Fir biogeoclimatic subzone (ESSFmw);
- elevation between 1400 and 1650 m;
- partial shade provided by overhead canopy;
- root system shaded by rocks of granite or basalt in origin;
- rapidly drained soils; and
- soils of basalt or granitic origin.

8 MEASURING PROGRESS

The following performance indicators provide a way to define and measure progress toward achieving the recovery (population and distribution) goal and recovery objectives. Performance measures are listed below for each objective with the target of achieving each stated measurable within the next five years.

Measurable for Objective 1:
Specific site management plans for the species are developed for extant populations..

Measurable for Objective 2:
A monitoring protocol is developed and implemented at the extant populations.

Measurable for Objective 3:
A feasibility study for augmentation is undertaken and augmentation implemented if deemed feasible.

9 EFFECTS ON OTHER SPECIES

Tweedy's lewisia occurs in association with other dry habitat species found in rocky sites; however, it is not anticipated that there will be impacts to other species or ecological processes during the initial recovery process. One Red-listed plant species, silvercrown (*Cacaliopsis nardosmia*), is found along the Pacific Crest Trail in Manning Provincial Park, 1.2 km southwest of Windy Joe Summit (B.C. Conservation Data Centre 2014). Brandegee's lomatium is a Blue-listed species that occurs at the Castle Creek location. Recovery planning activities for Tweedy's Lewisia will be implemented with consideration for all co-occurring species at risk, such that there are no negative impacts to co-occurring species at risk or their habitats.

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