Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the White Meconella (*Meconella oregana*) in Canada

White Meconella

2013

Canada

Recommended citation:

Parks Canada Agency. 2013. Recovery Strategy for the White Meconella (*Meconella oregana*) in Canada. *Species at Risk Act* Recovery Strategy Series. Parks Canada Agency, Ottawa. vi+ 31pp.

For copies of the recovery strategy, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk Public Registry (http://www.registrelep-sararegistry.gc.ca/default_e.cfm).

Cover illustration: White Meconella photograph by Matt Fairbarns

Également disponible en français sous le titre
« Programme de rétablissement de la méconelle d'Orégon (*Meconella oregana*) au Canada »

ISBN 978-1-100-22306-3
Catalogue no. En3-4/159-2013E-PDF

PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) 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.

The Minister of the Environment and the Minister responsible for the Parks Canada Agency is the competent minister for the recovery of the White Meconella and has prepared this strategy, as per section 37 of SARA. It has been prepared in cooperation with Environment Canada/Canadian Wildlife Service, the National Research Council Canada, the Department of National Defence, and the Province of British Columbia.

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 the Parks Canada Agency and/or Environment Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the White Meconella 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 Canada and/or the Parks Canada Agency 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.

White Meconella is a species of ephemeral wet areas in Garry Oak ecosystems and recovery of this species will be integrated with the recovery of species in the Recovery Strategy for Multi-Species at Risk in Vernal Pools and other Ephemeral Wet Areas Associated with Garry Oak ecosystems in Canada (Parks Canada Agency 2006).

RECOMMENDATION AND APPROVAL STATEMENT

The Parks Canada Agency led the development of this federal recovery strategy, working together with the other competent minister(s) for this species under the Species at Risk Act. The Chief Executive Officer, upon recommendation of the relevant Park Superintendent(s) and Field Unit Superintendent(s), hereby approves this document indicating that Species at Risk Act requirements related to recovery strategy development have been fulfilled in accordance with the Act.

Recommended by:

Helen Davies
Field Unit Superintendent, Coastal B.C., Parks Canada Agency

Approved by:

Alan Latourelle
Chief Executive Officer, Parks Canada

ACKNOWLEDGMENTS

Thank you to Matt Fairbarns for writing the initial draft of this recovery strategy. The Garry Oak Ecosystems Recovery Team is the recovery team for the White Meconella and is thanked for their involvement in the development of this recovery strategy. Further revision was the result of comments and edits provided by a number of organizations: the Province of British Columbia, Parks Canada Agency, Environment Canada, the Department of National Defence, Natural Resources Canada, and the National Research Council. Thank you to the various landowners who support recovery of this species on their land and provided access for surveys.

EXECUTIVE SUMMARY

White Meconella (*Meconella oregana*) is a small, globally imperilled, annual plant found in isolated sites from southern Vancouver Island to central California. Within its range, it is restricted to vernal seeps with thin soils and short turf plant communities.

There are only eight extant populations known from Canada, containing approximately 1,000 or fewer reproductive individuals in unfavourable years. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has assessed White Meconella as Endangered, and in September 2006, the species was listed as Endangered under Canada's *Species at Risk Act* (SARA).

White Meconella faces threats including habitat loss, invasive alien plant species, destructive recreational activities, and fire suppression. Limitations to this species include its dependence on seepage ecosystems, limited dispersal abilities, its annual life cycle, sensitivity to climate variability, and predisposition for demographic collapse associated with small population sizes.

In the short term, recovery objectives for the White Meconella will focus on the maintenance of populations and habitat and exploring the feasibility of establishing and/or augmenting populations to increase abundance and distribution.

Broad strategies to be taken to address the threats to the survival and recovery of the White Meconella are presented in section 6 Broad Strategies and General Approaches to Meet Objectives.

Critical habitat for White Meconella is identified in this recovery strategy to the extent possible based on best available information.

An action plan for this species will be completed by 2018.

RECOVERY FEASIBILITY SUMMARY

The recovery of White Meconella in Canada is considered feasible based on the criteria outlined by the Government of Canada (2009):

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

   Yes. All existing populations of plants produce seeds. Research on plants in garden environments has demonstrated that White Meconella plants are capable of producing abundant amounts of seed.

2. **Is sufficient suitable habitat available to support the species or could be made available through habitat management or restoration?**

   Yes. While White Meconella requires specialized habitat conditions, there is sufficient habitat suitable to sustain populations in their current condition, and additional unoccupied habitat that may be made suitable for White Meconella through recovery actions (e.g., removal of invasive alien plants).

3. **Can the primary threats to the species or its habitat (including threats outside Canada) be avoided or mitigated?**

   Yes. Primary threats such as residential and commercial development can be mitigated by investigating protection mechanisms and stewardship opportunities. Best Management Practices and/or operational statements can guide recovery planning for the species and its critical habitat, such as those actions outlined in Table 4. Recovery Planning Table. General actions include the control of invasive alien plant species and encroaching native plant species. Control of encroaching vegetation has been successfully implemented in other sites for other species.

4. **Do recovery techniques exist to achieve the population and distribution objectives or can they be expected to be developed within a reasonable timeframe?**

   Yes. General methods of recovery for species found in vernal pools and other ephemeral wetlands in Garry Oak ecosystems are outlined by Parks Canada Agency (2006). Seed collection, propagation and seed storage have already been successfully tested and techniques for re-establishing extirpated populations are likely to be developed. Successful techniques have been developed for removing Scotch Broom (*Cytisus scoparius*) and other woody shrubs with minimal damage to soils or species at risk, but new techniques are needed to control invasive alien herbaceous plant species. More cost-effective techniques to control invasive alien plants may have to be developed to improve the quality of potential habitat.

TABLE OF CONTENTS

1. COSEWIC Species Assessment Information

Date of Assessment: May 2005
Common Name (population): White Meconella
Scientific Name: *Meconella oregana*
COSEWIC Status: Endangered
Reason for Designation: A globally threatened annual plant with a highly restricted Canadian range and area of occupancy present at only eight locations within the naturally rare Garry Oak Ecosystem. Its populations, totalling fewer than 3,500 mature plants, fluctuate greatly with varying precipitation patterns and are at imminent risk of major losses from development within the highly urbanized range of the species. Its habitat has also been impacted by the spread of many exotic weedy plants.
Canadian Occurrence: B.C.
COSEWIC Status History: Designated Endangered in May 2005.
Canadian Occurrence: British Columbia
COSEWIC Status History: Designated Endangered in May 2005. Assessment based on a new status report.

2. Species Status Information

The COSEWIC status report does not estimate the proportion of either the global range or the global population size found in Canada, yet the Canadian range likely represents less than 1% of the global distribution. Incomplete data describing Oregon and California populations suggest that the Canadian population size and occupied area may constitute 50% or more of the global totals (Bittman pers. comm. 2004; Vrilakas pers. comm. 2004). Conservation ranks are provided for White Meconella in all jurisdictions where it occurs in Table 1.

Table 1: Conservation ranks for White Meconella (NatureServe 2010).

Location	Rank[1]	Rank Description
Global Status	G2G3	Imperilled or vulnerable
Canada	N2	Imperilled
British Columbia	S1	Critically imperilled
Unites States	N2	Imperilled
California*	S1.1	Very threatened
Oregon	S1	Critically imperilled
Washington	S2	Imperilled

*S1.1: Seriously endangered in California (California Department of Fish and Game, Natural Diversity Database 2010)

[1] NatureServe Conservation ranks are based on a one to five scale, ranging from critically imperilled (1) to demonstrably secure (5). Status is assessed and documented at three distinct geographic scales global (G), national (N), and state/province (S).

3. Species Information

3.1. Species Description

White Meconella is a member of the poppy family (Papaveraceae). It is a small annual herb arising from a slender taproot. The stems are erect to ascending and either solitary or sparingly branched from near the base of the shoot. See status report (COSEWIC 2005) for more detail.

3.2. Population and Distribution

White Meconella is restricted to southwestern British Columbia, Washington, Oregon, and California. The distribution of populations is highly scattered and there are large discontinuities between populations (Figure 1).

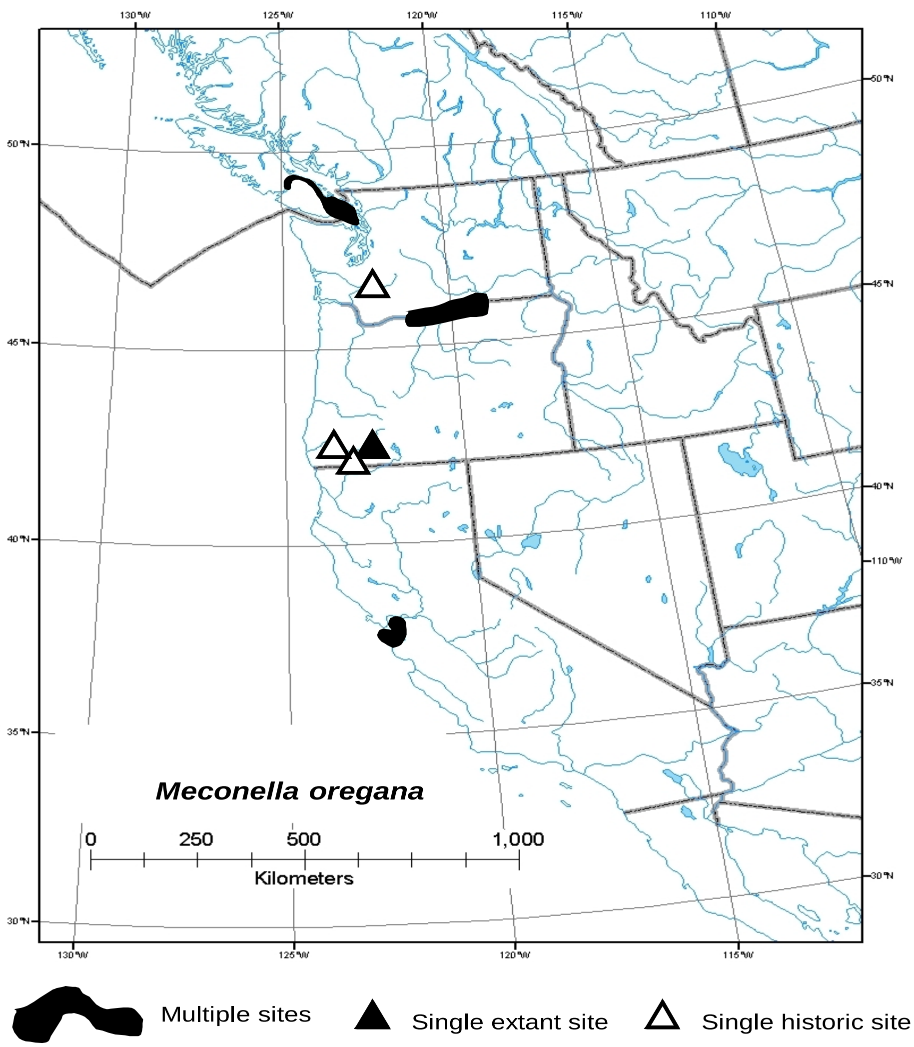

Figure 1. Global distribution of White Meconella (from COSEWIC 2005). Black regions indicate multiple populations, solid triangles indicate a single extant population, and open triangles indicate extirpated populations.

Most Canadian populations of White Meconella occur in the Southern Gulf Islands or Nanaimo Lowlands Ecosections and are in the Coastal Douglas-fir Biogeoclimatic Zone. The only exception is the Port Alberni population, which occurs in the Leeward Island Mountains Ecosection and is in the Very Dry Maritime subzone of the Coastal Western Hemlock (CWHxm) Biogeoclimatic Zone[2] (B.C. Ministry of the Environment n.d.; B.C. Ministry of Forests 2003) (Figure 2). In 2004, the Canadian population totalled 3,300-3,500 flowering individuals. In 2005, the Canadian population totalled approximately 1,000 flowering individuals (Roemer 2005; Avis and Avis 2005; Fairbarns pers. obs. 2005), rather than representing a decline in population size this lower total likely represents variation due to natural climatic factors. Other surveys conducted since 2005 indicate a trend of fluctuating local population size at several populations; also likely due to natural climatic conditions (Fairbarns 2008; B.C. Conservation Data Centre 2011). Another historical population on Jesse Island, in Departure Bay, Nanaimo, has not been observed since 1910. Further surveys are needed to determine the number of populations needed for the survival and recovery of this species in Canada.

Gene flow among sites is likely limited in this species. Canadian localities are about 50 km from the nearest US populations in Washington State; this severely limits the possibly of a metapopulation dynamic or gene flow with US populations (COSEWIC 2005). Further, similar and larger distances exist between extant Canadian populations, and seed dispersal is likely very limited (COSEWIC 2005). It is precautionary to presume that, lacking evidence to the contrary; Canadian populations are not dependant on gene flow or rescue effect from other US or Canadian populations and have shown the ability for long-term persistence without outside influence prior to the influence of human activity (COSEWIC 2005). Loss and degradation of Garry Oak ecosystems has also created a highly fragmented habitat (GOERT 2002; Lea 2006) which further limits seed dispersal between suitable habitats. For the purposes of this recovery strategy, sites separated by a distance of 1 km or more are considered separate populations.

[2] Despite being mapped in the Coastal Western Hemlock (CWH) Zone, the Port Alberni site is located in the very dry maritime (CWHxm) subzone which has a mesoclimate more similar to the Coastal Douglas-fir Zone.

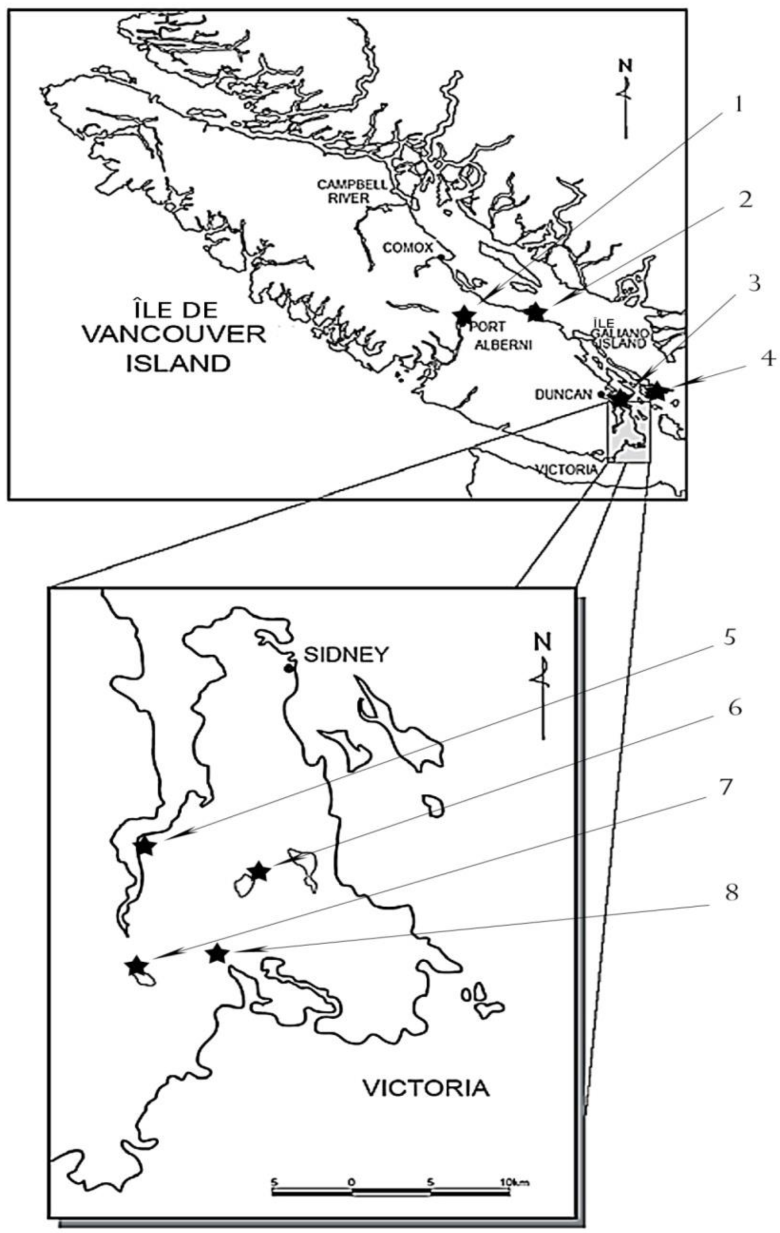

Figure 2. Extant Populations of White Meconella in Canada. Black stars indicate extant populations and the numbers refer to rows in Table 2

Table 2. General location, status, population size, and land tenure for extant populations of White Meconella in Canada (COSEWIC 2005; Roemer 2005; Avis and Avis 2005; Fairbarns pers. obs. 2005; B.C. Conservation Data Centre 2011).

Map Number	General location of population	COSEWIC survey (2004) and most recent (date varies)population counts[†]	Land Tenure
1	Cherry Creek (Port Alberni)	2004: 1,274 (2004) 2005: ~ 500	Non-federal
2	Nanoose Hill (Nanoose)	2004: Population not discovered 2007: 150-200	Federal
3	Mount Tuam (Saltspring Island)	2004: Population not discovered 2011: 2	Non-federal
4	Mount Fisher (Saturna Island)	2004: 52 flowering individuals 2008: 176	Non-federal
5	Jocelyn Hill (Highlands)	2004: Failed to find 2010: 100	Non-federal
6	Observatory Hill (Saanich)	2004: 422 flowering individuals 2005: 197 flowering individuals	Federal and non-federal
7	Skirt Mountain (Langford)	2004: 1,209 flowering individuals 2005: 129 flowering individuals	Non-federal
8	Seymour Hill (View Royal)	2004: 368 flowering individuals 2005: 86 flowering individuals	Non-federal

[†]It is important to note that only the most recent population counts are presented in the table and serve to indicate that all populations have been detected within the last ten years. This table should not be considered a record of survey effort and cannot be used to assess trends for a given population as intervening surveys and subsequent surveys where the species was not detected are not included.

3.3. Needs of the White Meconella

White Meconella has a number of specific biological and ecological needs which may limit the recovery of the species. Factors that may limit the survival and recovery of the Canadian population of White Meconella include:

- Habitat specialist: In B.C., White Meconella is restricted to seepage ecosystems that have constant seepage in the early spring but are very dry during the summer (Fairbarns 2008). Populations are often located on steep south to southwest facing slopes; however, within these slopes the species tends to occupy gently sloping bench microsites with shallow, highly organic soils. These microsites support short-turf plant communities which lack robust vascular plant species. While further habitat information is provided in the status report (COSEWIC 2005), the exact habitat requirements and habitat availability of White Meconella are poorly understood.
- Dispersal: White Meconella seeds are poorly adapted for long distance dispersal resulting in subpopulations of extremely small patch size which are dependent on banked seeds.
- Climate variability: Shifts in climate may limit recovery for this species through changes to the season or duration of inundation. Many species of ephemeral wetlands are sensitive to the timing and amount of rainfall—variations in rainfall can dramatically change species dominance and abundance from year to year (Bliss and Zedler 1997; Graham 2004). Such species also have mechanisms in place that prevent

germination when conditions are unfavourable (Bliss and Zedler 1997). Key demographic (size of populations, subpopulations, and individuals) and phenological (timing of flower production and seed set) attributes of White Meconella vary greatly among years, possibly indicating sensitivity to the rate at which the soil dries out in early spring. In addition, most germination appears to require a warm spell in late January (COSEWIC 2005; Fairbarns 2008). These observations are preliminary and it is largely unknown how the White Meconella will respond to changes in climate.

- Small population size:
  - Stochastic events: The very small areas occupied by White Meconella leave it susceptible to extirpation through unpredictable chance events (and thereby demographic collapse) that would not pose a risk to larger or more extensive populations.
  - Inbreeding depression: It is unknown whether restrictions exist that affect pollination.

4. Threats

4.1. Threat Assessment

Table 3. Threat Assessment Table

Threat	Level of Concern[1]	Extent	Occurrence	Frequency	Severity[2]	Causal Certainty[3]
Threat 1: Habitat Loss and Degradation						
Residential and Commercial Development	High	Localized	Historical and Imminent	Recurrent	High	High
Threat 2: Invasive Alien Species						
Encroachment of Invasive Alien Species	High	Widespread	Current	Continuous	High	Medium
Threat 3: Disturbance or Harm						
Destructive Recreational Use	Medium	Localized	Current	Recurrent	Moderate	Medium
Soil Compaction due to Grazing	Low	Widespread	Current	Continuous	Unknown	Low
Threat 4: Changes in Ecological Dynamics						
Fire Suppression	Medium	Widespread	Current	Continuous	Unknown	Low

[1] *Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the recovery of the species, consistent with the population and distribution objectives. This criterion considers the assessment of all the information in the table).*

[2] *Severity: reflects the population-level effect (High: very large population-level effect, Moderate, Low, Unknown).*

[3] *Causal certainty: reflects the degree of evidence that is known for the threat (High: available evidence strongly links the threat to stresses on population viability; Medium: there is a correlation between the threat and population viability e.g., expert opinion; Low: the threat is assumed or plausible).*

4.2. Description of Threats

4.2.1. Threat 1: Habitat Loss and Degradation

Residential and Commercial Development

Past and projected habitat loss presents the most serious threat to White Meconella. At least three populations (“Victoria”, “Tod Inlet Victoria”, and “Elk Lake”) are believed to have already been lost to development (COSEWIC 2005) and the two largest Canadian populations (representing 85% of the total Canadian population) occur on private lands that are threatened by residential and commercial development (COSEWIC 2005).

This threat is reflective of a century-long trend that has seen the loss of more than 95% of Garry Oak ecosystems in the Victoria area (Lea 2002; Lea 2006). Since the habitat of White Meconella is closely associated with Garry Oak ecosystems, the historical loss of Garry Oak ecosystems probably reflects a similar decline in habitat suitable for survival and recovery of White Meconella.

This threat is considered of high concern because the 85% of the total Canadian population occurs on non-federal land which is threatened by development.

4.2.2. Threat 2: Invasive Alien Species

Encroachment of Invasive Alien Species

Invasive alien species pose as great a threat to populations of White Meconella as habitat loss and are common in sites occupied by White Meconella. Scotch Broom (*Cytisus scoparius*), an invasive alien shrub, grows adjacent to and within some subpopulations of White Meconella and may suppress the growth and development of White Meconella by intercepting light or out-competing White Meconella for moisture and nutrients. Most sites with existing subpopulations of White Meconella have a significant component of invasive alien annual grasses and herbs, such as; Hairgrass (*Aira* spp.), annual Fescues (*Vulpia* spp.) and Brome (*Bromus* spp.) species, Hedgehog Dogtail (*Cynosurus echinatus*), Common Stork's-bill (*Erodium cicutarium*), Small-flowered Catchfly (*Silene gallica*), and Dovefoot Geranium (*Geranium molle*), which grow among, and form stands taller than, White Meconella resulting in negative effects similar to Scotch Broom.

Nevertheless, the cover of invasive alien annual plant species is typically less on occupied sites than on similar but unoccupied sites in the region (including areas where White Meconella formerly occurred). This suggests that while the presence of invasive alien herbaceous plant species within several White Meconella subpopulations may have a deleterious effect, the occupied sites contain significantly less competition by invasive alien plant species than unoccupied sites with similar physical characteristics. The causal certainty of this threat is medium because the correlation between the low invasive alien species counts (compared to adjacent unoccupied habitats) and White Meconella occurrences needs further examination. Nevertheless, the effects of competition and habitat change are likely to have severe effects on the populations of White Meconella and this threat is of high concern.

4.2.3. Threat 3: Disturbance or Harm

Destructive Recreational Use

Recreational use may have a significant impact on some populations of White Meconella as well as the habitat necessary for survival and recovery of the species. Recreational effects include trampling and soil compaction by hikers, which is quite intensive within a few metres of the Seymour Hill population. Motorized vehicle use poses a threat to the Cherry Creek population, which has become accessible as a result of recent logging activity in the area. Because this threat applies to the largest known Canadian population and has the potential for moderate severity, the level of concern is medium.

Soil Compaction Due to Grazing

Grazing may have little direct impact on White Meconella but the hooves of grazing livestock may contribute to habitat degradation and soil compaction that indirectly impacts the species. Although the status report lists grazing as a threat, it also indicates that wildlife may play an important role in seed dispersal and microsite enrichment. Further, there is potential that disturbance from grazing animals helps to maintain the open nature of White Meconella sites (i.e., landscapes), and the patchy nature of habitat that is suitable for the species. In the absence of evidence that grazing has a net negative effect on one more populations this factor should not be treated as a confirmed threat and its level of concern is therefore low.

4.2.4. Threat 4: Changes in Ecological Dynamics

Fire Suppression

Fire suppression may have contributed to the loss of habitat for White Meconella by allowing native and invasive alien shrubs and robust herbaceous plant species to invade habitat suited to the White Meconella or adjacent sites. Effects are similar to Threat 2; invasion by invasive alien species. Changes in ecological dynamics and natural processes have the potential to completely alter the habitat such that it is unsuitable for White Meconella. However, because the severity of this threat is unknown, it is of medium concern.

5. Population and Distribution Objectives

In Canada, White Meconella is found in habitats of open rocky or grassy sites that have early spring seepage but dry out in the summer and are associated with Garry Oak ecosystems. As such, the species has a highly restricted Canadian range and area of occupancy. Within this range, significant habitat loss since European settlement (Lea 2006) has likely resulted in population reductions. Development, encroachment of vegetation, and effects resulting from recreational activities and domestic grazing continue to exacerbate the situation (COSEWIC 2005). Given the permanent loss of most of the original habitat, it is not possible to recover the species to its natural area of occupancy or to its original probability of persistence. There are currently eight known White Meconella populations in Canada, some of which have very low population sizes based on the most recent survey (see Section 3).

In general, it is believed that multiple populations and thousands of individuals are likely required to attain a high probability of long-term persistence for a species (Reed 2005, Brook *et al.* 2006, and Traill *et al.* 2009). In an analysis of several published estimates of minimum viable population (MVP) sizes, Traill *et al.* (2007) found that the median population size required for plants to achieve a 99% probability of persistence over 40 generations was approximately 4,800 individuals (but see Flather *et al.* 2011, Garnett and Zander 2011, and Jamieson and Allendorf 2012 for critical evaluations of the analyses and the applicability of the results). Such information provides a useful guide, but developing specific quantitative and feasible objectives must consider more than just generalized population viability estimates, including the historical number of populations and individuals, the carrying capacity of extant (and potential) sites, the needs of other species at risk that share the same habitat, and whether it is possible to establish and augment populations of the species (Parks Canada Agency 2006, Flather *et al.* 2011, Jamieson and Allendorf 2012). Because not enough of this information is available for White Meconella, it is currently not possible to determine to what extent recovery is feasible and, therefore, it is not possible to establish quantitative long-term objectives. Recovery planning approaches (see Section 6) are designed to respond to knowledge gaps so that long-term, feasible, and quantitative recovery objectives regarding size and number of populations can be set in the future. At this time it is possible to set short-term objectives that focus on maintaining seven populations and maintaining the habitat at an eighth population, while exploring the feasibility of restoring populations and establishing new populations to increase abundance and distribution:

Objective 1: Maintain the Cherry Creek, Nanoose Hill, Mount Fisher, Jocelyn Hill, Observatory Hill, Skirt Mountain, and Seymour Hill populations of White Meconella.

Objective 2: Maintain the habitat at the Mt. Tuam site while the feasibility of population restoration is assessed for White Meconella.

Objective 3: Establish and/or augment populations to increase abundance and distribution[3] if determined to be feasible and biologically appropriate for White Meconella.

6. Broad Strategies and General Approaches to Meet Objectives

Broad strategies and approaches to meet the population distribution objectives for White Meconella include:

- Habitat and species protection: protect the extant populations and habitat from destruction (e.g., land conversion, trampling and grazing) by developing protection mechanisms/instruments for protection;
- Stewardship: prepare best (i.e., beneficial) management practices and engage the cooperation of all involved landowners and managers in habitat stewardship;
- Research: address knowledge gaps including presence of introduced species versus the presence of White Meconella and effects of grazing;

[3] The intent is to increase the area of occupancy and maintain the extent of occurrence.

- Public education and outreach: increase public awareness about the conservation value and management of White Meconella;
- Population research and monitoring: address knowledge gaps concerning life history, genetic connectivity and population and distribution targets; plan and implement a monitoring strategy;
- Population restoration: restore extant populations and establish new population(s) to recover the Canadian population of the species.

6.1. Strategic Direction for Recovery

Table 4. Recovery Planning Table

Threat or Limitation	Priority	Broad Strategy to Recovery	General Description of Research and Management Approaches
Residential and commercial development	High	Habitat and species protection	• Identify protection mechanisms/instruments for the species and its critical habitat.
Encroachment of invasive alien plant species Destructive recreational use Fire suppression	High	Stewardship	• Prepare Best Management Practices to support landowners in habitat stewardship activities such as control of invasive alien plant species, management of recreation activities and mitigation of impacts of fire suppression. • Engage the cooperation of all involved landowners and land managers in habitat stewardship according to Best Management Practices outlined above.
	Medium	Research	• Examine relationship and causality between levels of invasive alien annual plants and presence of White Meconella: do invasive alien herb species exclude White Meconella from suitable habitat?
	Low	Public education and outreach	• Deliver public education and outreach concerning species at risk, their habitats, needs, and management.
Knowledge gaps concerning population biology and trends Limiting factor: climate variability	High	Population research and monitoring	• Determine whether there are restrictions on pollination/reproduction, dispersal, seed production, seed dormancy, recruitment, or recruit survival. • Assess genetic connectivity between sites to inform the application of population targets at a size likely to ensure long-term persistence. • Implement a monitoring strategy for the Canadian population to track population size, trends and habitat conditions at each subpopulation.
Soil compaction due to grazing	Low	Research	• Examine site specific negative and/or positive effects of grazing on White Meconella populations
Limitation of small population size Limitation of Habitat specialist	Medium	Population restoration	• Implement a population restoration plan for existing populations (including a monitoring component). • Determine quantitative population and distribution targets that are likely to ensure long-term persistence. • Determine appropriate restoration and adaptive management techniques for existing populations of White Meconella and their habitat. • Develop population establishment/augmentation techniques. • Increase the size and abundance of existing populations. • Develop and implement a restoration plan for establishing one new population of White Meconella. • Identify high priority sites for establishment of White Meconella populations. • Conduct trials for White Meconella population establishment and augmentation. • Monitor success and impacts of translocations.

6.2. Narrative to Support the Recovery Planning Table

Effective habitat conservation and stewardship by private landowners are among the highest priorities to ensure the survival and recovery of the White Meconella, due to the fact that the largest populations occur on private lands and these may be threatened by residential and commercial development (Table 4).

White Meconella is a poorly understood species, thus research and monitoring will be key to effective and efficient recovery of this species. Key demographic attributes need to be understood for populations in Canada to determine what stages present the most serious restrictions to population growth and to identify underlying factors for the restriction. This information will provide a scientific basis for developing well-targeted management actions that are likely to foster efficient and effective recovery. Knowledge of germination dates, important growth periods, flowering times, and seed dispersal periods will provide a scientific basis for timing recovery actions and avoiding adverse impacts. Knowledge of seed viability, germination requirements, and seed bank longevity will assist in the development of effective techniques for seed collection and storage, propagation, and population establishment or augmentation. When it is efficient, effective, and poses little risk to the species, research should be coupled with applied population restoration whenever possible and appropriate, to optimize expediency and success of restoration measures. Research and monitoring activities will provide critical information regarding outcome of research and the success of recovery.

Research and monitoring activities will also provide important information on the effects and potential limitations imposed by climate variations. For example, climate variability may restrict reproduction. Similarly, climate variability and related impacts on natural variation in annual population sizes will likely be a factor considered in determining suitable population target range (i.e., extent of variation around target average). Monitoring population and habitat will also provide information regarding the species' response to weather patterns, which will help to inform discussions regarding how to respond to climate variability.

Design of the monitoring program is an important consideration, especially for rare annual plants which are likely to exhibit population fluctuations or rely on seed banks (Bush and Lancaster 2004): Data should be collected regularly over several years to account for population fluctuations. Further, data should be collected in years when plants are absent as well as when they are present to provide information on the species' responses to environmental conditions. When seed banks are involved, they are an important part of the lifecycle and must be considered in estimates of population size—the presence of even one individual may indicate a viable seed bank is present (Bush and Lancaster 2004).

In addition to research and monitoring, population restoration will also be a key factor in the recovery of this species because there are relatively few populations, many of which are small and thus susceptible to loss. Existing populations will be bolstered through habitat restoration and, if necessary, augmentation using the closest genetic match, to improve their chances of survival. Further, at least one new population will be established, if feasible, to provide resiliency and guard against the loss of existing populations.

Public support is important for the recovery of White Meconella. Landscape level changes in land use have, and are continuing to alter the habitat and processes this species depends on. The public use of some of the sites means that public support and involvement will be required to effect changes away from the current damaging land use, to practices that are compatible with White Meconella (such as reducing trampling and the resulting plant death and soil compaction).

7. Critical Habitat

Areas of critical habitat for White Meconella are identified in this recovery strategy. Critical habitat is defined in the *Species at Risk Act* as "...habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species" (Subsection 2(1)). Habitat for a terrestrial wildlife species is defined in the *Species at Risk Act* as "…the area or type of site where an individual or wildlife species naturally occurs or depends on directly or indirectly in order to carry out its life processes or formerly occurred and has the potential to be reintroduced" (Subsection 2(1)).

7.1. Identification of the Species' Critical Habitat

Critical habitat for White Meconella is identified in this recovery strategy to the extent possible based on best available information; more precise boundaries may be mapped, and additional critical habitat may be added in the future if ongoing research (e.g., through work by the province, stewardship and recovery groups, university projects, or related federal Interdepartmental Recovery Fund projects) supports the inclusion of areas beyond those currently identified. It is recognized that the critical habitat identified below is insufficient to achieve the population and distribution objectives. Critical habitat has been identified for all eight known populations (Cherry Creek, Nanoose Hill, Mount Tuam, Mount Fisher, Jocelyn Hill, Observatory Hill, Skirt Mountain, and Seymour Hill), further study is required (see below) to confirm the existence of and identify critical habitat for the Jesse Island population. The schedule of studies section (Section 7.2; Table 5) outlines activities required to identify additional critical habitat necessary to meet the population and distribution objectives.

The habitat of White Meconella plants is generally characterized as vernally moist, low elevation rocky or grassy slopes (Douglas *et al* 1999). Populations are found on southern Vancouver Island and Gulf Islands within local climate characterized by warm, dry summers and mild winters (B.C. Conservation Data Centre 2011). Field investigations by local botanical experts at the sites of five extant populations provided information to identify critical habitat (Fairbarns 2008a,b; Maslovat and Junk 2008; Costanzo *et al.* 2009; Fairbarns 2010; GOERT 2011). The critical habitat attributes below cover the range of attributes from studied sites, but not all sites have been studied in detail. Further, due to the general nature of these attributes, they may include some habitat types that are unsuited to the species. Therefore, critical habitat identification is based on the recorded White Meconella patches not the presence of the following biophysical attributes which generally characterize the critical habitat:

- Open areas with full sun and short or sparse vegetation (cover of trees, shrubs, and tall vascular plants is never substantial).

- Soil surface is characterized by at least some exposed mineral soil, and fine litter or coarse woody debris is rarely present.
- Elevations less than 250 m.
- Steep south to southwest facing slopes, containing relatively level benches.
- Soils are thin (generally less than 10 cm thick), well drained, and are generally rich in organic matter with a significant component of sand and/or fine gravel.
- Near constant seepage in the early growing season (January to March), but by late spring the soil experiences significant water deficits for prolonged periods.

White Meconella's requirement for open areas with full sun and constant seepage in the growing season can be used to define the area of critical habitat and are explained in more detail below:

The White Meconella is intolerant of shading and the area surrounding the plants and the seed bank must be clear of shading shrubs and trees; this area is the canopy opening required by the species. Canopy openings must be large enough that the White Meconella plants are not sheltered by surrounding vegetation. The minimum size of openings can be determined based on the height of vegetation that is able to grow in the area and cast shade on the White Meconella (Spittlehouse *et al.* 2004). An additional consideration with regards to canopy opening is that when tall vegetation falls, it will cover an area of ground for a distance equal to its height.

In addition to openings, specific hydrological characteristics are critical to the survival of this species. Within its Canadian range White Meconella occurs on sites that have constant seepage in the early spring but are very dry during the summer. This seepage is provided by the catchment associated with each group of plants. The catchment area is directly responsible for receiving rainwater which flows along the prevailing topography towards the plants. Surface water flow and subsurface seepage from this catchment area is essential to the survival of the White Meconella plants. These catchment areas are generally small and isolated within landscape scale catchments.

Critical habitat for the survival of each patch[4] of White Meconella is composed of the minimum canopy opening and the catchment area occupied by the patch. The minimum canopy opening and the catchment area are always connected to the recorded location of a White Meconella patch and in all cases will overlap to some degree (no special status is applied to areas of overlapping critical habitat). The default minimum canopy opening required for light to reach the plants is the area bounded by a 20 m distance surrounding the location of each patch in all directions (20 m is generally the maximum height attained by trees in the soils surrounding White Meconella). The catchment for each patch of White Meconella is delineated by following the upslope high point of land which divides water flowing towards the patch location from water flowing away; these catchment areas are generally relatively small and isolated within landscape catchments. Conceptually the minimum canopy opening and the catchment area can be visualized as a "v" shaped seepage draining into an "o" shaped minimum canopy opening—

[4] Patch is a term used to refer to a single or group of several plants in close proximity. A specific mapping scale and minimum separation distance have not been used to quantitatively define a patch; the identification of patches is based on survey work performed by a biologist familiar with the species. Lacking any detailed information on seed bank extent, the seed bank is assumed to be included within each patch: the only information pertaining to the spatial extent of the White Meconella seed bank is derived from the physical characteristics of the seeds, and dispersal distance is probably very limited (COSEWIC 2005).

though in reality the minimum canopy opening and the catchment area are rarely regularly shaped and it is possible for the catchment to be completely contained within the minimum canopy opening. If the seepage extends beyond the canopy opening the top of the "v" of seepage influence represents the upper limit of the habitat, otherwise the canopy opening represents the limit of the habitat.

Populations of White Meconella are likely prone to large annual fluctuations (COSEWIC 2005). While some habitat (a given minimum canopy opening and catchment) may not be used every year, the presence of plants in one year indicates that the habitat may be critical for storing seeds and boosting seed production in favourable years. All habitat used at any time (during a year or over multiple years) by each patch of plants in each extant population is required to achieve the population and distribution objectives and is critical habitat; however, due to population fluctuations this habitat cannot be completely identified based on data from any single year: a long term data set is required to ensure the full range of population fluctuation is captured. Recent data (Fairbarns 2008a,b; Maslovat and Junk 2008; Costanzo *et al.* 2009; Fairbarns 2010; GOERT 2011) can be used to identify a minimum baseline of critical habitat required by White Meconella populations. It is expected that these datasets do not represent the maximum extent of annual variation in these populations; and therefore, do not represent the total habitat required for the survival of extant White Meconella populations. The studies referred to above have been used to guide the location of boundaries within which critical habitat is found; these boundaries were applied as a minimum bounding area to enclose all known minimum canopy openings and catchment areas (along with any associated GPS uncertainty) for each population. It is expected that over time, continued monitoring which documents annual fluctuations in population extent and habitat use will provide data which more confidently characterizes the total habitat needed by this species.

Within the geographical boundaries identified in Figure 3 through Figure 7, critical habitat for White Meconella is the minimum canopy opening and catchment area associated with the recorded location of each White Meconella patch. Unsuitable habitat within these areas, such as existing infrastructure (e.g., roads, parking lots, and buildings at Observatory Hill) is not necessary for the survival or recovery of White Meconella and is not critical habitat. The critical habitat for these locations was mapped in 2008 and 2009 by local botanical experts (Fairbarns 2008a,b; Maslovat and Junk 2008; Costanzo *et al.* 2009; Fairbarns 2010).

Within the geographical boundaries identified in Figure 8, critical habitat for White Meconella is the minimum canopy opening and catchment area for the recorded location of each White Meconella patch. These areas were mapped by GOERT using the best available information (2011).

Within the geographical boundaries identified in Figure 9 and Figure 10, critical habitat for White Meconella is the minimum canopy opening and any catchment area for the recorded location of each White Meconella patch. The critical habitat is based on occurrence data (B.C. Conservation Data Centre 2011). While the Skirt Mountain location was visited in 2011, no plants could be located to map critical habitat in detail (GOERT 2011). Although more detailed surveys will be conducted in the future, it is expected that the critical habitat falls within the boundaries identified in Figure 9 and Figure 10.

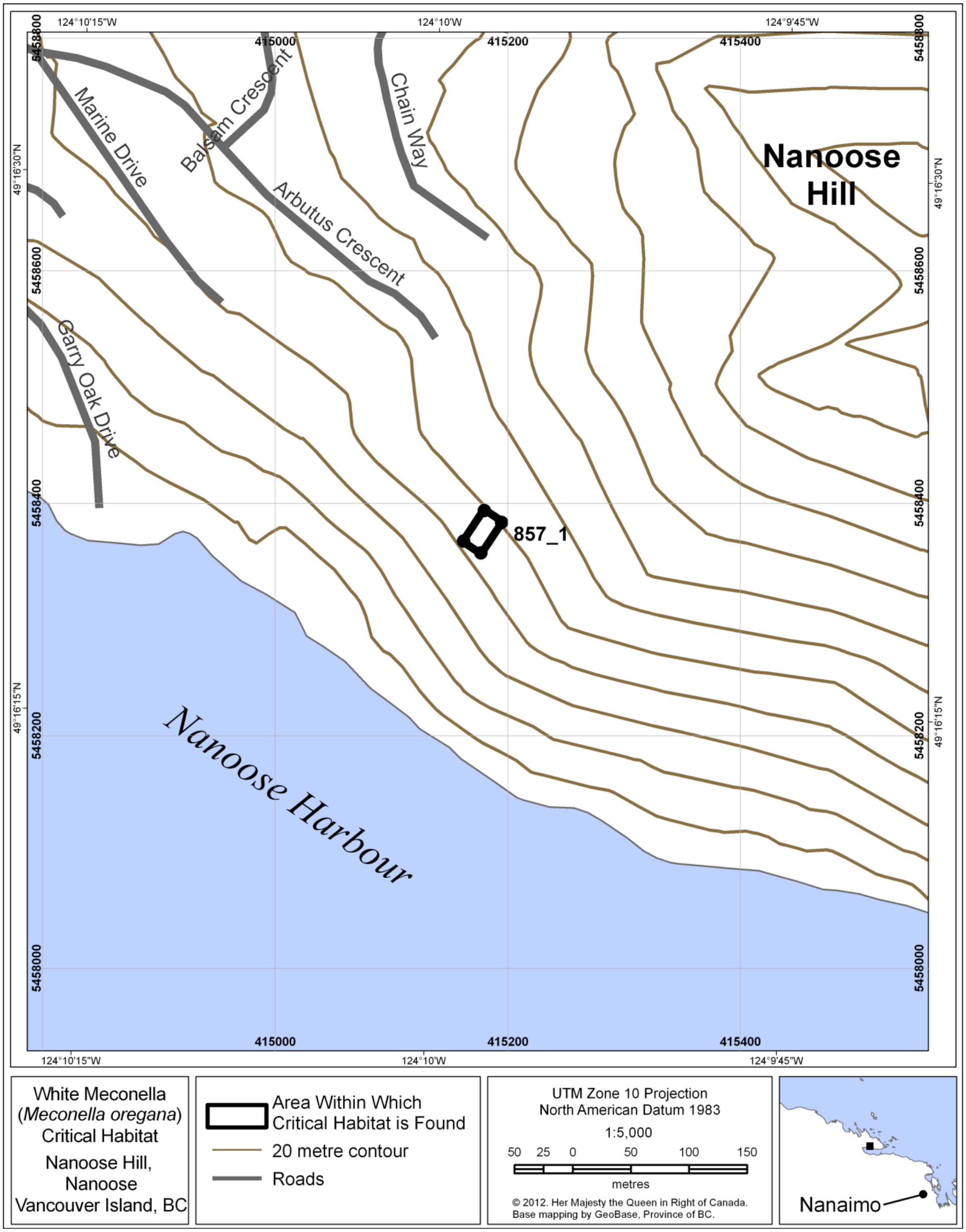

Figure 3. Area (~0.06 ha) within which critical habitat for White Meconella is found at Nanoose Hill. As of October 2011 approximately 0.05 ha of critical habitat has been identified within this area.

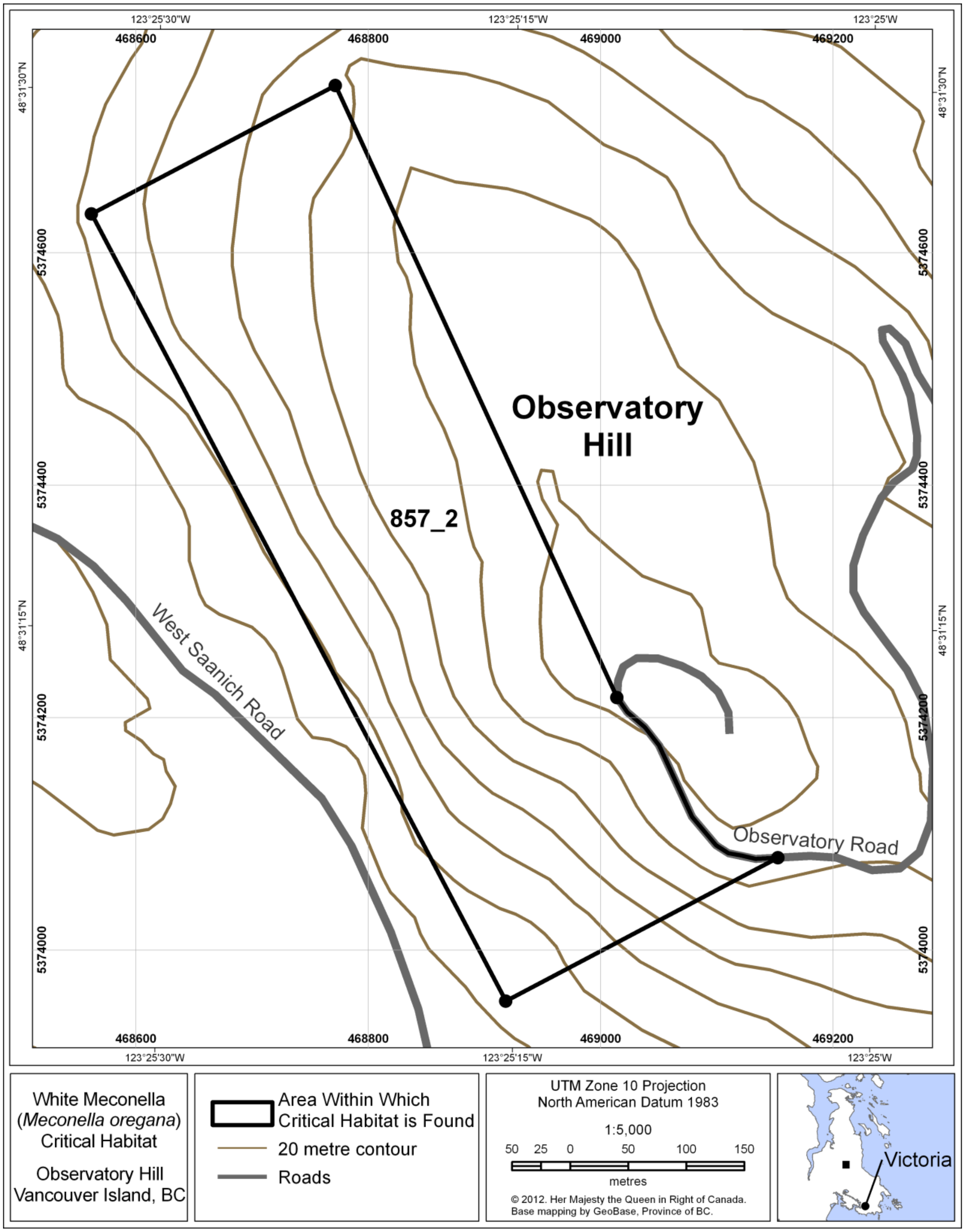

Figure 4. Area (~17.7 ha) within which critical habitat for White Meconella is found at Observatory Hill. As of October 2011 approximately 2.5 ha of critical habitat has been identified within this area.

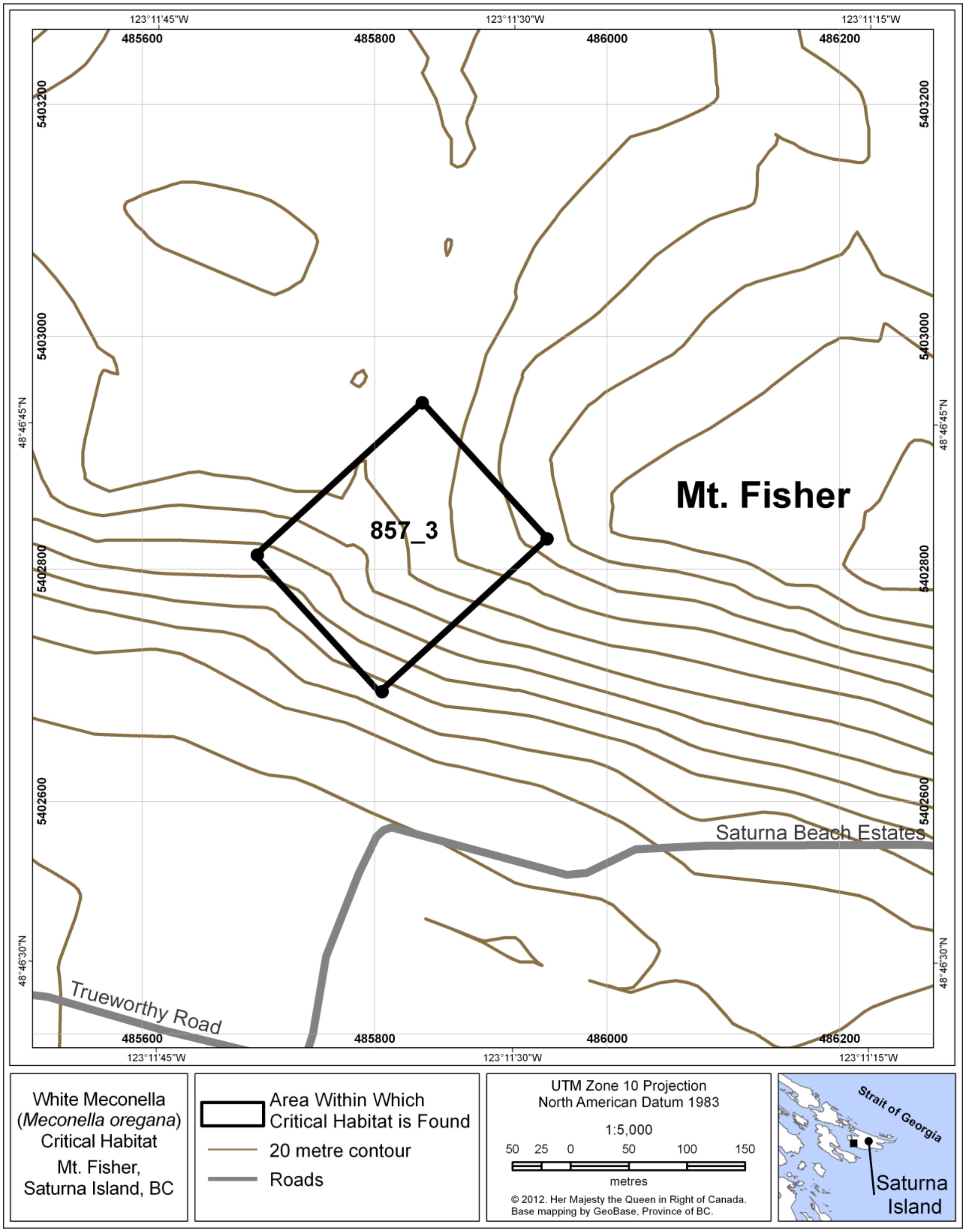

Figure 5. Area (~3.1 ha) within which critical habitat for White Meconella is found at Mount Fisher (Saturna Island). As of October 2011 approximately 0.1 ha of critical habitat has been identified within this area.

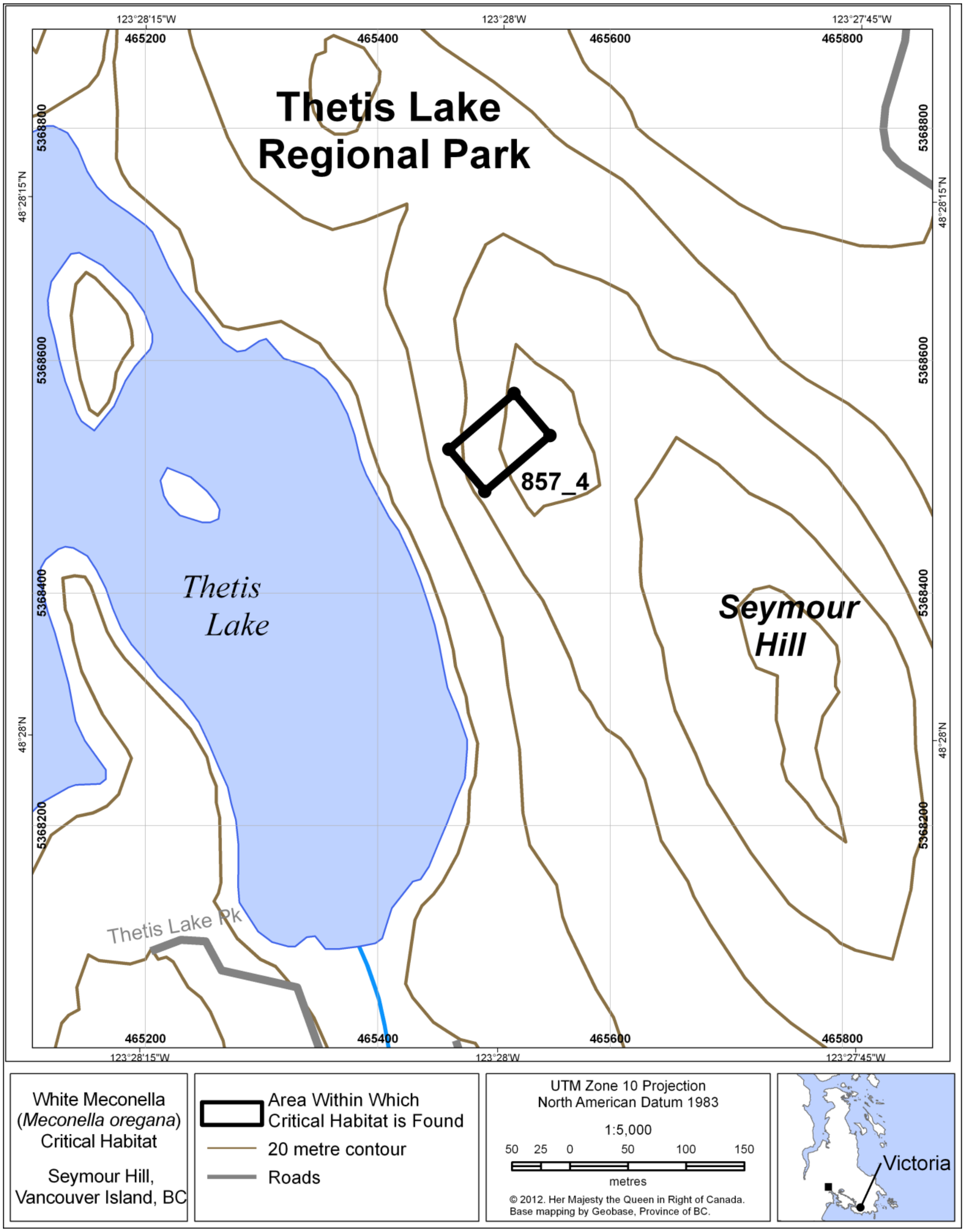

Figure 6. Area (~0.4 ha) within which critical habitat for White Meconella is found at Seymour Hill. As of October 2011 approximately 0.05 ha of critical habitat has been identified within this area.

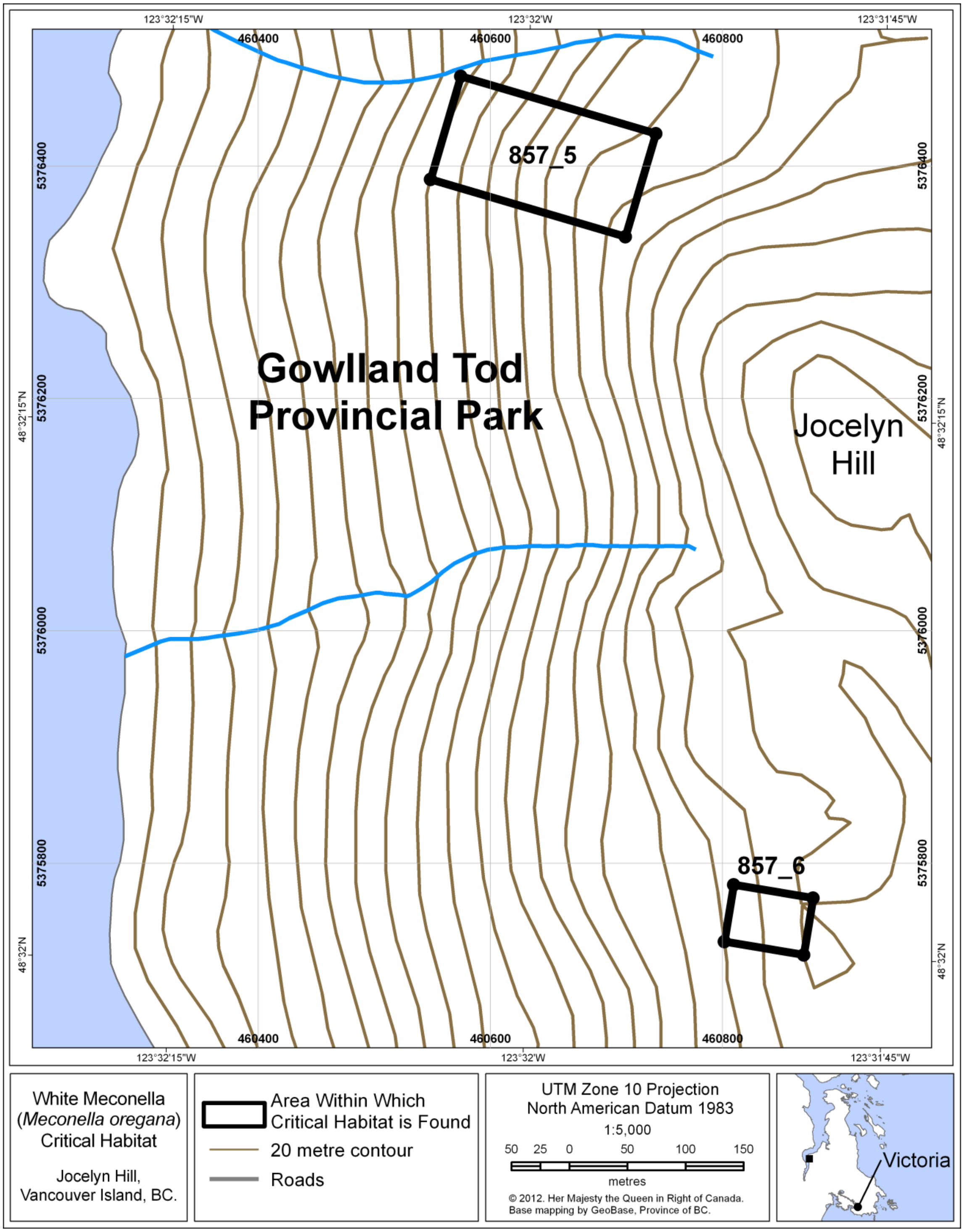

Figure 7. Area (~2.0 ha) within which critical habitat for White Meconella is found at Jocelyn Hill. As of October 2011 ~0.5 ha of critical habitat has been identified within these two areas.

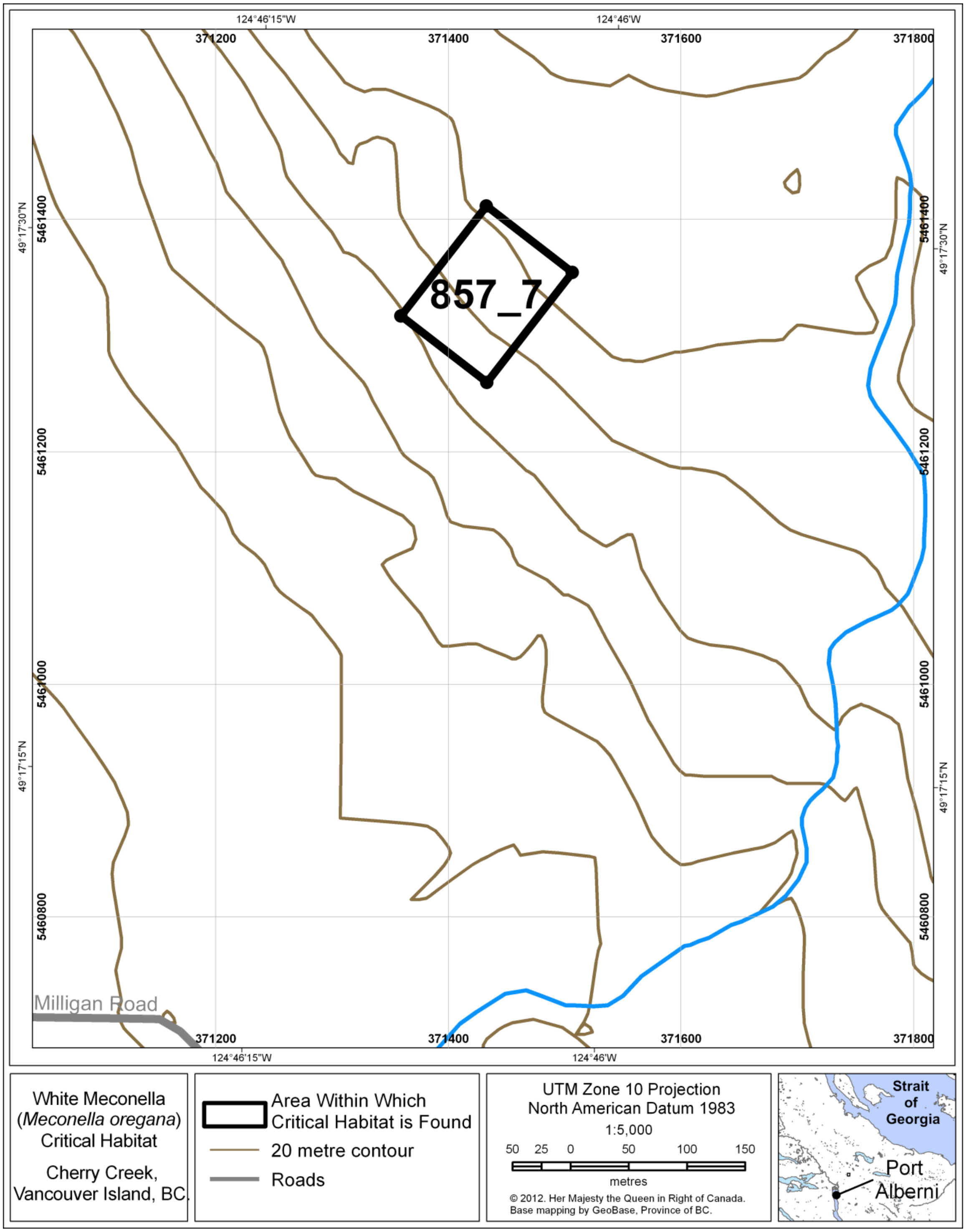

Figure 8. Area (~1.1 ha) within which critical habitat for White Meconella is found near Cherry Creek. As of October 2011 approximately 0.5 ha of critical habitat has been identified within this area.

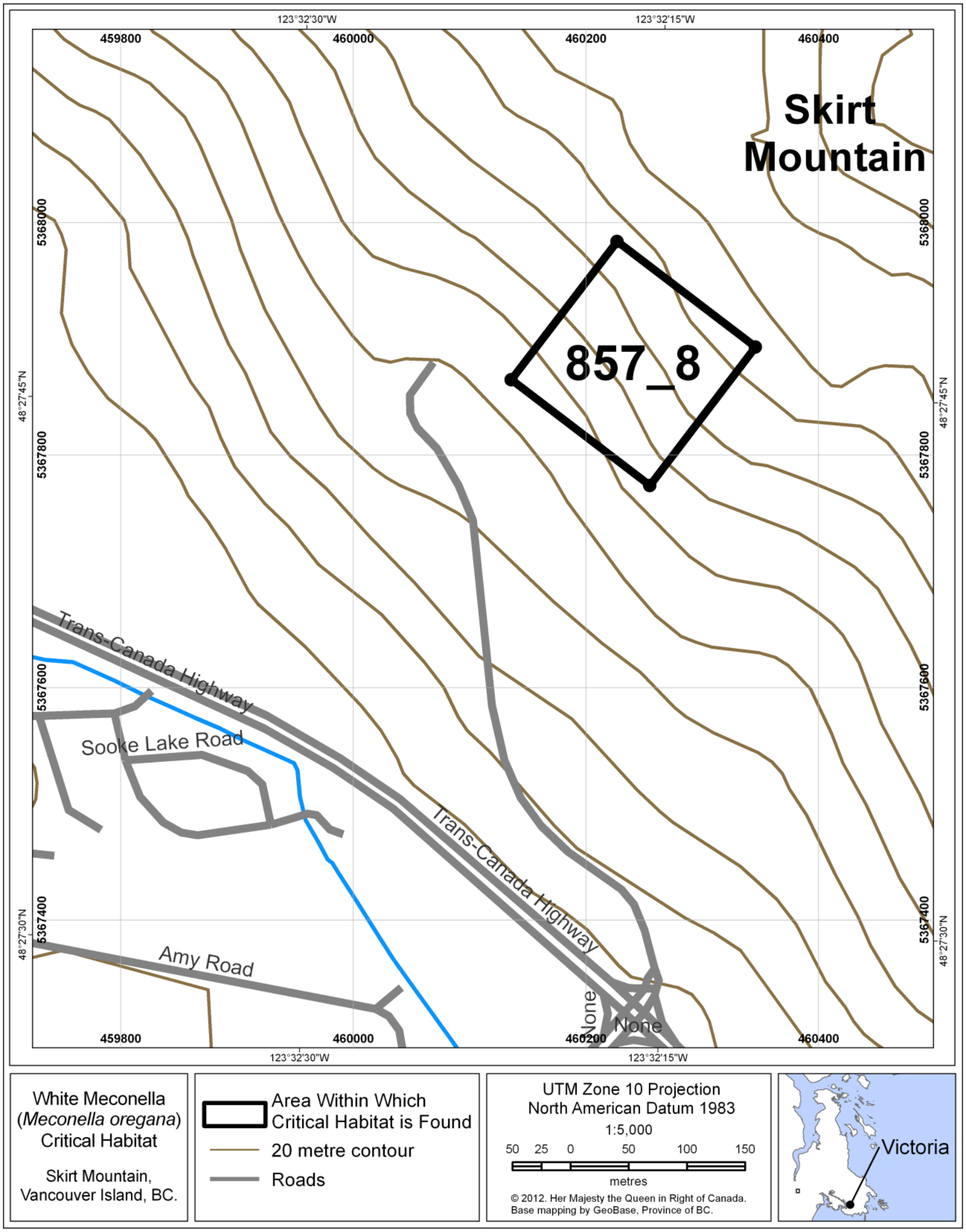

Figure 9. Area (~2.2) within which critical habitat for White Meconella is found on Skirt Mountain. As of October 2011 approximately 0.2 ha of critical habitat has been identified within this area.

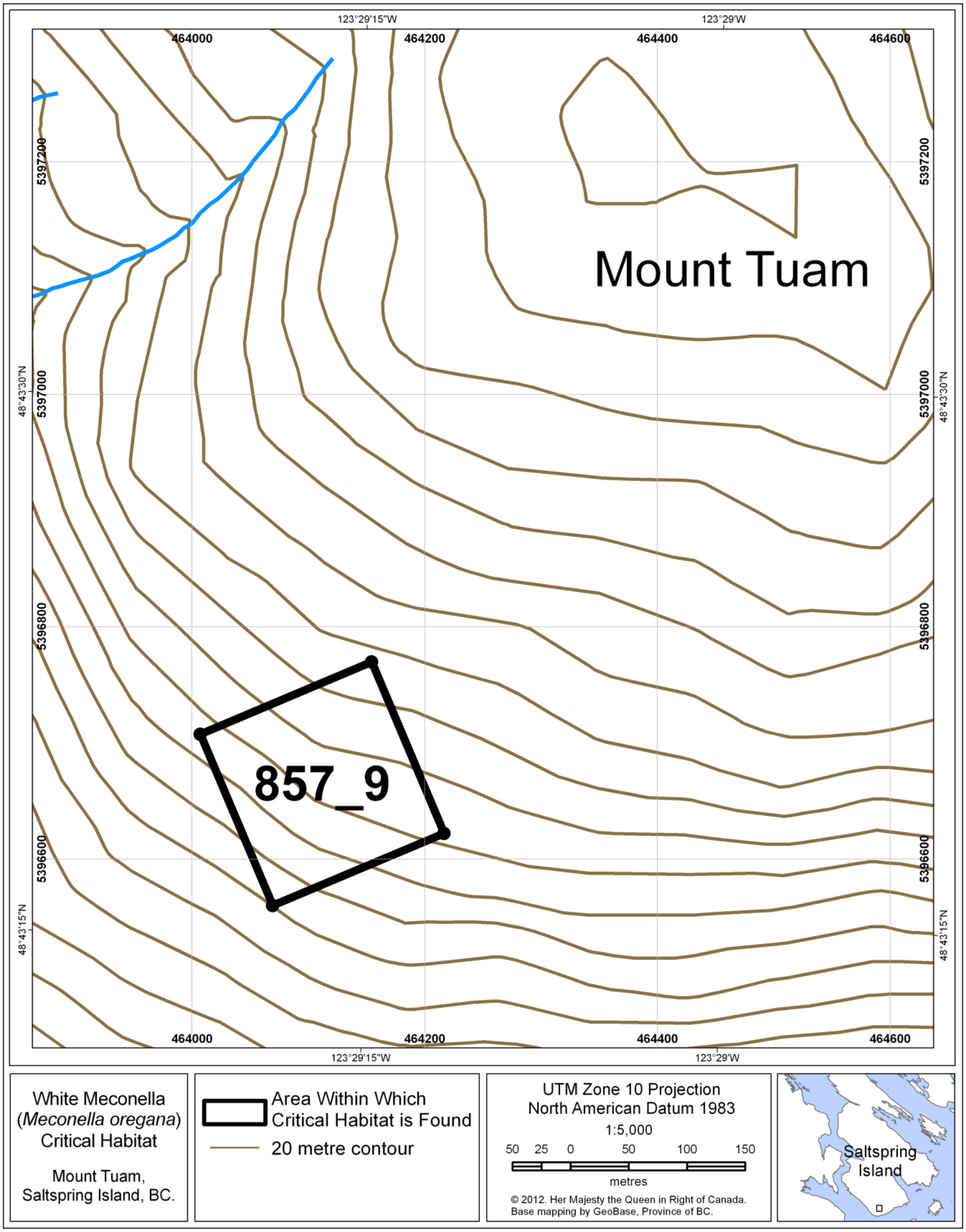

Figure 10. Area (~2.6) within which critical habitat for White Meconella is found on Mount Tuam. As of October 2011 approximately 0.07 ha of critical habitat has been identified within this area.

7.2. Schedule of Studies to Identify Critical Habitat

Table 5. Schedule of Studies

Description of Activity	Rationale	Timeline
To identify sufficient critical habitat for the survival of existing populations, additional monitoring of existing populations is required to refine the maximum patch extent and habitat used.	Large population fluctuations mean that critical habitat cannot be completely identified based on data from a single year (it may have been a poor year with small populations): a long-term data set is required to ensure the full range of population fluctuation and habitat use is captured.	Ongoing, until statistical analysis of population fluctuations provides some measure of confidence that major fluctuations have been accounted for.
Determine if the population on private land at Jesse Island (population #8 in Status Report) is extant.	Required in order to protect the populations.	2013
Identification of sites with a potential for establishment of new populations of White Meconella and identification of critical habitat for any re-established populations.	Required to meet population and distribution objectives.	2017
Test the suitability of sites proposed for additional populations.	Attempt to establish, maintain, and monitor White Meconella individuals in an experimental manner in one of the sites.	2017
	If suitability tests are successful, test the potential for establishing new self sustaining populations and expanding existing populations through introduction of additional seeds or seedlings into suitable habitats. Seed bank viability must be determined to facilitate restoration and introductions.	2018 onwards
	Undertake analyses to determine the amount and configuration of habitat needed to achieve the recovery objectives.	Dependent upon previous steps

7.3. Activities Likely to Result in the Destruction of Critical Habitat

Examples of activities likely to destroy critical habitat are provided below and are not limited to those in Table 6. It is important to note that some activities have the potential to destroy critical habitat from outside the critical habitat. Destruction of critical habitat will result if any part of the critical habitat is degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from single or multiple activities at one point in time or from the cumulative effects of one or more activities over time.

Table 6. Examples of Activities Likely to Result in the Destruction of Critical Habitat.

Activity	Effect of activity on critical habitat	Most likely sites
Recreational use (e.g., walking/ hiking, off road vehicle use, domestic animal exercising).	Soil compaction and loss of vegetation leading to altered habitat attributes including alteration of hydrological regimes (such as decreased infiltration and increased runoff). Plants may become stressed and die or be unable to germinate due to impaired ability of the habitat to provide suitable soil moisture. Habitat is likely to be lost due to increased erosion. In addition, these activities are likely to introduce or spread invasive alien plant species. Invasive alien plant species compete with White Meconella and alter the availability of light, water, and nutrients in the habitat, such that the habitat would not provide the necessary habitat conditions required by White Meconella.	• Cherry Creek • Jocelyn Hill • Seymour Hill • Nanoose Hill
Development (e.g., construction) or landscaping (e.g., planting, trail building or maintenance).	This activity can cause direct land conversion, soil compaction and hydrological effects (see recreational use), altered moisture regime (e.g., impounded drainage, or reduced water flow to the plants through ditching, or diversion of subsurface water by built structures), and introduction of invasive alien plant species (e.g., intentional plantings or accidental introductions such as facilitated by unclean machinery; see recreational use for effect of invasive alien plant species).	• Skirt Mountain • Cherry Creek • Mount Fisher • Observatory Hill

8. Measuring Progress

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives. Specific progress towards implementing the recovery strategy will be measured against indicators outlined in subsequent action plans. Progress towards recovering White Meconella in Canada will be assessed using the following measures:

Objective 1: Maintain the Cherry Creek, Nanoose Hill, Mount Fisher, Jocelyn Hill, Observatory Hill, Skirt Mountain, and Seymour Hill populations of White Meconella.

- By 2018, best management practices are developed and implemented at three or more sites.
- The populations remain extant.
- By 2023, all populations show a stable or increasing trend in population size[5].

Objective 2: Maintain the habitat at the Mt. Tuam site while the feasibility of population restoration is assessed for White Meconella.

- By 2018, best management practices are developed and implemented.
- Habitat suitable for White Meconella remains extant at Mt. Tuam.

[5] Note that populations are expected to fluctuate and require long term datasets to estimate (Bush and Lancaster 2004).

Objective 3: Establish and/or augment populations to increase abundance and distribution[6] *if determined to be feasible and biologically appropriate for White Meconella.*

- By 2018, additional sites have been identified for establishment or restoration of White Meconella population(s).
- By 2018, propagation techniques have been developed.
- By 2023, one or more (re)introduction or augmentation experiments are underway at suitable site(s).

9. Statement on Action Plans

One or more action plans will be completed by 2018.

10. References

Avis, R. and L. Avis. 2005. *Personal Communication with M. Fairbarns.* April 10, 2005.

B.C. Conservation Data Centre. 2011. BC Species and Ecosystems Explorer. B.C. Ministry of Environment, Victoria, B.C. Web site: http://a100.gov.bc.ca/pub/eswp/ [accessed October 2011].

B.C. Ministry of Forests. 2003. Biogeoclimatic Ecosystem Classification Subzone/Variant Map for South Island Forest District, Vancouver Forest Region. Victoria, British Columbia. Web site: http://www.for.gov.bc.ca/ftp/hre/external/!publish/becmaps/PaperMaps/wall/DSI_SouthIsland_Wall.pdf [accessed February 2006].

B.C. Ministry of the Environment. nod. Ecoregions of British Columbia, B.C. Ministry of the Environment. Web site: http://www.env.gov.bc.ca/ecology/ecoregions/ [accessed February 2006].

Bittman, R., pers. comm. 2004. *Email correspondence to M. Fairbarns.* January 2004. Botanist at the California Natural Diversity Database Sacramento, CA.

Bliss, Shannon E, and Paul H. Zedler. 1997. The germination process in vernal pools: Sensitivity to environmental conditions and effects on community structure. Oecologia 113 (1): 67-73.

Brook, B.W., L.W. Traill, and C.J.A. Bradshaw. 2006. Minimum viable population sizes and global extinction risk are unrelated. Ecology Letters, (2006) 9:375-382.

Bush, D. and J. Lancaster. 2004. Rare Annual Plants—Problems with Surveys and Assessments. Prairie Conservation and Endangered Species Conference, February 28, 2004.

California Department of Fish and Game. 2010. Natural Diversity Database, Special Vascular Plants, Bryophytes, and Lichens List. xiii + 71 pp. Web site: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/SPPlants.pdf [accessed November 2010].

[6] The intent is to increase the area of occupancy and maintain the extent of occurrence.

Costanzo, B., J. Penny, and M. Donovan. 2009. Delineating important habitat around plant *Juncus kelloggii*, *Meconella oregana* and *Sanicula arctopoides* using the SARCC Process. Unpublished report prepared for the Garry Oak Ecosystems Recovery team. 6 pp.

COSEWIC. 2005. COSEWIC assessment and status report on the White Meconella *Meconella oregana* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 25 pp.

Douglas, G.W, D.V. Meidinger, and J. Pojar (ed.). 1999. Illustrated Flora of British Columbia: Volume 4 - Dicotyledons (Orobanchaceae through Rubiaceae). B.C. Ministry of Environment, Lands, and Parks and B.C. Ministry of Forests, Victoria, British Columbia. v + 427 pp.

Fairbarns, M. 2008. Demographic and phenological patterns of *Meconella oregana* (White Meconella). Natural Resources Canada, Victoria, B.C. 33 pp.

Fairbarns, M. 2008a. Report on Potential Critical Habitat In Garry Oak Ecosystems. B.C. Ministry of Environment, Victoria, B.C. 220 pp.

Fairbarns, M. 2008b. Report on Potential Critical Habitat For Selected Rare Plant Occurrences In CRD Parks. Capital Regional District, Parks, Victoria, B.C. 37 pp.

Fairbarns, M. 2010. Report on Potential Critical Habitat in Garry Oak Ecosystems. Parks Canada Agency, Victoria, B.C. 45 pp.

Flather, C.H., G.D. Hayward, S.R. Beissinger, and P.A. Stephens. 2011. Minimum viable populations: is there a 'magic number' for conservation practitioners? Trends in Ecology and Evolution 26:307-316.

Garnett, S.T., and K.K. Zander. 2011. Minimum viable population limitations ignore evolutionary history. Trends in Ecology and Evolution 26(12): 618-619.

GOERT. 2002. Recovery strategy for Garry Oak and associated ecosystems and their associated species at risk in Canada: 2001-2006. Draft 20 February 2002. Garry Oak Ecosystems Recovery Team, Victoria, B.C. x + 191 pp.

GOERT. 2011. Rare plant surveys and habitat assessments, unpublished data provided by the Garry Oak Ecosystems Recovery Team, Victoria, B.C.

Government of Canada. 2009. Species at Risk Act Policies: Overarching Policy Framework [Draft]. ii+ 38pp, in Environment Canada. Species at Risk Act Policies and Guidelines Series, Ottawa, Ontario. Web site: http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=1916 [accessed June 2010].

Graham, T. 2004. Climate change and ephemeral pool ecosystems: Potholes and vernal pools as potential indicator systems, U.S. Department of the Interior, U.S. Geological Survey. Web site: http://geochange.er.usgs.gov/sw/impacts/biology/vernal/ [accessed January 2006].

Jamieson, I.G., and F. W. Allendorf. 2012. How does the 50/500 rule apply to MVPs? Trends in Ecology and Evolution, Online, 1566: 1-7.

Lea, T. 2002. Historical Garry Oak Ecosystems of Greater Victoria and Saanich Peninsula. 1:20,000 Map. Terrestrial Information Branch, B.C. Ministry of Sustainable Resource Management. Victoria, B.C.

Lea, T. 2006. Historical Garry Oak Ecosystems of Vancouver Island, British Columbia, pre-European Contact to the Present. Davidsonia 17:34-50.

Maslovat, C. and C. Junk. 2008. Report of Survey for Meconella oregana at 119 Payne Road (Curtis Property), Saturna Island. Unpublished report prepared for the Garry Oak Ecosystems Recovery team. 5 pp.

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Web site: http://www.natureserve.org/explorer. [accessed March 2011].

Parks Canada Agency. 2006. Recovery Strategy for Multi-Species at Risk in Vernal Pools and other Ephemeral Wet Areas Associated with Garry Oak Ecosystems in Canada. xiv + 73 pp, in Government of Canada. Species at Risk Act Recovery Strategy Series, Ottawa, Ontario.

Reed, D. H. 2005. Relationship between Population Size and Fitness. Conservation Biology 19(2): 563-568

Roemer, H. 2005. Personal Communication with M. Fairbarns. Oct 21, 2005.

Spittlehouse, D. L., R.S. Adams, and R.D. Winkler. 2004. Forest, edge and opening microclimate at Sicamous Creek: Research Report 24. British Columbia Ministry of Forests, Research Branch, Victoria, B.C. vii+ 43 pp. Web site: http://www.for.gov.bc.ca/hfd/pubs/Docs/Rr/Rr24.htm [accessed November 2011].

Traill, L.W., C.J.A. Bradshaw, and B.W. Brook. 2007. Minimum viable population size: A meta-analysis of 30 years of published estimates. Biological Conservation 139:159-166.

Traill, L.W., B.W. Brook, R.R. Frankham, and C.J.A. Bradshaw. 2009. Pragmatic population viability targets in a rapidly changing world. Biological Conservation 143:28-34.

Vrilakas, S., pers. comm. 2004. Telephone conversation with M. Fairbarns. January 2004 Botanist, Oregon Natural Heritage Information Center. Portland Oregon.

APPENDIX A: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. 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.

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.

This recovery strategy was evaluated for potential effects (positive and negative) on non-target species, natural communities, and/or natural processes. Important to note is that a number of other rare species (Table 7) have been reported in the vicinity of one or more extant populations of White Meconella. Efforts to recover the White Meconella are expected to benefit these co-existing rare species, as they share common threats such as encroachment by invasive alien plant species.

Table 7. Co-occurring Rare Species

Species	Common name	Conservation Rank	COSEWIC Status*
Butterflies			
Erynnis propertius	Propertius Duskywing	G5 S2S3	
Euphyes vestris	Dun Skipper	G5 S3	T
Plants			
Agrostis pallens	Dune Bentgrass	G4G5 S3S4	
Allium amplectens	Slimleaf Onion	G4 S3	
Eurybia radulina	Rough-leaved Aster	G4G5 S1	
Balsamorhiza deltoidea	Deltoid Balsamroot	G5 S1	E
Botrychium simplex	Least Moonwort	G5 S2S3	
Clarkia amoena var. lindleyi	Lindley's Farewell-to-Spring	G5T5 S3	
Entosthodon fasicularis	Banded Cordmoss	G4G5 S2S3	SC
Githopsis specularioides	Common Bluecup	G5 S2S3	
Heterocodon rariflorum	Rare-flowered Bluecup	G5 S3	
Idahoa scapigera	Scalepod	G5 S2	
Lomatium dissectum var. dissectum	Coastal Chocolate-tips	G4T4 S1	

Lotus unifoliolatus var. unifoliolatus	Spanish-clover	G5T5 S3	
Lupinus lepidus	Prairie Lupine	G5 S1	E
Plagiobothrys tenellus	Slender Popcornflower	G4G5 S1	T
Rupertia physodes	California-tea	G4 S3	
Sanicula bipinnatifida	Purple Sanicle	G5 S2	T
Packera macounii	Macoun's Groundsel	G5 S3	
Sericocarpus rigidus	White-top Aster	G3 S2	SC
Viola howellii	Howell's Violet	G4 S2S3	
Viola praemorsa ssp. praemorsa	10.1. Yellow Montane Violet	10.2. G5T3T5 S2	E
10.3. Yabea microcarpa	10.4. California Hedge-parsley	10.5. G5? S1S2	
*Status: E = Endangered, T = Threatened, SC = Special Concern, S-ranks assigned as per B.C. Conservation Data Centre and NatureServe.			

Although it is not feasible to discuss all of the potential species interactions that may result from implementation of this recovery strategy, the following specific positive effects can be identified:

- Protection of habitat will in general reduce shared threats and disturbance for co-existing species and associated habitat.
- Increased public education and awareness may reduce harmful activities in sites supporting this and other species at risk.
- Management of invasive alien plant species may restore habitat for other plant species at risk and native species in general.

While several positive effects on other species and the environment are expected from implementing the overall strategy for the recovery of the White Meconella, there is potential for negative effects on non-target species, natural communities, and/or natural processes if sound conservation approaches are not applied. Any on-site activities (surveys, research, or management) to aid recovery of White Meconella could potentially result in trampling or disturbance of co-occurring species, unless care is taken to avoid damage to plants and animals. Further, if not planned and implemented carefully, large-scale management actions, such as invasive alien plant removal or the use of herbicides, may have a negative effect on other plants at risk (e.g., through trampling, increased herbivory, inadvertent dispersal of invasive alien species, potential colonization of newly created gaps by other invasive alien plants, and harm from improper herbicide application) and the environment (runoff from herbicide application).

The potentially negative effects of recovery can be mitigated or eliminated at the project implementation phase through proper field procedures and/or strong collaboration with key conservation partners such as the Garry Oak Ecosystems Recovery Team and appropriate government agencies. Further, all population augmentation/establishment should take a precautionary approach, and research should involve experimental translocation trials (Maslovat 2006). One approach to ensure that potential negative impacts of translocation are minimized would be to select restoration/translocation sites that are already degraded to the point that they no longer support viable populations of other species at risk. Some recovery strategy activities may require project-level environmental assessment as required under the *Canadian Environmental Assessment Act*. Any activities found to require project-level environmental assessments will be assessed at that time pursuant to the provisions of the *Act*.

Actions taken to aid in the recovery of this species should, if conducted in an open, informative manner, provide benefits for all species at risk and their habitats through increased public awareness of the negative environmental consequences associated with invasive alien species, the need to maintain natural ecological processes, and the need to protect natural habitats from the effects of development. This recovery strategy benefits the environment by promoting the conservation and recovery of the White Meconella, a natural component of biodiversity. In addition, it is likely that habitat restoration for White Meconella will benefit other co-occurring native species which occupy the same habitat. The SEA process has concluded that this recovery strategy will likely have several positive effects on the environment and other species. There are no obvious adverse environmental effects anticipated with the implementation of this recovery strategy.