PROPOSED

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

Recovery Strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in Canada

Branched Phacelia

2012

Canada

Recommended citation:

Environment Canada. 2012. Recovery Strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in Canada [Proposed]. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. XIX pp. + Appendix.

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 (SAR) Public Registry (www.sararegistry.gc.ca).

Cover illustration: Jenifer Penny, B.C. Ministry of Environment

Également disponible en français sous le titre
« Programme de rétablissement de la phacélie rameuse (*Phacelia ramosissima* var. *ramosissima*) au Canada [Proposition] »

ISBN
Catalogue no.

RECOVERY STRATEGY FOR THE BRANCHED PHACELIA (*Phacelia ramosissima* var. *ramosissima*) IN CANADA

2012

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

In the spirit of cooperation of the Accord, the Government of British Columbia has given permission to the Government of Canada to adopt the "Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia" under Section 44 of the *Species at Risk Act.* Environment Canada has included an addition which completes the SARA requirements for this recovery strategy, and excludes the section on Socio-Economic Considerations. Socio-economic factors are not part of the consideration process for federal recovery strategies developed under SARA. These factors are kept isolated from this strategic phase of recovery planning.

2012

The federal Recovery Strategy for the Branched Phacelia in Canada consists of:

PART 1: Federal Addition to the "Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia", prepared by Environment Canada.

PART 2: "Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia", prepared by the Southern Interior Rare Plants Recovery Implementation Group for the British Columbia Ministry of Environment.

TABLE OF CONTENTS

PART 1: Federal Addition to the “Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia”, prepared by Environment Canada

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.

SARA section 37 requires the competent Minister, which is the federal Minister of the Environment in this case, to prepare a recovery strategy for all listed extirpated, endangered or threatened species. 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 attached provincial recovery strategy (Part 2 of this document) was provided as science advice to the jurisdictions responsible for managing the species in British Columbia. Environment Canada has prepared this federal addition to meet the requirements of SARA.

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 Canada, or any other jurisdiction, alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Branched Phacelia 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 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.

SPECIES STATUS INFORMATION

Legal Designation: SARA Schedule 1 (Endangered) (2006)

Table 1. Conservation Status (from NatureServe 2011 and B.C. Conservation Framework 2011).

Global (G) Rank	National (N) Rank	Sub-national (S) Rank	COSEWIC Status	B.C. List	B.C. Conservation Framework
G5?TNR (species is globally secure, variety not ranked	Canada (NNR) United States (NNR)	Canada: BC (S2); United States: CA (SNR), NV (SNR), OR (SNR), WA (SNR)	Endangered (2005)	Red	Highest priority: 1, under Goal 3**

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

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

It is estimated that the percent of the global range of this species in Canada is less than 1%.

SPECIES AT RISK ACT REQUIREMENTS

The following sections address specific requirements of SARA that are either not addressed, or which need more detailed comment, in the "Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia" (Part 2 of this document, referred to henceforth as "the provincial recovery strategy").

1. Socio-economic Considerations

The "Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia" contains a short statement on socio-economic considerations. As socio-economic factors are not a consideration in any aspect of the preparation of SARA recovery strategies, (see Section 41(1) of SARA), the Socio-economic Considerations section of the "Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia" is not considered part of the federal Minister of Environment's recovery strategy for this species. Furthermore, socio-economic factors were excluded from the preparation of all other sections of this federal addition, including Population and Distribution Objectives and Critical Habitat.

2. Recovery Feasibility

This section replaces the "Recovery Feasibility" section in the provincial recovery strategy.

Recovery of the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) is considered technically and biologically feasible based on the following four criteria (Government of Canada 2009):

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

   Yes, there are at least three extant populations in Canada. This species reproduces sexually and produces abundant seed. Field data suggest that two populations are apparently stable; abundance trend data for the third population is lacking.

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

   Yes. There is suitable habitat at the currently occupied sites, and additional suitable habitat may be available. While there have been declines in habitat quality and extent, there is sufficient habitat to support the extant populations.

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

   Yes, threats can be mitigated through identified recovery planning approaches.

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

   Yes, general recovery techniques consist primarily of threat mitigation, and potentially, population establishment.

3. Population and Distribution Objectives

This section replaces the "Recovery Goal" section in the provincial recovery strategy.

Environment Canada has determined the Population and Distribution Objective for Branched Phacelia to be:

To maintain the three extant populations of this species at their locations in Canada. To maintain or improve current population sizes at these locations, as well as any other extant populations that may be identified.

Rationale:

Historical abundance and distribution information for this species show that all three extant populations have been recently confirmed (2007, 2009, 2011[1] surveys). Populations occur near Osoyoos, B.C. This species is at the northern extent of its range in Canada. There is no information to indicate that the species was previously more widespread, therefore an objective to actively increase the number of populations, which may allow for downlisting of the species, is not appropriate. However, if additional naturally occurring populations are discovered, they should also be maintained.

4. Critical Habitat

4.1 Identification of the Species' Critical Habitat

This section replaces the "Critical Habitat" section in the provincial recovery strategy.

Section 41 (1)(c) of SARA requires that recovery strategies include an identification of the species' critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. The 2008 provincial recovery strategy for this species noted that critical

[1] Portions of two populations surveyed May 25, 2011, and June 6, 2011: observers Kella Sadler (Environment Canada), Andrew Robinson (Environment Canada), Terry McIntosh (consultant), Orville Dyer (B.C. Ministry of Forests, Lands and Natural Resource Operations), Kirk Safford (B.C. Ministry of Environment), Mark Weston (B.C. Parks, B.C. Ministry of Environment), Sara Bunge (B.C. Parks, B.C. Ministry of Environment).

habitat could not be identified at that time (nor is it required in the provincial process), but that it might be identified in a subsequent federal strategy or addition. This federal document does identify critical habitat to the extent possible for this species. 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. 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.

Ecological attributes of Branched Phacelia habitat are outlined in the provincial recovery strategy (2008), and COSEWIC Assessment and Status Report (2005):

1. Landscape attributes: Canadian distribution is restricted to the Southern Okanagan Basin, in the very hot Okanagan variants of the Bunchgrass and Ponderosa Pine Biogeoclimatic Zones.
2. Habitat attributes: Within this distribution area, Branched Phacelia occurs on talus[2] slopes, which are often calcareous, steep (40-60% slope), at 396-900m elevation, and with various aspects.
3. Microhabitat attributes: Branched Phacelia is typically found at the base of dry talus slopes. Vegetation at these sites is often sparse owing to harsh conditions.

Critical habitat for Branched Phacelia is fully identified for the three known extant populations, occurring near Osoyoos, B.C. Branched Phacelia is a perennial species, producing large amounts of seed. However, there is no information regarding the species' ability to bank seeds over long periods, nor is there any information regarding its capacity for long-range seed dispersal. Further, seeds may require a period of physiological dormancy (i.e., a period of cool and moist conditions) before germinating. Owing to these biological characteristics of Branched Phacelia, maintaining connectivity between sub-populations[3] where they occur on talus slopes is considered important, particularly where microhabitat conditions are consistently suitable.

Critical habitat is identified as the area occupied by individual plants or patches of plants, including the associated potential location error from GPS units, plus an additional 50 meters to encompass the immediately adjacent areas. Ecosystem processes that occur on talus slopes (e.g. erosional patterns) are integral to the production and maintenance of suitable microhabitat conditions for Branched Phacelia. Where talus slopes are apparent as a distinct ecological[4] feature at the landscape scale, the entire portion of the talus slope associated with the documented plant or patch of plants is also identified as critical habitat. Connectivity is maintained between sub-populations where they occur in close proximity, and where there is consistent intermediate habitat. The exact areas identified as critical habitat, and the methodology behind the identification, are described in Appendix 1.

[2] A talus slope is defined as a sloping mass of relatively large, loose rocks (also known as scree); coarse rock fragments collect at the base of the slope as the cliff erodes.

[3] "Populations" are separated by >1 km; "sub-populations" represent records of individuals, or patches of individuals, that are within 1 km of each other.

[4] "Distinct" ecological, or landscape features are here referred to as those that are distinguishable at a landscape scale (through use of detailed ecosystem mapping or aerial photos), which, at that scale, appear as ecologically contiguous features with relatively distinct boundaries (e.g., cliffs, banks, or slopes, drainage basins, seepage plateaus, or distinct vegetation assemblages), and which comprise the context for a species occurrence.

4.2 Schedule of Studies to Identify Critical Habitat

This section replaces the "Recommended schedule of studies to identify critical habitat" section in the provincial document.

Critical habitat has been fully identified in this document, therefore no schedule of studies is required.

4.3 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. Activities described in Table 2 include those likely to cause destruction of critical habitat for Branched Phacelia; destructive activities are not limited to those listed.

Table 2. Examples of activities likely to result in destruction of critical habitat for Branched Phacelia.

Threat	Description of activity contributing to habitat loss	Threat level
Conversion of natural landscape for human use and development	Results in direct loss of habitat through vegetation removal or replacement, debris deposition, or impact by machinery.	High
Mineral exploration	Results in direct loss of habitat through removal of Branched Phacelia and its required substrate, burial resulting from debris deposition, or substrate and microhabitat alteration by machinery.	Moderate
Deliberate talus removal for landscaping purposes	Results in loss or alteration of talus habitat required for Branched Phacelia	Low / Unknown
Use of ATVs or other vehicles outside of existing trails	Results in disturbance of local biophysical conditions, including immediate or proximal substrate properties, to the extent that the habitat is no longer suitable for Branched Phacelia.	Low / Unknown
Deliberate introduction of alien invasive plants	Direct effect is a reduction of space and soil available for Branched Phacelia, and indirect effects, e.g., alteration of shade, water, and nutrients available to exclude niche range of Branched Phacelia.	Unknown

Landscape development, i.e., conversion of the natural landscape for residential, industrial, recreational, and/or agricultural purposes, has been identified as the major threat likely to result in destruction of critical habitat for Branched Phacelia. The Okanagan Valley is experiencing high rates of development; recently potential habitat for Branched Phacelia has been lost to housing and industrial development. Mineral exploration is also a threat to Branched Phacelia; mining activity

has occurred within a few metres of one extant subpopulation on the east slope of Mount Kruger, possibly linking this activity to the recent loss of two subpopulations at that location. Critical habitat may be damaged by deliberate talus removal for landscaping purposes, or by overuse by recreational users (ATVs, hiking). These threats were observed to be low or of unknown severity in 2008, but they should be monitored. Recreational activities are anticipated to increase as local development continues.

5. Statement on Action Plans

One or more action plans will be posted on the Species at Risk Public Registry by 2014.

6. Effects on the Environment and Other Species

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

Branched Phacelia occurs in the South Okanagan Valley, where other rare species are found. Critical habitat identified for Branched Phacelia is known to overlap with critical habitat identified for Grand Coulee Owl-clover, for example. The recovery approaches proposed are not expected to negatively affect any other species. The recommended habitat protection will indirectly benefit other species at risk in the area; increased public education and awareness may limit harmful recreational activities at these locations, and management of invasive species may restore habitat for other plant species at risk. In acknowledgement of the high potential for shared habitat among local species at risk, large-scale management actions, such as invasive species removal or the use of herbicides, should be planned and implemented carefully. All on-site activities (surveys, research, and management), to aid recovery may pose a threat to co-occurring species (e.g., via trampling, increased herbivory, or inadvertent dispersal of alien species during disposal), unless care is taken to avoid damage.

7. References

B.C. Conservation Framework. 2011. Conservation Framework Summary: *Phacelia ramosissima* var. *ramosissima*. B.C. Minist. of Environment. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed October 24, 2011).

Government of Canada. 2009. *Species at Risk Act* Policies, Overarching Policy Framework [Draft]. *Species at Risk Act* Policy and Guidelines Series. Environment Canada. Ottawa. 38 pp.

NatureServe. 2011. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: October 24, 2011).

Southern Interior Rare Plants Recovery Implementation Group. 2008. Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia. Prepared for the B.C. Ministry of Environment, Victoria, BC. 14 pp.

Appendix 1. Critical habitat identification and location

1. Decision tree for critical habitat identification

In Canada, there are three confirmed populations of Branched Phacelia: (1) west of Osoyoos (Figures A1-A3, "Mount Kruger, east slope"); (2) southwest of Osoyoos (Figure A4, "Mount Kruger, southeast slope"); and (3) near Kilpoola Lake (Figure A5, "Mount Kruger, west slope"). A decision tree was developed to identify critical habitat for these populations, based on available knowledge.

The first decision is regarding the quality of available information on all records[5] of this species in Canada, with the choice of accepting or rejecting any given record for consideration as critical habitat based on three criteria, i.e., time since most recent observation, location uncertainty, and observation of current habitat suitability.

The second decision is based on how readily the habitat is able to be defined. For all accepted records a minimum "critical function zone" distance[6] is imposed. If critical habitat is readily identifiable based on available ecological information (ecosystem and/or aerial photo mapping, as well as expert advice from individuals who have specialized knowledge of the species and its locations), boundaries are extended on that basis to include areas of importance; i.e., priority landscape features that are plainly critical to the occurrence. "Distinct" ecological, or landscape features are here referred to as those that are distinguishable at a landscape scale (through use of detailed ecosystem mapping or aerial photos), which, at that scale, appear as ecologically contiguous features with relatively distinct boundaries (e.g., cliffs, banks, or slopes, drainage basins, seepage plateaus, or distinct vegetation assemblages), and which comprise the context for a species occurrence.

If the information described above is not available, i.e., (a) absence of high-resolution mapping, (b) lack of detailed ecosystem information, or (c) lack of expert advice, and/or (d) absence of any apparent landscape features of critical importance which would direct identification, then a formula for minimum habitat size (defaulting to minimum "critical function zone" distance) is proposed.

This approach (1) allows for an emphasis on ecological attributes which are of actual importance to the species, (2) permits the opportunity to use all available types of knowledge and information on a priority basis (i.e., within the context of a logical sequence of implementation), and (3) provides a method to identify critical habitat when detailed and/or specialized knowledge is lacking.

[5] "Records" are here referred to as the finest-scale of data available (i.e., point data representing individual plants, or polygons representing discrete patches of plants). The term "occurrence" is used synonymously in this text, to describe actual portions of a landscape that are occupied by individuals or patches of individuals, and which form the basis for critical habitat mapping.

[6] Minimum "critical function zone" distance is defined here as 50 m additional to the area of occupancy. Detailed rationale for use of this distance is included in section 2 of this Appendix.

Decision Tree:

1a. Occurrences have not been revisited for >25 years, **and** use imprecise and/or inaccurate geographic referencing systems (location uncertainty distance is greater than 100 m), **or** the habitat no longer exists at that location to support the species (no critical habitat will be defined until more is known about the population and location)

1b. Occurrences have been relocated and revisited in the past 25 years, **or** habitat has been revisited in the past 5 years to confirm it has the potential to support an occurrence, **or** geographic reference is accurate and precise (location uncertainty distance is less than 100 m) (go to 2)

2. Minimum critical habitat identified for ALL occurrences will include (*a*) specified area of occupancy, (*b*) all of the habitat within the GPS error distance (m) of the specified area of occupancy, and (*c*) an added minimum critical function zone distance of 50 m to ensure the inclusion of all necessary habitat associated with the occurrence (refer to rationale section following the decision tree), i.e., in all cases:

- *Minimum critical habitat (distance to boundary) = occurrence area + b + c*

2a. Where the species is a generalist associated with widespread habitats, **or** a specialist that occupies dynamic disturbance regimes difficult to delineate as patches in space, **or** occupies habitat that is otherwise poorly defined, **or** the best available information does not support more detailed interpretation and determination of critical habitat at a landscape scale, the minimal critical function zone distance (as defined above) is maintained around all occurrence areas.

2b. Where the species occupies readily identifiable habitat patches, such that any or all of the following methods of determination are available, and applicable, and support more detailed interpretation and determination of critical habitat:

- use of detailed ecosystem mapping
- use of aerial photos for identification of critical landscape features, and opportunities for connectivity, particularly wherever habitat quality and characteristics are continuous between patches
- use of any existing studies that can provide more detailed insight into critical habitat location and connectivity between occurrences
- consideration of any special circumstances or threats

In this case, this additional set of information may be used to extend critical habitat identification beyond the minimal critical habitat distance described above, i.e.:

- *Critical habitat (distance to boundary) = occurrence area + b + c + d*

Where *d* = extent of additional critical habitat identified; i.e., landscape feature, connectivity corridor, adjustment for special circumstances. In order to ensure that the identification of critical habitat is biologically defensible, extended and/or irregular critical habitat boundaries should be developed with, agreed upon, and confirmed by, species experts and/or relevant recovery teams.

2. Rationale for decision tree hierarchy

To identify habitat critical for the survival or recovery of a plant, it is necessary to consider factors that contribute to sustained reproductive success and colonization (i.e., dispersal of propagules, successful germination, and natural population fluctuation), as well as primary resources required for growth (i.e., space, water, sunlight, nutrients).

Population dynamics for plants in early successional environments may show greater fluctuation, both spatially and temporally, as compared to plants that comprise later-successional environments. This can be attributed to contrasting life history strategies typical of colonizing, versus competitive, and/or slow-growing species. Colonizing species can occupy patches opportunistically and perpetually within early-successional habitats (Hanski 1982), and are dependent on (a) local ecosystem dynamics, to perpetuate the creation of suitable habitat patches, and (b) connectivity between patches, for successful dispersal and colonization. Patch dynamics may be important within the context of later-successional environments as well, e.g. some species may persist as "satellite" species in old growth forest, colonizing new forest gaps. Plants with a more competitive live history approach (typically perennial, slower-growing) will have occurrences that are more spatially and temporally consistent, and which may therefore exhibit a more directly observable link between "threshold" breeches in required microhabitat properties, and population decline.

In most cases a detailed understanding of population dynamics will not be available for individual plant species at risk. The task, therefore, is to identify the properties that we know are of critical importance to its success, built on a prioritized model of (1) identifying basic biological requirements, (2) understanding ecological dynamics that relate to the context of the occurrence, (3) promoting connectivity between occurrences to foster reproductive success, and (4) accounting for special circumstances and threats.

The first priority in critical habitat identification should be to identify the primary resources required for the species growth. Each plant species has a different range of biological requirements, however. Where species occur, niche requirements have been met; therefore it follows that identifying an occurrence will involve identifying the unique combination of microhabitat properties at that site. It is understood that activities in areas proximal to an occurrence will affect local microhabitat properties. The distance at which proximal effects will impact rare plant occurrences may vary, depending on circumstance. Since it is unlikely that all factors contributing to local microhabitat can be identified, it is reasonable to include as critical habitat a minimum distance to ensure the maintenance of required microhabitat properties, wherever specialized information is lacking.

Existing research has identified bryophytes (mosses and liverworts) and lichens as uniquely sensitive indicators of microhabitat change. Lacking roots, bryophytes take up the majority of water and nutrients through atmospheric inputs, and as well as passively from the substrata on which they grow (Schofield 1985). As such, this group of plants has been used in monitoring a range of environmental effects, including acid raid, air pollution, and identifying threshold habitat fragment size for maintaining constituent microhabitat properties (light, moisture, humidity).

Studies that have used bryophytes or lichens to identify edge effect thresholds in mixed forest and coniferous forests (Esseen & Renhorn 1998, Baldwin & Bradfield 2005) have identified effects up to a distance of 45-50 m into remnant habitat fragments. Similarly, a study on microenvironmental gradients at habitat edges, i.e., light, temperature, litter moisture, vapor pressure deficit, humidity (Matlack 1993), and a study of edge effects as evidenced by changes in plant community structure and composition (Fraver 1994), each showed that effects could be detected to 50 m into habitat fragments. Forman and Alexander (1998) and Forman et al. (2003) found that most roadside edge effects on plants resulting from construction and repeated traffic have their greatest impact within the first 30 to 50 m. These data provide a logical basis for suggesting a minimum critical function zone distance of 50 m to ensure microhabitat properties for rare plant species occurrences are incorporated in the identification of critical habitat.

Once a critical function zone distance has been determined (minimum = 50 m), and where additional information exists, these boundaries may be built on or extended to account for factors identified previously (context, connectivity, special circumstances and threats). Ecosystem features that are discrete, identifiable, and which are logically associated with an occurrence should be included in the identification of critical habitat. That is, critical habitat should be identified such that relevant ecosystem dynamics (i.e., that directly contribute to spatial, and temporal perpetuation of the species) are included, wherever they can be determined, using the best available knowledge. Where habitat is consistent between existing occurrences, connectivity should be maintained. Finally, special circumstances should also be considered which may support a critical function zone distance that is greater than the standard minimum (50 m), e.g., proximity to dominant invasive alien species and/or roadside planting that would rapidly reduce or alter existing habitat (Jordan et al. 2008, Van Riper and Larson 2009), or proximity to heavy roadside or industrial emissions that would result in increased deposition of deleterious chemicals and alteration of existing habitat. Some species may be particularly sensitive to atmospheric deposition, which is detectable in plants and soils up to 1 to 2 km away from the source (Meshalkina et al. 1996, Hao et al. 2006, Kochy and Wilson 2001). In some cases, and based on supporting evidence, site- and species-specific factors could logically modify the placement or distance of critical habitat boundaries, based on the area required to maintain necessary resources for plant survival.

Anthropogenic features including roads, well-established trails, and associated developed urban and residential landscape are not identified as critical habitat for Branched Phacelia, even when they occur within the minimum critical function zone distance. It is not clear at this time whether or to what extent these features contribute to local habitat quality, where they occur in close proximity to extant occurrences. Based on existing distribution information, it is presumed that these features do not provide essential ecological function to support Branched Phacelia populations.

3. References

Baldwin, L.K., and G.E. Bradfield. 2005. Bryophyte community differences between edge and interior environments in temperate rain-forest fragments of coastal British Columbia. Can. J. For. Res. 35(3): 580–592.

Esseen, P.A., and K.E. Renhorn. 1998. Edge effects on an epiphytic lichen in fragmented forests. Conserv. Biol. 12(6): 1307-1317.

Forman, R.T.T., and L.E. Alexander. 1998. Roads and their major ecological effects. Ann. Rev. Ecology and Systematics 29: 207-231.

Forman, R.T.T., D. Sperling, J.A. Bissonette, A.P. Clevenger, C.D. Cutshall, V.H. Dale, L. Fahrig, R. France, C.R. Goldman, K. Heanue, J.A. Jones, F.J. Swanson, T. Turrentine, and T.C. Winter. 2003. Road ecology: Science and solutions. Island Press. Covelo CA.

Fraver, S. 1994. Vegetation responses along edge-to-interior gradients in the mixed hardwood forests of the Roanoke River Basin, North Carolina. Conserv. Biol. 8(3): 822-832.

Hanski, I. 1982. Dynamics of regional distribution: the core and satellite species hypothesis. Oikos 38: 210-221.

Hao, X., C. Chang, H.H. Janzen, G. Clayton, and B.R. Hill. 2006. Sorption of atmospheric ammonia by soil and perennial grass downwind from two large cattle feedlots. Journal of Environmental Quality. 35: 1960-1965.

Jordan, N.R., D.L. Larson, and S.C. Huerd. 2008. Soil modification by invasive plants: effects on native and invasive species of mixed-grass prairies. Biological Invasions. 10: 177-190.

Kochy, M., and S.D. Wilson. 2001. Nitrogen deposition and forest expansion in the northern Great Plains. Journal of Ecology. 89: 807-817.

Matlack, G.R. 1993. Microenvironment variation within and among forest edge sites in the eastern United States. Biol. Conserv. 66(3): 185-194.

Meshalkina, J.L., A. Stein, and O.A. Makarov. 1996. Spatial variability of soil contamination around a sulphureous acid producing factory in Russia. Water, Air and Soil Pollution. 92: 289-313.

Schofield, W.B. 1985. Introduction to Bryology. The Blackburn Press, N.J.

Van Riper, L.C. and D.L. Larson. 2009. Role of invasive *Melilotus officinalis* in two native plant communities. Plant Ecology. 200: 129-139.

4. Maps of critical habitat for Branched Phacelia in Canada

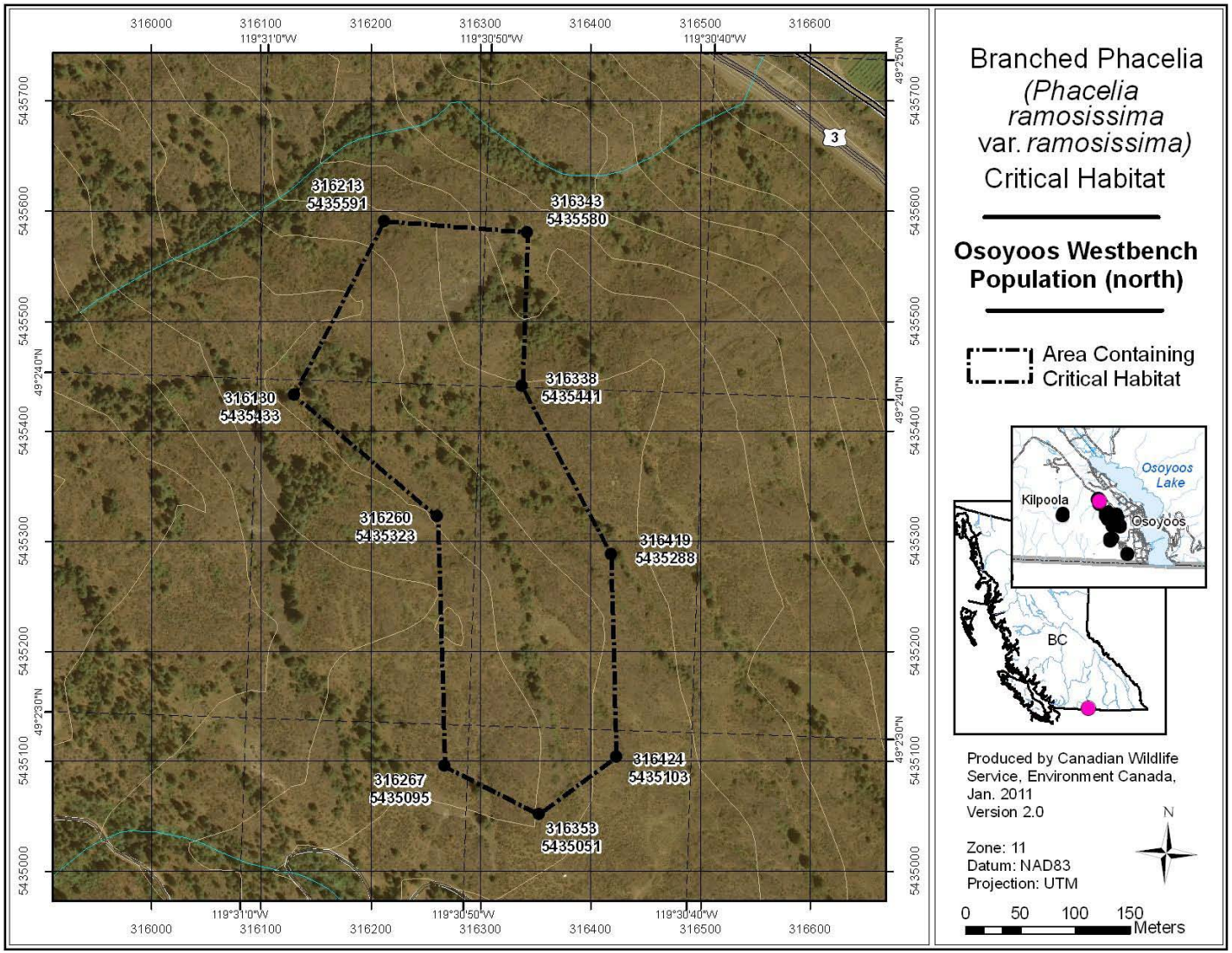


Figure A1. Critical Habitat for Branched Phacelia near Osoyoos, British Columbia; the Osoyoos Westbench Population corresponds with the “Mount Kruger, east slope” population in the provincial recovery strategy. The northern portion of this population is shown.

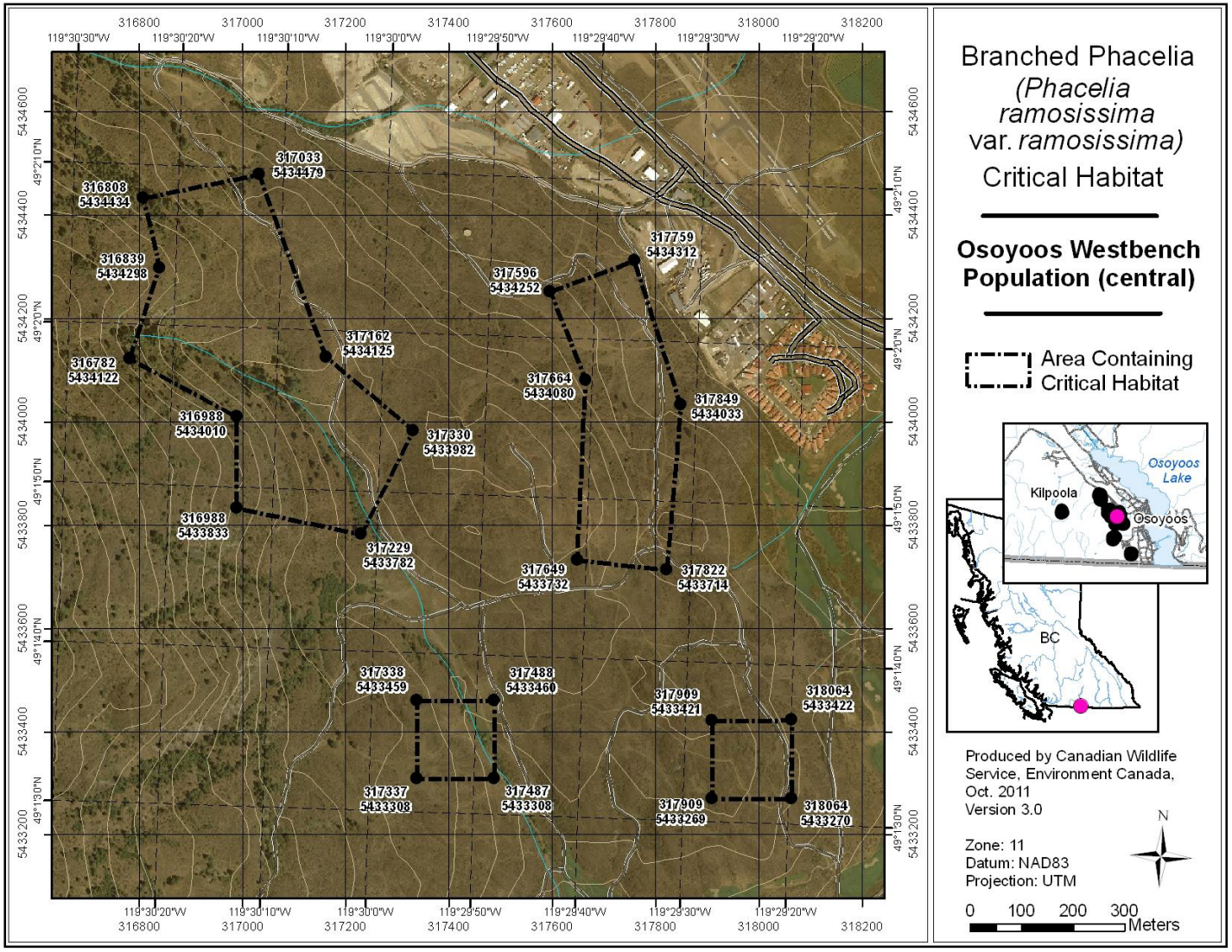


Figure A2. Critical Habitat for Branched Phacelia near Osoyoos, British Columbia; the Osoyoos Westbench Population corresponds with the “Mount Kruger, east slope” population in the provincial recovery strategy. The central portion of this population is shown.

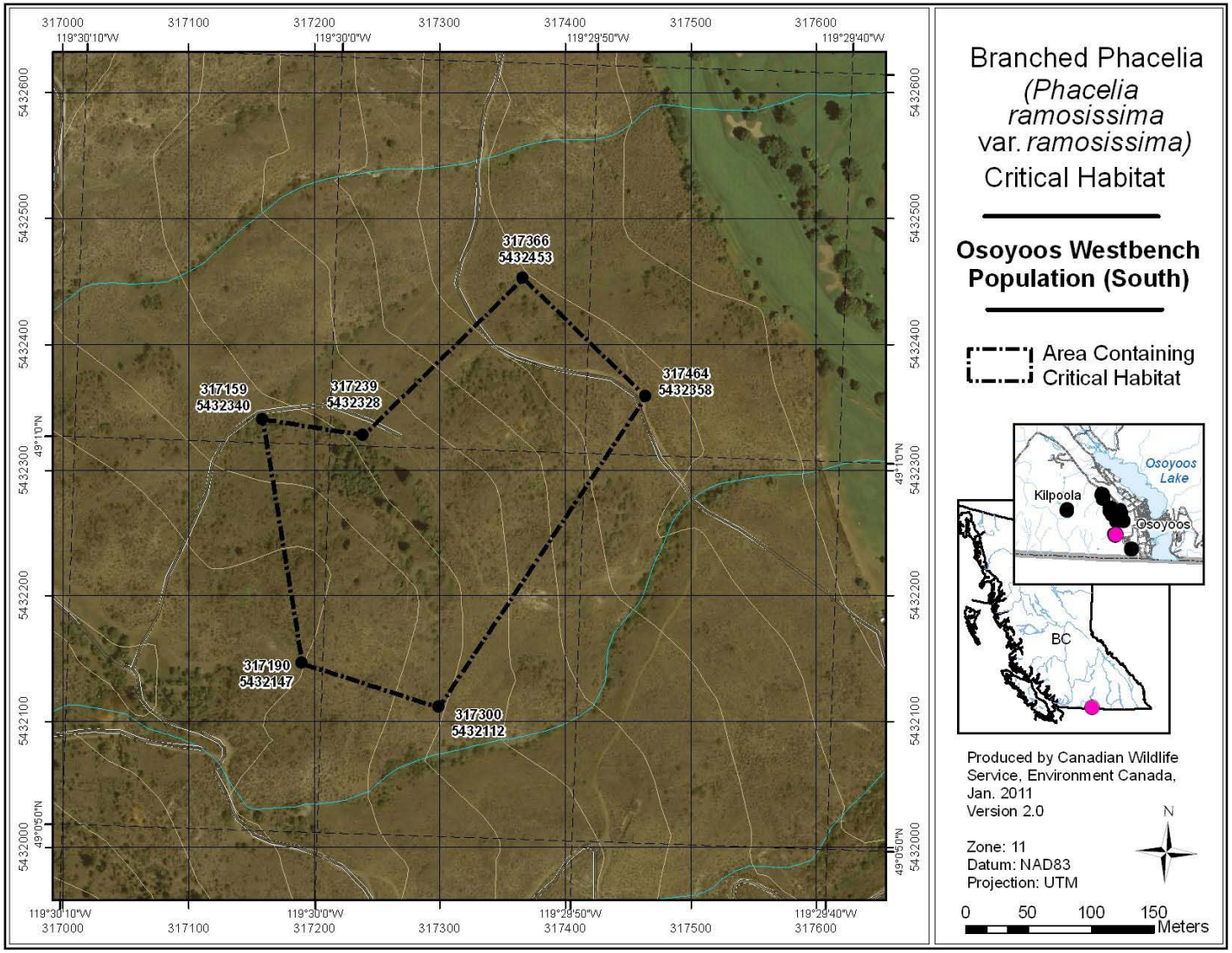


Figure A3. Critical Habitat for Branched Phacelia near Osoyoos, British Columbia; the Osoyoos Westbench Population corresponds with the “Mount Kruger, east slope” population in the provincial recovery strategy. The southern portion of this population is shown.

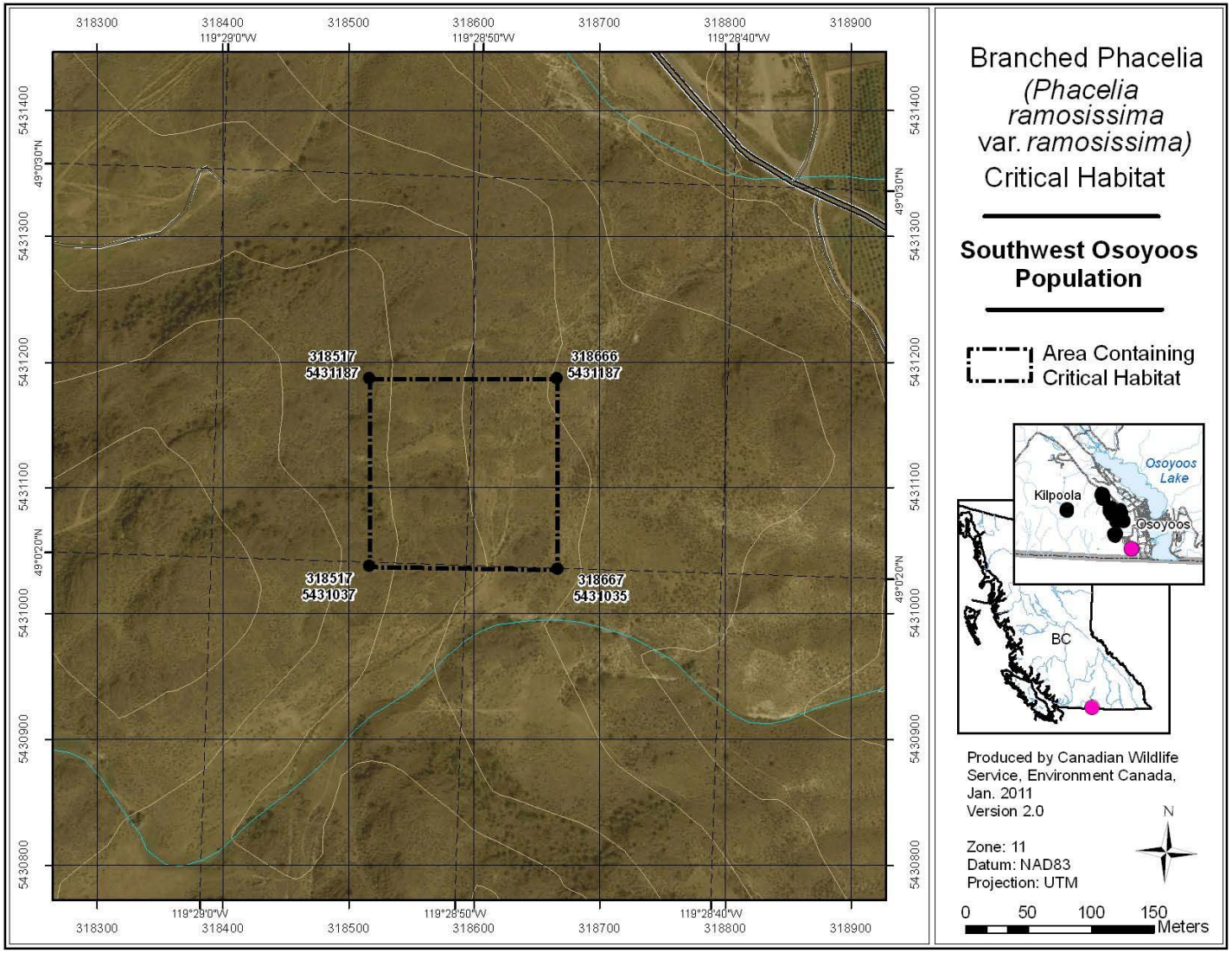


Figure A4. Critical Habitat for Branched Phacelia near Osoyoos, British Columbia; the Southwest Osoyoos Population corresponds with the “Mount Kruger, southeast slope” population in the provincial recovery strategy**.**

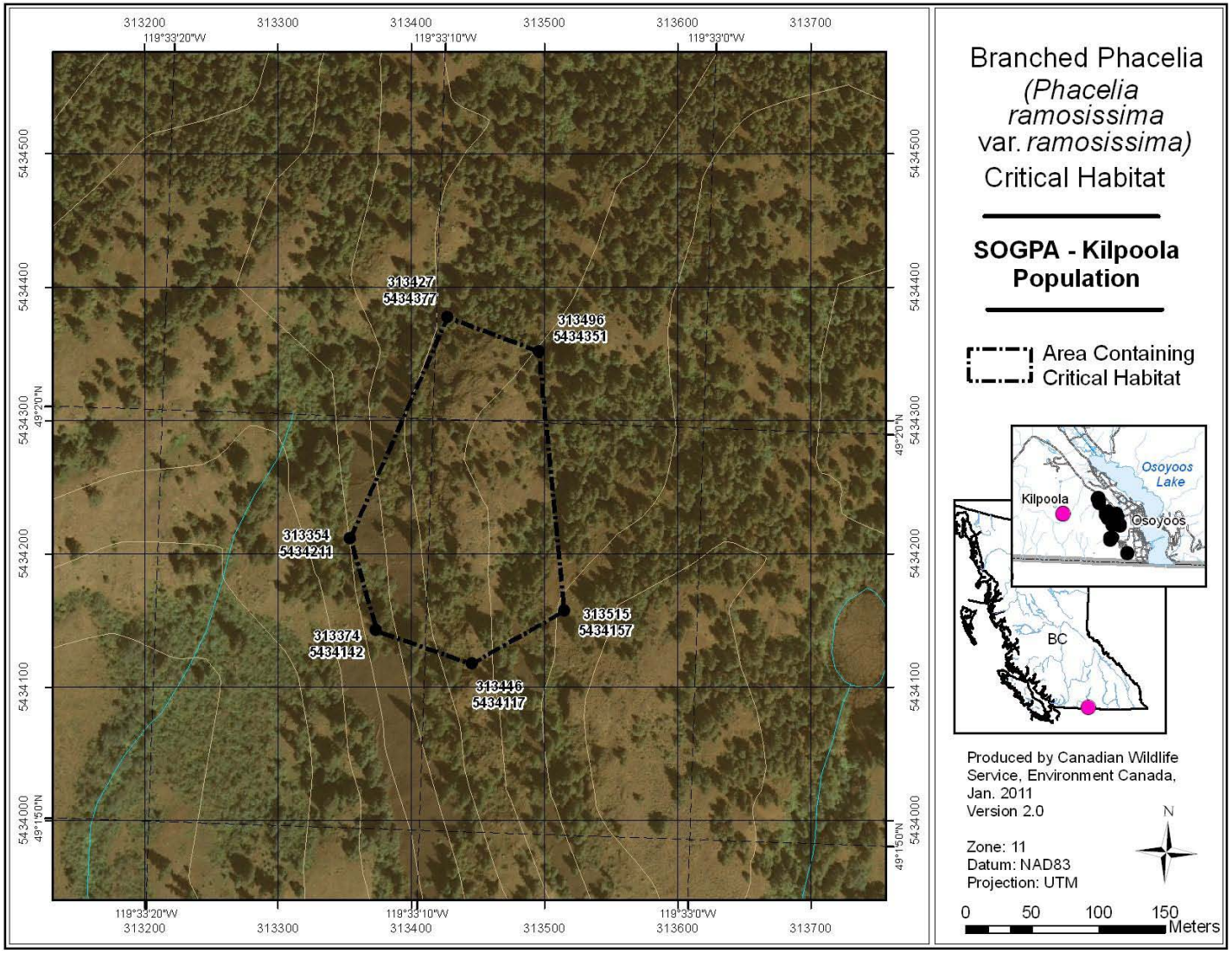
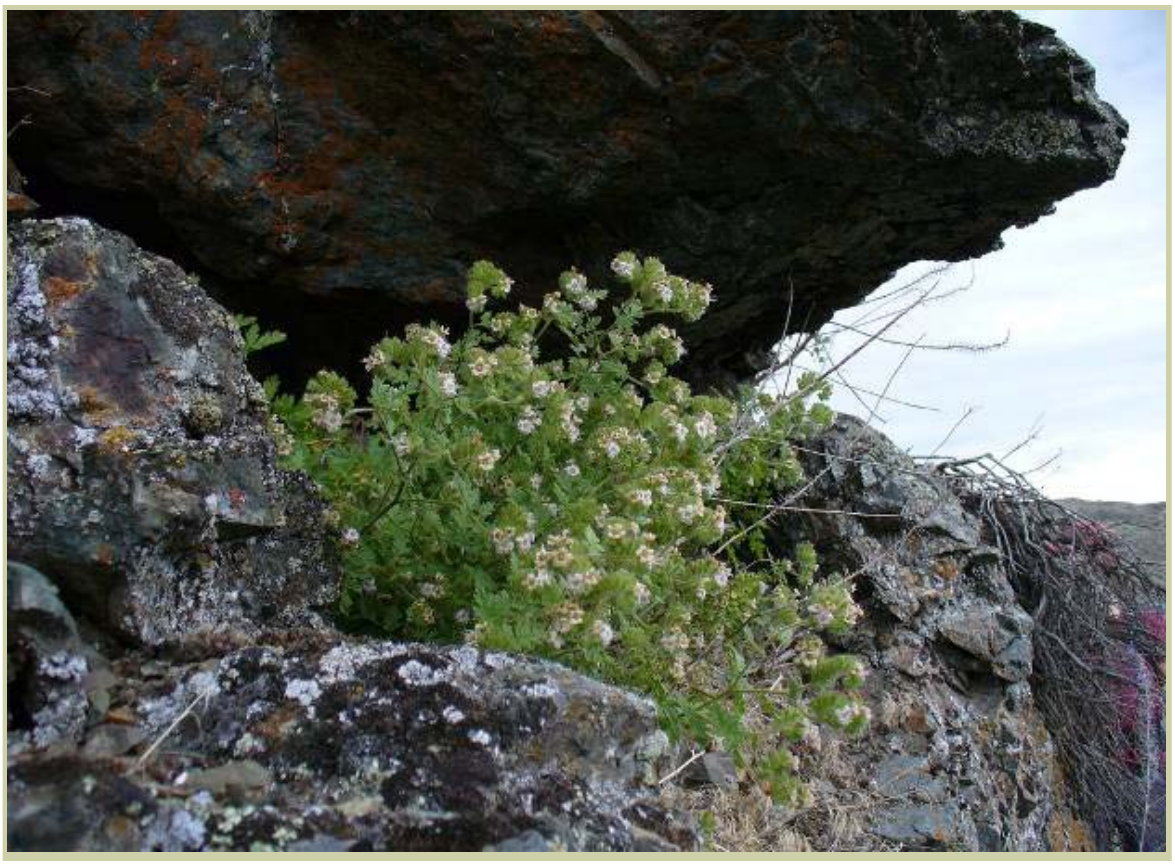


Figure A5. Critical Habitat for Branched Phacelia near Osoyoos, British Columbia; the South Okanagan Grasslands Protected Area (SOGPA) – Kilpoola Population corresponds with the “Mount Kruger, west slope” population in the provincial recovery strategy.

PART 2: Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia”, prepared by the Southern Interior Rare Plants Recovery Implementation Group for the B.C. Ministry of Environment

Recovery Strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia



Prepared by the Southern Interior Rare Plants Recovery Implementation Group

BRITISH COLUMBIA
The Best Place on Earth

Ministry of Environment

November 2008

About the British Columbia Recovery Strategy Series

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

What is recovery?

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

What is a recovery strategy?

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

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

What's next?

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

For more information

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

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

Recovery Strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia

Prepared by the Southern Interior Rare Plants Recovery Implementation Group

November 2008

Recommended citation

Southern Interior Rare Plants Recovery Implementation Group. 2008. Recovery strategy for the Branched Phacelia (*Phacelia ramosissima* var. *ramosissima*) in British Columbia. Prepared for the B.C. Ministry of Environment, Victoria, BC. 14 pp.

Cover illustration/photograph

Crystal Klym

Additional copies

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

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

Publication information

ISBN 978-0-7726-6102-9

Cataloguing in Publication: Pending

Disclaimer

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

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

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

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

RECOVERY TEAM MEMBERS

Southern Interior Rare Plants Recovery Implementation Group

Harold Baumbrough, Biologist, Naramata, BC
Brenda Costanzo (co-chair), B.C. Ministry of Environment, Victoria, BC
Orville Dyer (co-chair), B.C. Ministry of Environment, Penticton, BC
Matt Fairbarns, Botanist, Victoria, BC
Terry McIntosh, Biospherics Environmental Inc., Botanist, Vancouver, BC
Alex McLean, B.C. Ministry of Forests and Range, Penticton, BC

Former Members

Pam Krannitz (retired), Canadian Wildlife Service, Vancouver, BC
Ted Lea (retired), Vegetation Ecologist, B.C. Ministry of Environment, Victoria, BC
Bryn White, Okanagan College, Penticton, BC

Technical Contact

Ron Hall, Osoyoos Indian Band, Oliver, BC

AUTHOR

Matt Fairbarns wrote the original draft of this recovery strategy.

RESPONSIBLE JURISDICTIONS

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

ACKNOWLEDGEMENTS

Jenifer Penny, Ted Lea, Orville Dyer, and Brenda Costanzo provided valuable content changes to the original draft.

EXECUTIVE SUMMARY

Branched phacelia (*Phacelia ramosissima* var. *ramosissima*) is a robust perennial plant restricted to intermountain areas from the southern Okanagan Valley in south-central B.C., south through Washington and Oregon to Nevada and southern California. NatureServe has assigned a status of globally secure to the species. Branched phacelia is assessed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This designation was assigned because the Canadian populations are geographically restricted and known only from three[1] small populations numbering fewer than 1000 plants. The species was listed on Schedule 1 of the federal *Species at Risk Act* in 2006 as endangered.

The Canadian extent of occurrence covers about 5 km^2 near Osoyoos, BC, and the three populations known from Canada occupy less than 1 km^2. The populations occur on a mix of private and provincial Crown land.

Within its range, branched phacelia is restricted to talus slopes in the Bunchgrass and Ponderosa Pine Biogeoclimatic zones. It appears to prefer steep (40–60%) slopes of various aspects, sparsely vegetated with shrubs, forbs, and grasses.

Branched phacelia faces threats from habitat loss or degradation due to urban development, mining and mineral exploration, and potential threats of talus removal, recreational activities, and invasive species.

The recovery goal for branched phacelia is to maintain all known extant populations in B.C.

The short-term (5-year) recovery objectives are:

1. Establish protection for the known extant populations (with no loss or degradation of occupied habitat).
2. Assess the extent of the five threats to the populations (urban development, mining and mineral exploration; and the potential threats of talus removal, recreational activities, and invasive species) and reduce their impacts.
3. Investigate the feasibility of restoring and enhancing populations at extant sites and implement restoration measures when deemed necessary.
4. Address knowledge gaps relating to species biology, particularly life history and demographics.
5. Confirm the distribution of branched phacelia and update population and distribution objectives as needed.

No critical habitat can be identified for branched phacelia in Canada at this time, but it may be identified at a later date in a federal addition by Environment Canada, or in a future action plan. It is expected that critical habitat will be proposed following the completion of outstanding work required to quantify specific habitat and area requirements for the species, further research on the

[1] One of the populations described in the COSEWIC status report was based on a mapping error and never existed. However, an additional population was discovered in 2007, so the total remains at 3 populations.

biology of the species, and monitoring of the populations to determine population trends. Consultation with affected landowners and organizations will also be necessary.

A recovery action plan will be completed by 2012.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

BACKGROUND

Species Assessment Information from COSEWIC

Assessment Summary: May 2005
Common name: branched phacelia
Scientific name: *Phacelia ramosissima*
Status: Endangered
Reason for designation: A geographically highly restricted perennial known only from three small populations numbering fewer than 1,000 plants subject to continued habitat loss and population decline from urban expansion and mining activities.
Occurrence: British Columbia
Status history: Designated Endangered in May 2005. Assessment based on a new status report.

Description of the Species[2]

Branched phacelia is a perennial herb from a branched stem-base and a taproot (Figure 1). The glandular-hairy (having glands, usually sticky) stems are 0.5–1.5 m long. The basal leaves (leaves near the base of the stem), if any, are soon shed while the stalked, glandular-hairy, odoriferous stem leaves are alternate (alternate up the stem, not opposite each other) lance-shaped (sword-shaped) in outline, wider towards the tip, and 10–20 cm long and 3–10 cm wide. The leaves are divided into oppositely arranged lobes (rounded sections) and the lobes are cleft (divided) and toothed. The flowering structure consists of a coiled, 1-sided, dense, terminal cluster of lavender, pale cream, or sometimes white, 5–8 mm long, corollas (a corolla is the ring of petals). The hairy calyces (an outer ring of reduced, petal-like structures) have linear lobes with hairless stamens that protrude well beyond the petals. The fruits are capsules that contain 8-12, 1–2 mm long, pitted seeds.

[2] The following section is adapted from the species description in the status report (COSEWIC 2005).

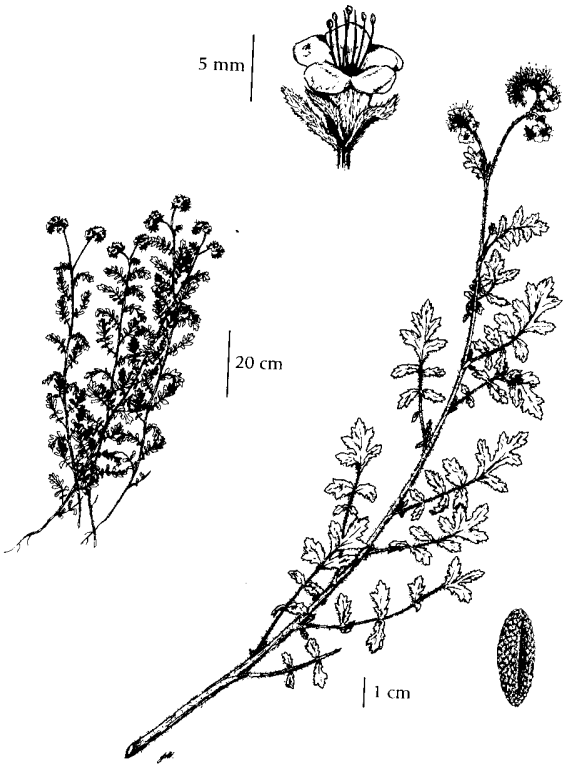


Figure 1. Illustration of branched phacelia. Left: habit; top-centre: flower; lower-centre: branch; lower right: seed (Line drawing by an unattributed illustrator in Douglas *et al.* 1999, with permission).

Populations and Distribution

Branched phacelia is restricted to intermountain areas from the southern Okanagan Valley in south-central B.C., south through Washington and Oregon to Nevada and southern California (Figure 2).

Six varieties of *Phacelia ramosissima* occur within North America, and the variety *ramosissima* is the only variety of this species occurring in Canada (Wilken *et al.* 1993; Kartesz 1999). Other varieties occurring within North America are listed in Table 1.

Table 1. Varieties of *Phacelia ramosissima* in North America and province/state of occurrence.

Variety	Province/State
austrolitoris	CA
eremophila	CA, NV, OR
latifolia	AZ, CA, NV, UT
montereyensis	CA
ramosissima	B.C., CA, NV, OR, WA
subglabra	CA, ID, NV, OR

AZ = Arizona; B.C. = British Columbia; CA = California; ID = Idaho; NV = Nevada; OR = Oregon; UT = Utah; WA = Washington.

Branched phacelia is ranked globally secure by NatureServe conservation ranks (Table 2).

Table 2. Conservation ranks for branched phacelia (variety *ramosissima*).

Location	Rank	Rank description
British Columbia	S1	Critically imperiled
Washington	SNR	Not ranked
Oregon	SNR	Not ranked
California	SNR	Not ranked
Nevada	SNR	Not ranked
Global	G5?TNR	Species is globally secure; variety *ramosissima* is not ranked

Sources: Oregon Natural Heritage Information Centre (2004), California Department of Fish and Game, Natural Diversity Database (2005), Washington Natural Heritage Program (2005), B.C. Conservation Data Centre (2008), NatureServe (2008).

Figure 2. Distribution of branched phacelia in North America (from COSEWIC 2005). Map shows the range of variety *ramosissima*, the only one occurring in Canada.

In Canada, branched phacelia has always been rare as this species is at the northern extent of its range. It was first reported in 1985, however additional records since then have not been monitored to determine population trends.

Currently, populations of branched phacelia have been reported near Osoyoos along the east, west, and southeast slopes of Mount Kruger on the west side of Osoyoos Lake, BC (Figure 3;

Table 3). There are three populations[3] of branched phacelia: one population on the west slope of Mount Kruger; one population (consisting of 16 subpopulations) on the east slope of Mount Kruger; and one population on the southeast slope of Mount Kruger, which is a new occurrence since the COSEWIC (2005) status report.[4]

The extent of occurrence of branched phacelia in Canada is approximately 5 km^2. The area of occupancy is between 800 and 1000 m^2 and a total Canadian population of fewer than 1000 plants (COSEWIC 2005). The Canadian area of occupancy and population size represents less than 1% of the global population and distribution for branched phacelia.

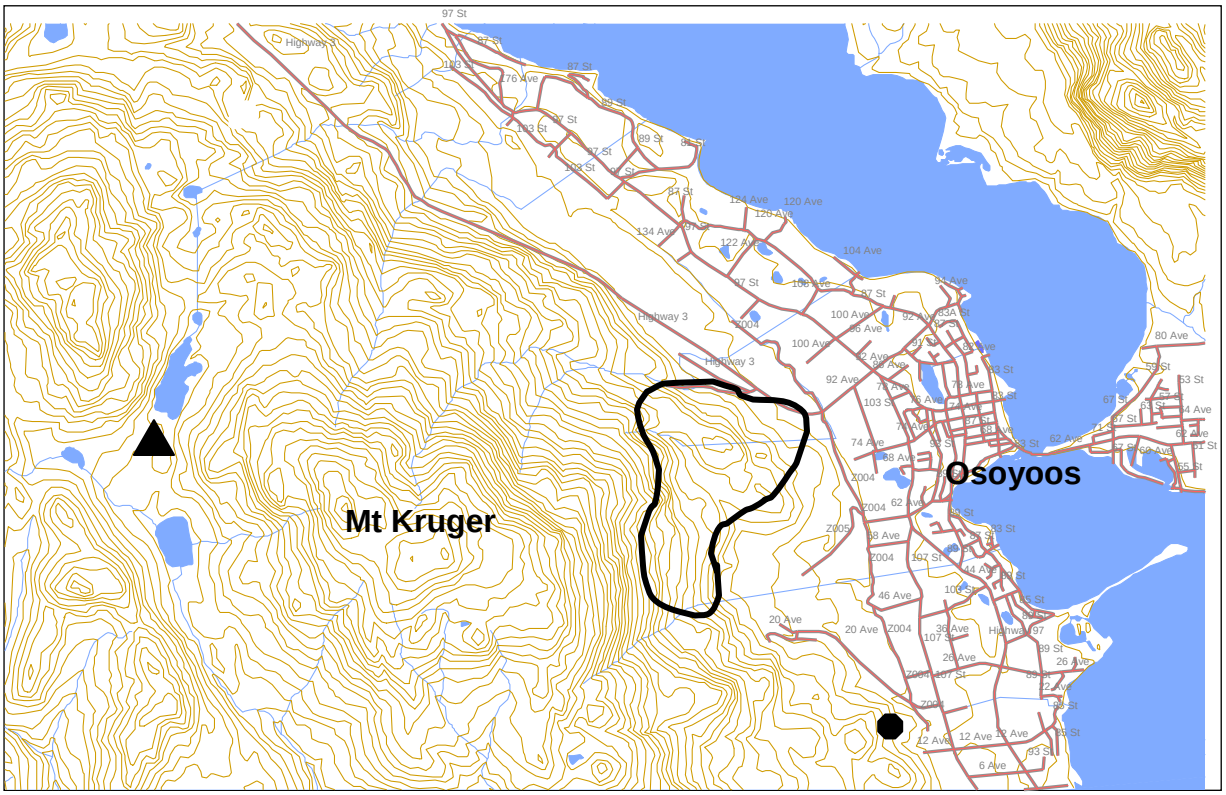


Figure 3. Distribution of branched phacelia in Canada. The triangle represents Mount Kruger west slope population, and the open polygon represents subpopulations on the east slope of Mount Kruger (west bench of Osoyoos Lake). Solid dot is the new population on southeast slope of Mount Kruger.

[3] Populations are locations that are separated from each other by < 1 km
[4] One of the population described in the status report was based on a mapping error and never existed.

Table 3. Summary of populations and subpopulations of branched phacelia in Canada.

Population	Subpopulations	Status and description	Land tenure
Mount Kruger, west slope	None	1998: six plants over 10 m^2. Not seen since July 18, 1998 observation.	South Okanagan Grassland Protected Area
Mount Kruger, east slope	16 subpopulations	1998: eight subpopulations with a combined population of 500–700 individuals occupying about 800–1000 m^2. 2007: nine of the 16 subpopulations were surveyed with a population of 426 plants/910 m^2	16 extant subpopulations - Mixed private and provincial Crown land. Twelve subpopulations are on provincial Crown land, including one in the South Okanagan Grassland Protected Area. Four other subpopulations are on private land. Two others have been extirpated from private land (COSEWIC 2005).
Mount Kruger, southeast slope	None	2007: 15-m long patch	Private land

Needs of the Branched Phacelia

Biological needs, ecological role, and limiting factors

Branched phacelia does not reproduce from cuttings or pieces of the plant (M. Fairbarns, pers. comm., 2006), therefore dispersal of the species likely depends on reproduction through seed. Most phacelia species exhibit physiological dormancy (dormancy due to internal inhibitors usually enzymes and hormones) and require a period of cool and moist conditions before germinating (Baskin and Baskin 1998). It is a perennial species and the longevity and demographic attributes of Canadian plants is unknown. Canadian plants produce large amounts of seed but there is no information regarding the species' ability to bank seeds over long periods, nor is there any information regarding its capacity for long-range seed dispersal.

The species is probably pollinated by bees (M. Fairbarns, pers. comm., 2006). The small populations of this species in B.C. are likely susceptible to stochastic events and demographic collapse.

Habitat needs

Branched phacelia is restricted to the Southern Okanagan Basin, Okanagan Range Ecosection (B.C. Ministry of Environment 2005), in the very dry hot Okanagan variants of the Bunchgrass and Ponderosa Pine Biogeoclimatic zones (B.C. Ministry of Forests 2003). Within this area, it occurs on talus slopes, often calcareous in nature. Leading species nearby include shrubs that can tap into water stored deep in the soil (mock-orange - *Philadelphus lewisii*; soopolallie – *Shepherdia canadensis*; oceanspray – *Holodiscus discolor*; saskatoon – *Amelanchier alnifolia*; nootka rose – *Rosa nutkana*; poison ivy – *Toxicodendron rydbergii*; big sagebrush – *Artemisia tridentata*) and drought-tolerant forbs and grasses (bluebunch wheatgrass – *Pseudoroegneria spicata*; narrow-leaved goosefoot – *Chenopodium desiccatum*; Richardson's penstemon – *Penstemon richardsonii*). It appears to prefer steep (40–60%) slopes of various aspects (J. Penny,

pers. comm., 2005). The influences of fire and fire suppression have not been examined; some *Phacelia* species found in California semi-arid sites need fire for germination (Baskin and Baskin 1998).

Threats

Habitat loss or degradation
Urban development constitutes a major threat to the species as the south Okanagan Valley is experiencing high rates of growth. Potential habitat for branched phacelia has recently been lost to housing and industrial development.

Mining exploration on Mount Kruger potentially threatens branched phacelia (COSEWIC 2005). Mineral exploration activity has occurred within a few metres of one extant subpopulation on the east slope of Mount Kruger and may have contributed to the loss of one or both of the recently extirpated subpopulations (Table 3).

Currently, mineral claims cover all branched phacelia occurrences outside of the South Okanagan Grasslands Protected Area; however, no mining permits have been active since 2000 (A. Brunke, pers. comm., 2006). Mining permits are required for all mineral exploration work involving machinery, but “pick-and-shovel” exploration may be ongoing.

Other potential threats
Talus removal, recreational activities, and invasive species are potential threats. Some talus slopes in the South Okanagan have been excavated to provide rocks for landscaping (T. Lea, pers. comm., 2006). The potential severity of this threat is unknown. As well, recreational activities may impact the habitat of the branched phacelia (trampling, accidental removal of talus), and the spread of invasive alien plant species from nearby areas may threaten the species as well. The potential severity of these threats is unknown.

Actions Already Completed or Underway

In 2007, the B.C. Conservation Corps with the Ministry of Environment partially resurveyed the Mount Kruger area, as did Terry McIntosh and Mike Sarell. A new population found by the latter team is called Mount Kruger, southeast slope (Table 3). No other recovery actions have been completed or are underway.

Knowledge Gaps

More survey work should be conducted in other parts of the Southern Okanagan Basin and possibly within the Okanagan Range and Southern Okanagan Highland Ecosections to determine the presence of unreported populations.

The key demographic attributes should be described for populations in Canada to determine the longevity of plants, identify what stages present the most serious bottlenecks to population growth, and identify the underlying factors. This information will provide a scientific basis for developing well-targeted management actions that are likely to foster efficient, effective, and

economical recovery.

The seasonal development of branched phacelia should be studied. 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.

Seed viability, germination requirements, and seedbank longevity should be determined. This information will assist in the development of effective techniques for seed collection and storage, propagation and population establishment or augmentation. The breeding system should be investigated. If the results indicate that branched phacelia is an outbreeder, its major pollinator guilds should be identified.

RECOVERY

Recovery Feasibility

Recovery is biologically and technically feasible for branched phacelia (Table 4).

Table 4. Technical and biological feasibility of recovery, criteria from Environment Canada *et al.* (2005).

Criteria	Feasibility
1. Are individuals capable of reproduction currently available to improve the population growth rate or population abundance?	Yes. It reproduces sexually and produces abundant seed.
2. Is sufficient suitable habitat available to support the species or could it be made available through habitat management or restoration?	Yes. While there have been declines in habitat quality and extent, there is no compelling evidence that sufficient habitat securement for recovery is impossible.
3. Can significant threats to the species or its habitat be avoided or mitigated through recovery actions?	Yes. Threats can be mitigated through the actions outlined in Table 5.
4. Do the necessary recovery techniques exist and are they demonstrated to be effective?	Yes. Recovery techniques consist primarily of threat mitigation techniques. One subpopulation on the east slope of Mount Kruger was found (during the 2003 surveys for the status report) on rubble excavated from a mine (S. Smith, pers. comm., 2006), which indicates that population establishment is technically feasible.

Recovery Goal

The recovery goal for branched phacelia is to maintain all known extant populations in B.C.

Rationale for the Recovery Goal

Specific targets for population numbers are not possible due to lack of historical data for determining long-term population trends. As well, because the species is at the northern extent of its range in North America, it is likely that it has always been rare. There is too little known about the species' demography, seasonal development and productivity to develop more specific goals.

Recovery Objectives

The short-term (5-year) recovery objectives are:

1. Establish protection for the known extant populations (with no loss or degradation of occupied habitat).
2. Assess the extent of the five threats to the populations (urban development, mining and mineral exploration; and the potential threats of talus removal, recreational activities, and invasive species) and reduce their impacts.
3. Investigate the feasibility of restoring and enhancing populations at extant sites and implement restoration measures when deemed necessary.
4. Address knowledge gaps relating to species biology, particularly life history and demographics.
5. Confirm the distribution of branched phacelia and update population and distribution objectives as needed.

Approaches Recommended to Meet Recovery Objectives

Broad strategies for the recovery of branched phacelia are presented in Table 5.

1. Protect habitat[5] for existing populations.
2. Monitor threats and develop best management practices or management plans.
3. Establish scientific research to determine if restoring and enhancing populations is feasible and deemed necessary.
4. Establish scientific research to address knowledge gaps relating to the viability of the species including demography, population dynamics, seed germination requirements, seedbank longevity, and genetics.
5. Inventory and monitor existing populations and potential sites for additional populations.
6. Provide public outreach (stewardship) with landowners and land managers to increase interest in the protection and stewardship of the species.

[5] This may involve protection in any form including stewardship agreements and conservation covenants, land use designations, and protected areas.

Recovery planning table

Table 5. Recovery planning table for branched phacelia.

Priority	Obj. no.	Broad strategies to address threats	Threats or concerns addressed	Recommended approaches
Urgent	1	Habitat protection	Habitat loss and degradation – urban development, mining and mineral exploration, talus removal	• Establish protection measures for all populations (e.g. covenants and other agreements) in cooperation with the South Okanagan–Similkameen Conservation Program (SOSCP).
Urgent	1, 2	Habitat protection and public outreach	Habitat loss and degradation – all	• Prepare best management practices to support landowners in habitat stewardship activities. • Identify which private and public landowners have populations of branched phacelia on their lands. • Contact landowners through the landowner contact program of SOSCP.
Necessary	2,3,4	Scientific research	Habitat loss and degradation – all	• Determine whether there are bottlenecks affecting pollination/reproduction, dispersal, seed production, recruitment, recruit survival. • Determine feasibility of population enhancement at extant locations. • Determine appropriate management techniques to protect existing populations of branched phacelia and their habitat.
Necessary	1, 2, 3, 5	Inventory and population /threat monitoring	Habitat loss and degradation – all	• Identify and prioritize areas for inventory. • Conduct inventory to determine whether there are any undocumented populations. • Monitor populations and assess threats at sites.
Necessary	3	Habitat restoration	Habitat loss and degradation – all	• Identify sites suitable for restoration and enhancement of extant populations if deemed necessary • Implement restoration activities
Beneficial	1,2	Public outreach - stewardship with landowners/land managers	Habitat loss and degradation – all	• Deliver public education and outreach concerning branched phacelia and their management (e.g. to naturalist and outdoor recreation clubs, First Nations, local governments, landowners, land managers, and stakeholders).

Performance Measures

The following performance measures are related to the objectives:

1. Protection measures, such as covenants, stewardship agreements and best management practices have been developed (Objective 1).
2. Population monitoring indicates that the numbers of plants at the extant sites are stable or increasing, by 2012 (Objective 1);
3. Impact of the five main threats to the populations has been investigated and threats are reduced and/or mitigated at sites of all extant populations by 2012 (Objective 2);

4. Initiation of a scientific investigation to determine whether or not it is feasible and necessary to restore and enhance extant populations is completed by 2012 (Objective 3).
5. Scientific research has been initiated to address knowledge gaps (Objective 4).
6. Public outreach sessions have been presented to land owners and land managers (Objective 5).

Critical Habitat

Identification of the species' critical habitat

No critical habitat can be identified for branched phacelia in Canada at this time, but it may be identified at a later date in a federal addition by Environment Canada, or in a future action plan. It is expected that critical habitat will be proposed following the completion of outstanding work required to quantify specific habitat and area requirements for the species, further research on the biology of the species, and monitoring of the populations to determine population trends. Consultation with affected landowners and organizations will also be necessary.

Recommended schedule of studies to identify critical habitat

1. Identify biotic and abiotic habitat attributes (e.g. soil texture, size of talus soil depth, slope, aspect, hydrologic regime for the entire growing period, species composition) at extant sites by 2012.

2. Using established survey and mapping techniques (applied during phenologically appropriate periods – June and July), delineate the boundaries of all occupied habitats by 2012.

Existing and Recommended Approaches to Habitat Protection

The population on the west slope of Mount Kruger and one of the east slope subpopulations occur in the South Okanagan Grasslands Protected Area. There are no active logging or mining tenures in the protected area (MWLAP 2003).

Eleven other subpopulations on the east side of Mount Kruger occur on provincial Crown land, but are not protected from mining and much of the area is covered by active mining claims.

The remaining four subpopulations on the east slope of Mount Kruger, and the south-east slope Mount Kruger population, occur on private land. Their habitat could be protected through stewardship mechanisms that effectively prevent development for mining or urban development. Effective mechanisms include establishment of conservation covenants, eco-gifting of the small areas where branched phacelia occurs, or purchase of the properties for conservation.

Effects on Other Species

Branched phacelia is found in the South Okanagan Valley where other rare species are found (see Table 6). The recovery actions proposed are not expected to negatively affect any other species. The recommended habitat protection will indirectly benefit other species in the area.

Table 6. Rare species occurring in the South Okanagan Valley.

Species	Common name	Conservation rank	COSEWIC status
Vertebrates			
Taxidea taxus	Badger	G5 S1	E
Ambystoma tigrinum	Tiger Salamander	G5 S2	E
Spea intermontana	Great Basin Spadefoot	G5 S3	T
Ammodramus savannarum	Grasshopper Sparrow	G5 S2B	NA
Spizella breweri breweri	Brewer's Sparrow, *breweri* subspecies	G5T4 S2B	NA
Catherpes mexicanus	Canyon Wren	G5 S3	NAR
Crotalus oreganus	Western Rattlesnake	G5 S3	T
Pituophis catenifer deserticola	Gopher Snake, *deserticola* subspecies	G5T5 S3	T
Hypsiglena torquata	Night Snake	G5 S1	E
Phrynosoma douglasii	Pigmy Short-horned Lizard	G5 SX	XT
Butterflies			
Satyrium fuliginosa	Sooty Hairstreak	G4 S1	NA
Satyrium californica	California Hairstreak	G5 S3	NA
Satyrium behrii	Behr's Hairstreak	G5 S2	T
Plants			
Calochortus lyallii	Lyall's mariposa lily	G3 S2	T
Orthocarpus barbatus	Grand Coulee owl-clover	G2G4 S1	E
Halimolobos whitedii	Whited's halimolobos	G3? S2	NA
Bolboschoenus fluviatilis	river bulrush	G5 S2S3	NA
Salix amygdaloides	peach-leaf willow	G5 S2	NA
Camissonia andina	Andean evening-primrose	G4 S1	NA
Linanthus septentrionalis	northern linanthus	G5 S2S3	NA
Lepidium densiflorum var. *pubicarpum*	prairie pepper-grass	G5T4 S1	NA
Gilia sinuata	shy gilia	G5 SH	NA
Erigeron poliospermus var. *poliospermus*	cushion fleabane	G4T4 S2S3	NA
Verbena hastata var. *scabra*	blue vervain	G5T5 S2	NA
Sphaeralcea coccinea	scarlet globe-mallow	G5? S1	NA
Gaura coccinea	scarlet gaura	G5 S1	NA
Astragalus sclerocarpus	The Dalles milk-vetch	G5 S2	NA
Astragalus filipes	threadstalk milk-vetch	G5 S3	NA
Lappula occidentalis var. *cupulata*	western stickseed	G5T5 S1	NA
Thelypodium laciniatum var. *laciniatum*	Thick-leaved thelypody	G5T5	NA

Status: XT = extinct, E = endangered, T = threatened, SC = special concern, NA = not assessed, NAR = not at risk. S-ranks are assigned by the B.C. Conservation Data Centre and NatureServe.

Socioeconomic Considerations

Recovery of branched phacelia and restoration of its habitat will contribute to the biodiversity, health, and functioning of the environment and enhance opportunities for appreciation of such special places and species thereby contributing to overall social value in the Southern Interior of B.C. The natural beauty of grasslands and associated ecosystems in the South Okanagan and Similkameen areas are an important resource for British Columbians, and contribute to the tourism and recreation industry. Protecting these natural spaces, biodiversity, and recreation values has enormous value to the local economy. Recovery actions could affect private land development, and talus rock and mining sectors. The expected magnitude of these effects is unknown and will be further addressed in the action plan.

Recommended Approach for Recovery Implementation

The recovery team should strive for cross-membership with teams managing the recovery of other rare grassland species in the South Okanagan–Similkameen area. Despite the obvious benefits of cross-membership with other recovery team(s), a single-species approach is best suited to the recovery of branched phacelia because it occurs in specialized talus habitats. Special attention will have to be paid to potential impacts of recovery activities on snake hibernacula.

The South Okanagan–Similkameen Conservation Program (SOSCP) is a partnership of non-governmental, government, and First Nations organizations that conserve the biodiversity of the region, which includes the Canadian extent of occurrence of branched phacelia. SOSCP promotes stewardship through landowner contact, applies First Nations knowledge and ecological heritage, offers educational programs, assists in the securement of sites for conservation, and undertakes research and habitat restoration. While SOSCP provides a landscape conservation context for the protection of species at risk, it currently has no specific projects directed at the recovery of branched phacelia.

Statement on Action Plans

A recovery action plan for branched phacelia will be completed by 2012.

REFERENCES

Baskin, C. and J. Baskin. 1998. Seeds: ecology, biogeography and evolution of dormancy and Germination. Academic Press, San Diego, CA. 666 p.

B.C. Conservation Data Centre. 2008. BC Species and Ecosystems Explorer. B.C. Min. Sustainable Resour. Manage., Victoria, BC. <http://srmapps.gov.bc.ca/apps/eswp/> [Accessed August 3, 2005]

B.C. Ministry of the Environment. 2005. Ecosection map, Thompson and Okanagan Regions. <http://wlapwww.gov.bc.ca/sir/fwh/wld/map_page/images/ecosctns.gif> [Accessed February 2006]

B.C. Ministry of Forests. 2003. Biogeoclimatic ecosystem classification subzone/variant map for Penticton Forest District, Kamloops Forest Region. Victoria, BC. 1:250,000. <http://www.for.gov.bc.ca/hre/becweb/papermap/Field/DPE_Penticton_Field.pdf> [Accessed February 2006]

B.C. Ministry of Water, Air and Land Protection (MWALP). 2003. Management direction statement for Kilpoola Site, South Okanagan Grasslands Provincial Protected Area. Okanagan Region. <http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/s_okanpa/kilpoola.pdf> [Accessed February 2003]

California Department of Fish and Game. 2005. Natural Diversity Data Base. http://www.dfg.ca.gov/biogeodata/cnddb/cnddb_info.asp [Accessed February 2003].

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2005. Assessment and status report on the branched phacelia (*Phacelia ramosissima*) in Canada. Ottawa, ON. vi + 18 p.

Douglas, G.W., D. Meidinger, and J. Pojar. 1999. Illustrated flora of British Columbia. Vol. 3. Dicotyledons (Diapensiaceae through Onagraceae). B.C. Min. Environ., Lands and Parks and B.C. Min. For., Victoria, BC. 423 p.

Environment Canada, Parks Canada Agency, and Fisheries and Oceans Canada. 2005. *Species at Risk Act* policy: recovery – draft policy on the feasibility of recovery. April 15, 2005. Ottawa, ON.

Kartesz, J.F. 1999. A synonymized checklist and atlas with biological attributes for the vascular flora of the United States, Canada, and Greenland. First edition [CD ROM]. In J.F. Kartesz and C.A. Meacham. Synthesis of the North American flora, Version 1.0. North Carolina Botanical Garden, Chapel Hill, NC.

NatureServe. 2008. NatureServe Explorer: an online encyclopedia of life. Version 6.2, Arlington, VA. <http://www.natureserve.org/explorer> [Accessed March 10, 2008]

Oregon Natural Heritage Information Center. 2004. Rare, threatened and endangered species of Oregon. Oregon State Univ., Portland, OR. 105 p.

Washington Natural Heritage Program. 2005. List of vascular plants tracked by the Washington Natural Heritage Program, July 2005. <http://www.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html> [Accessed August 3, 2005]

Wilken, D.H., R.R. Halse, and R.W. Patterson. 1993. Phacelia. Pages 691–706 *in* J.C. Hickman, ed. The Jepson manual: higher plants of California. Univ. Calif. Press, Berkeley, CA. 1400 p.

Personal Communications

Brunke, A. 2006. *Telephone conversation with M. Fairbarns*. March 2, 2006. B.C. Min. Energy, Mines and Petroleum Resources, Mining and Minerals Division, South Central Region, Kamloops, BC.

Fairbarns, M. 2006. Botanical Consultant, Victoria, BC.

Lea, T. 2006. *Interview with M. Fairbarns*. February 2006. Species at Risk Botanist. B.C. Min. Environ., Victoria, BC.

Penny, J. 2005. *E-mail correspondence to M. Fairbarns*. June 2005. Senior Botanist. B.C. Conservation Data Centre, Victoria, BC.

Sarrell, M. 2006. *E-mail correspondence to M. Fairbarns*. February 2006. Herpetologist. Ophiuchus Consulting, Oliver, BC.

Smith, S. 2006. *E-mail and telephone correspondence with M. Fairbarns*. February 2006. Co-author of status report on branched phacelia. Currently a biologist with the Garry Oak Ecosystems Recovery Team, Victoria, BC.