

Recovery Strategy for the Short-rayed Alkali Aster (*Symphyotrichum frondosum*) in Canada

Short-rayed Alkali Aster



2013

Recommended citation:

Environment Canada. 2013. Recovery Strategy for the Short-rayed Alkali Aster (*Symphyotrichum frondosum*) 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 Public Registry (www.sararegistry.gc.ca).

Cover illustration: Terry T. McIntosh

Également disponible en français sous le titre
« Programme de rétablissement de l'aster feuillu (*Symphyotrichum frondosum*) au Canada
[Proposition] »

© Her Majesty the Queen in Right of Canada, represented by the Minister of the Environment, 2013. All rights reserved.

ISBN

Catalogue no.

Content (excluding the illustrations) may be used without permission, with appropriate credit to the source.

RECOVERY STRATEGY FOR THE SHORT-RAYED ALKALI ASTER (*Symphyotrichum frondosum*) IN CANADA

2013

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 short-rayed alkali aster (*Symphyotrichum frondosum*) in British Columbia” (Part 2) 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.

The federal Recovery Strategy for the Short-rayed Alkali Aster in Canada consists of two parts:

Part 1: Federal Addition to the “Recovery Strategy for the short-rayed alkali aster (*Symphyotrichum frondosum*) in British Columbia”, prepared by Environment Canada.

Part 2: Recovery Strategy for the short-rayed alkali aster (*Symphyotrichum frondosum*) in British Columbia, prepared by the Short-rayed Alkali Aster Recovery Team, for the British Columbia Ministry of Environment.

TABLE OF CONTENTS

PART 1: Federal Addition to the “Recovery Strategy for the short-rayed alkali aster (Symphyotrichum frondosum) in British Columbia”, prepared by Environment Canada ..	I
PREFACE.....	II
ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT	III
1. Species Status Information.....	III
2. Socio-economic Considerations	III
3. Recovery Feasibility	IV
4. Population and Distribution Objectives	IV
5. Critical Habitat	V
5.1 Identification of the Species’ Critical Habitat.....	V
5.2 Schedule of Studies to Identify Critical Habitat.....	VIII
5.3 Examples of Activities Likely to Result in Destruction of Critical Habitat	VIII
6. Statement of Action Plans	X
7. Effects on the Environment and Other Species	X
8. References	XI
Appendix 1. Maps of critical habitat for Short-rayed Alkali Aster in Canada	XII
PART 2: Recovery Strategy for the short-rayed alkali aster (Symphyotrichum frondosum) in British Columbia, prepared by the Short-rayed Alkali Aster Recovery Team, for the British Columbia Ministry of Environment	XIX

PART 1: Federal Addition to the “Recovery Strategy for the short-rayed alkali aster (*Symphotrichum frondosum*) 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.

The Minister of the Environment is the competent minister for the recovery of the Short-rayed Alkali Aster and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. It has been prepared in cooperation with the Department of Fisheries and Oceans Canada (as a SARA-participating agency), and the British Columbia Ministry of Environment. 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 British Columbia Ministry of Environment led the development of the attached recovery strategy for the Short-rayed Alkali Aster (Part 2) in cooperation with Environment Canada.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada, or any other jurisdiction, alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Short-rayed Alkali Aster 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.

ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT

The following sections have been included to address specific requirements of SARA that are not addressed in the “Recovery Strategy for the short-rayed alkali aster (*Symphyotrichum frondosum*) in British Columbia” (Part 2 of this document, referred to hereafter as “the provincial recovery strategy”). In some cases, these sections may also include updated information or modifications to the P/T recovery strategy for adoption by Environment Canada.

1. Species Status Information

Legal Status: SARA Schedule 1 (Endangered) (2007)

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

Global (G) Rank	National (N) Rank	Sub-national (S) Rank	COSEWIC Designation	B.C. List	B.C. Conservation Framework
G4*	Canada (NNR) United States (NNR)	Canada: British Columbia (S1), United States: Arizona (SNR), California (SNR), Colorado (SNR), Idaho (SNR), Maine (SNR), Montana (SH), Nevada (SNR), New Mexico (SNR), Oregon (SNR), Utah (SNR), Washington (SNR), Wyoming (S2)	Endangered (2006)	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%.

2. Socio-economic Considerations

The “Recovery Strategy for the short-rayed alkali aster (*Symphyotrichum frondosum*) in British Columbia” contains a short statement on socio-economic considerations. As socio-economic analysis is not required under Section 41(1) of SARA, the Socio-economic Considerations section of the “Recovery Strategy for the short-rayed alkali aster (*Symphyotrichum frondosum*) in British Columbia” is not considered part of the Minister of the Environment’s recovery strategy for this species.

3. Recovery Feasibility

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

Recovery of the Short-rayed Alkali Aster (*Symphyotrichum frondosum*) is considered technically and biologically feasible based on the following four criteria outlined in the draft SARA Policies (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, the current populations of Short-rayed Alkali Aster are capable of reproducing; most members of the Asteraceae family reproduce readily from seed.

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

Yes, there is sufficient suitable habitat for this species, and additional suitable habitat might also be made available through habitat management or restoration.

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

Yes, through effective management for this species, including the potential control of invasive species, some of the primary threats can be mitigated.

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 methods and techniques for the recovery of this species already exist.

4. 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 Short-rayed Alkali Aster to be:

To maintain the distribution, and to maintain or (where feasible) improve the abundance, of all known extant populations of this species in Canada, as well as any other extant populations that may be identified in Canada.

Rationale:

Abundance and distribution information for this species shows eight confirmed extant populations¹ on federal and non-federal land in the southern interior of B.C. (2007, 2003 surveys; as per data available in the provincial recovery strategy, and from the BC CDC). There is no information to confirm that the species was previously more widespread, therefore an objective to actively increase the number of populations, which may allow for down-listing of the species, is not appropriate. However, if additional naturally occurring populations are discovered, they should also be maintained. The rate of change in population size for extant populations is unknown; it is important to note for future monitoring and/or trend estimation purposes, that the population size of this annual species may characteristically fluctuate between survey years (Bush and Lancaster 2004). Where the best available information and/or long-term monitoring indicates overall population decline, deliberate attempts to improve abundance (e.g., through seeding or change in land use management) are appropriate.

In reference to potential additional extant populations of Short-rayed Alkali Aster, two small occurrences have been reported in the Fraser Valley, B.C., at (1) New Westminster (2006), and (2) at Surrey (1994). These occurrences were not included in the provincial recovery strategy (2009) owing to their characterization as apparently incidental, non-viable populations. In 2011, Environment Canada reviewed the historical and existing information for these records. Frank Lomer (2011 pers. comm.), the original observer of both Fraser Valley occurrences, indicated that Short-rayed Alkali Aster has not persisted at either site, and that neither location comprises suitable habitat for Short-rayed Alkali Aster at present. However, Lomer notes that the Surrey population likely came in with dredged sand from the Fraser River, indicating Short-rayed Alkali Aster might occur (or have occurred) in the Thompson/Fraser drainage.

5. Critical Habitat

5.1 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 2009 provincial recovery strategy for Short-rayed Alkali Aster noted that critical habitat could not be identified at that time (nor is it required in the provincial process), owing to a lack of information on habitat and area requirements for the species. This federal document does identify critical habitat to the extent possible for Short-rayed Alkali Aster. For populations with critical habitat identified in this recovery strategy, more precise boundaries may be mapped, and additional critical habitat may be added in the future, if additional research

¹ “Populations” are generally characterized as being separated by >1 km, and “sub-populations” represent records of individuals, or patches of individuals, that are within 1 km of each other. In some cases, dispersal dynamics and the species' ecology warrant customized population separation distances. For one known extant population of Short-rayed Alkali Aster at Vaseux Lake, B.C., the northern and southern “sub-populations” are actually 1.75 km apart. The features comprising this occurrence were considered to share linear shoreline water-current flow, and so were identified as one population by the B.C. Conservation Data Centre (Marta Donovan, pers. comm. 2011).

supports greater inclusion of areas beyond what is 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.

Critical habitat for Short-rayed Alkali Aster is identified for five of the eight confirmed² extant populations in the south interior of British Columbia. Critical habitat could not be identified for three of the eight known extant populations, owing to a lack of geographic information (i.e., population location details are not sufficient for this purpose). Available data and descriptions for these three populations, shown below, indicate a geographical range of greater than 10 kilometers of shoreline, for an unknown number of plants. Detailed geographic information for these three populations is not currently available to Environment Canada. The three populations that do not have critical habitat identified at this time are described as follows (refer to provincial recovery strategy for details):

1. Osoyoos Lake, northeast shore (EO2³): 50-70 plants (in 1993)
2. Osoyoos Lake, east shore (EO6): ≥ 40 plants over 200 m² (in 1999)
3. Osoyoos Lake, southeast shore (EO3): 5 plants / m²; total area unspecified (in 2002)

Environment Canada endeavours to engage the appropriate individuals and agencies such that the sharing of spatial occurrence data will be granted, and so that the critical habitat for this population may be completely identified in due course.

Ecological attributes of Short-rayed Alkali Aster habitat are outlined in the provincial recovery strategy, and in the COSEWIC status report (COSEWIC 2006):

1. Short-rayed Alkali Aster is found predominantly in the Bunchgrass Biogeoclimatic Zone in the southern Okanagan Valley. This area is characterized as having a semi-arid steppe climate, with cold winters. Summers are hot and dry, with low mean annual rainfall (300 mm) and relatively short growing seasons.
2. Within these environments, Short-rayed Alkali Aster has been reported from lakeshore habitats including sandy beaches (Osoyoos Lake), and from the lightly sloping draw-down zone⁴ of lakes and ponds (Vaseux Lake, Skaha Lake, Max Lake). Two isolated plants have also been reported along the edge of the Fraser River (Surrey, and New Westminster B.C.).
3. Seasonally fluctuating water levels are important to population dynamics. Short-rayed Alkali Aster is a late emergent, wet shoreline species; plants germinate when water levels recede in later summer months.

Short-rayed Alkali Aster is associated with sandy shorelines, and edges of ponds, lakes, and rivers, in areas that experience seasonal flooding. Ecosystem processes that occur along shorelines (e.g., extent of water level fluctuation, duration of flooding; also nutrient cycling and sedimentation properties) are integral to the production and maintenance of suitable microhabitat conditions for

² These five populations were re-confirmed in 2007, and 2003 surveys.

³ EO numbers refer to Element Occurrences tracked by the British Columbia Conservation Data Centre.

⁴ The draw-down zone is the area at the edge of a body of water that is frequently and/or seasonally exposed to the air owing to water-level changes caused by evaporation, water usage, and/or management of control dams.

Short-rayed Alkali Aster. Shoreline erosion and microclimate will be directly affected by development or landscape alteration in proximal areas.

Critical habitat for Short-rayed Alkali Aster in Canada is identified as the area occupied by individual plants or patches of plants, including the associated potential location error from GPS units (ranging from 13 m to 25 m uncertainty distance), plus an additional 50 meters (i.e., critical function zone distance⁵) to encompass immediately adjacent areas. Critical habitat also includes the entire portion of distinct ecological features⁶ which are associated with, and are integral to, the production and maintenance of suitable habitat conditions. Distinct ecological features identified as critical habitat for Short-rayed Alkali Aster include: seasonally-flooded shorelines (down to the lowest documented water level), as well as the associated draw-down zone adjacent to shorelines. Shoreline habitats are maintained via extent of water level fluctuation, duration of flooding, nutrient cycling, and sedimentation properties. Where occurrences are in close proximity (location uncertainty plus critical function zone boundaries are less than 100 m apart), and/or where they occur in association with the same distinct ecological feature, showing continuous suitable habitat characteristics between them, connective habitat (i.e., the area in-between occurrences) is identified as critical habitat.

Areas containing critical habitat are shown in Appendix 1. The polygons shown were derived to closely encompass the occurrences, plus location error, plus critical function zone distance as well as connective habitat and portions of distinct ecological features, where appropriate. The polygons shown on each map thus represent actual critical habitat, excluding established anthropogenic features and standing water, as follows. Given that existing anthropogenic features (including active roads, establish building structures) do not possess the ecological attributes required for the Short-rayed Alkali Aster, they are not included as critical habitat, even when they occur within the minimum critical function zone distance (i.e., 50 m plus GPS error) of the plant occurrence. Permanent standing water below the lowest documented water line is not identified as critical habitat. Should it be determined through further study that these features do provide an essential ecological function, the identification of critical habitat will be updated accordingly. Detailed methods and decision-making processes relating to critical habitat identification are archived in a supporting document.

It is recognized that the critical habitat identified above is insufficient to achieve the population and distribution objectives for the species. The schedule of studies (Section 5.2) outlines the activities required to identify additional critical habitat necessary to support these objectives.

⁵ Critical function zone distance has been defined as the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g., critical light, moisture, humidity levels necessary for survival).

⁶ “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.

5.2 Schedule of Studies to Identify Critical Habitat

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

The following schedule of studies (Table 2) will enable the identification of critical habitat for additional populations of Short-rayed Alkali Aster in Canada.

Additional spatial data is required to identify critical habitat at locations for three known extant populations occurring at Osoyoos Lake, B.C. Environment Canada endeavours to engage the appropriate individuals and agencies such that the sharing of spatial occurrence data will be granted, and so that the critical habitat for these populations may be identified in due course.

Two additional occurrences of Short-Rayed Alkali Aster were found in the Fraser Valley (1994, 2006), but plants have not been observed to persist (2011). At this time, it is not known if viable propagules remain in the seed bank, and/or if these records indicate a greater range of distribution, e.g., locally opportunistic occurrences, in the area or near vicinity.

Table 2. Schedule of Studies to Identify Additional Critical Habitat.

Activity	Rationale	Timeline
Obtain data sharing agreement permitting access to geographic information (population location details) for the remaining three known extant populations of Short-rayed Alkali Aster, occurring at Osoyoos Lake, B.C. in order to identify critical habitat for the above-mentioned extant populations.	Ensure critical habitat is identified to support all extant Short-rayed Alkali Aster populations in Canada. Currently, the best available spatial information only permits identification of five of the eight known extant populations that are located in the south interior of B.C.	2013-2018
Conduct targeted surveys in areas of suitable habitat within the proximity of the observations of Short-rayed Alkali Aster in the Fraser River drainage banks including areas at Surrey and New Westminster, B.C., and assess any new or reconfirmed populations against criteria for identifying critical habitat.	Ensure critical habitat is identified to support all extant Short-rayed Alkali Aster populations in Canada. Currently, adequate information exists to identify critical habitat for only the eight known extant populations in the south interior of B.C.	2013-2018

5.3 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. The provincial recovery strategy provides a detailed description of limitations and potential threats to Short-rayed Alkali Aster. Activities described in Table 3 include those likely to cause destruction of critical habitat for the species; destructive activities are not limited to those listed.

Table 3. Examples of activities likely to result in destruction of critical habitat for Short-rayed Alkali Aster.

Activity	Description of activity resulting in or contributing to the destruction of critical habitat	Threat level
Inappropriate lake water level control (as implemented by human management of outlet dams) for flood control, drinking water or irrigation purposes, causing water level stabilization and/or abnormal fluctuations	Results in suppression of natural flood/drought cycles and water level regimes such that hydrological qualities and processes are beyond the niche tolerance range of Short-rayed Alkali Aster; water levels artificially maintained at too-high or too-low levels, or that are prevented from fluctuating required amounts at appropriate times ⁷ , will prevent successful completion of one or more life history stages, i.e., germination, growth, and/or flowering.	High
Deliberate destruction of natural shoreline for recreation, residence, or agriculture, including: creation of structures, removal of vegetation or natural substratum	Results in direct habitat loss by creation of structures (e.g., docks, boat ramps, boat houses, and sheds), or by removal of seed bank and natural substratum required for growth (e.g., vegetation removal as a function of beach maintenance/aesthetics, or lawn creation) in areas identified as critical habitat for the Short-rayed Alkali Aster.	High
Introducing detrimental patterns of disturbance in areas occupied by, or proximal to, Short-rayed Alkali Aster, including: excessive recreational use (e.g., ATVs, hiking, boat damage, trampling by swimmers), trampling by livestock, or landscape development	Detrimental disturbance patterns cause direct and indirect habitat loss by altering natural ecological processes and dynamics required for perpetuation. The nature and magnitude of disturbance dynamics will impact local water and nutrient cycling, as well as substratum characteristics (e.g., erosion, compaction) which influence success of seed set, dormancy, germination, and growth. Damaging ecological processes in occupied and/or immediately adjacent areas will have immediate and cumulative effects on the quality and availability of habitat for Short-rayed Alkali Aster.	High
Deliberate introduction of alien invasive plants, or efforts to control existing invasive species	Alien invasive species cause direct reduction of habitat available for Short-rayed Alkali Aster, and indirect effects, e.g., alteration of shade, water, and nutrients available to exclude niche range of Short-rayed Alkali Aster. Efforts to control invasive plants through mechanical or chemical means can likewise result in habitat alteration such that it is no longer suitable for Short-rayed Alkali Aster.	Moderate

Habitat destruction from water level stabilization and/or abnormal fluctuations has been identified as a major threat to Short-rayed Alkali Aster populations. The water levels of Osoyoos Lake, Vaseux and Skaha Lake (in combination, associated with 7 of the 8 known extant populations) are managed by outlet dams. Shoreline species are adapted to fluctuating water levels, including regular flooding and summer draw-down with associated siltation and wave action that reduces organic matter, and, ultimately, reduces competition. Water levels are artificially controlled at all of the known extant sites in B.C. If lake levels are maintained too high or too low, or if water levels are maintained at one level too long, such that extended flooding or drying results (i.e., preventing natural fluctuations), this will reduce the critical habitat available to Short-rayed Alkali Aster, as well as the successful persistence or emergence of seeds from the seed bank, and any subsequent recruitment.

⁷ Research on germination and survival requirements, and corresponding habitat attributes such as lake levels, has been identified as a knowledge gap in the provincial recovery strategy. More detailed understanding of the effects of within- and between- year water-level fluctuation on Short-rayed Alkali Aster growth and abundance at all life history stages is required for appropriate water level control (i.e., time, level, and duration of artificial flooding).

Habitat loss through shoreline destruction and development has also been identified as a major threat to Short-rayed Alkali Aster. The ecological preference of Short-rayed Alkali Aster for lakeshore habitat makes it particularly threatened by residential developments (including associated landscaping activities), and local recreational beach-use activities (i.e., for boating, camping, walking, or swimming). In some instances, it would appear that some level of human disturbance benefits this species, owing to its preference for recently-disturbed habitat and reduced competition with other vegetation. Anthropogenic activities such as roto-tilling and sand-sifting beach areas to reduce weed encroachment may benefit Short-rayed Alkali Aster by mimicking natural disturbance regimes, like wave and storm action. However, appropriate timing (pre-germination, and post-seed set) and duration of these activities is essential. Excessive beach use by sunbathers, boaters, recreational vehicles, and children digging, as well as trampling by livestock (particularly in post-germination and pre-seed set periods), appears to severely affect habitat quality and characteristics such that it is no longer suitable for Short-rayed Alkali Aster. Encroachment or in-filling shoreline areas for lawns, docks, or construction of a breakwater also causes direct destruction of critical habitat. Nutrient loading in these heavily used lakes may also be a concern, as this species' preferred habitat is low in nutrient availability.

Invasive non-native species are a threat to this species, particularly in absence of natural water level fluctuations that can provide natural controls. Invasive plants White Sweet Clover (*Melilotus alba*), Purple Loosestrife (*Lythrum salicaria*), Houndstongue (*Cynoglossum officinale*), Giant Burdock (*Arctium lappa*), Canada Thistle (*Cirsium arvense*), Diffuse Knapweed (*Centaurea diffusa*), and Sulphur Cinquefoil (*Potentilla recta*), have been reported to occur with Short-rayed Alkali Aster at sites in the south interior of B.C. Invasive alien plants reduce available habitat by competing for resources, and concurrently, by altering the quality of resources available to Short-rayed Alkali Aster (e.g., space, water, light, nutrients). However, efforts to control these species may also cause inadvertent mechanical or chemical damage to Short-rayed Alkali Aster habitat.

6. Statement on Action Plans

An action plan will be posted on the Species at Risk Public Registry by 2018.

7. 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.

Short-rayed Alkali Aster occurs in the South Okanagan Valley, where other rare species are found. Critical habitat identified for Short-rayed Alkali Aster is known to overlap with critical habitat identified for other shoreline plants in the area that are characterized as species at risk. For example, the SARA Schedule 1 plant species Toothcup (*Rotala ramosior*), Scarlet Ammannia (*Ammannia robusta*), Small-flowered Lipocarpha (*Lipocarpha micrantha*), and Bent Spike-rush (*Eleocharis geniculata*) also occur at the Osoyoos Lake sites. The provincially rare Awned Cyperus (*Cyperus squarrosus*) is known to co-occur in this area as well.

The proposed recovery approaches 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 of Short-rayed Alkali Aster 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.

8. References

B.C. Conservation Data Centre. 2011. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed July 13, 2011).

B.C. Conservation Framework. 2011. Conservation Framework Summary: *Symphyotrichum frondosum*. B.C. Minist. of Environment. Victoria, B.C. Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed July 13, 2011).

Bush, D., and J. Lancaster. 2004. Rare annual plants – problems with surveys and assessments. Prairie Conservation and Endangered Species Conference, February 28, 2004.

COSEWIC. 2006. COSEWIC assessment and status report on the short-rayed alkali aster *Symphyotrichum frondosum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 22pp.

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: July 13, 2011).

Appendix 1. Maps of critical habitat for Short-rayed Alkali Aster in Canada

In Canada, Short-rayed Alkali Aster occurs at eight locations on federal and non-federal land, in the south interior of British Columbia. Critical habitat for five of the eight known extant populations has been identified, i.e., at Max Lake (Figure A1), Skaha Lake (Figure A2), Vaseux Lake (Figure A3-A4), northwest Osoyoos Lake (Figure A5), and southwest Osoyoos Lake (Figure A6).

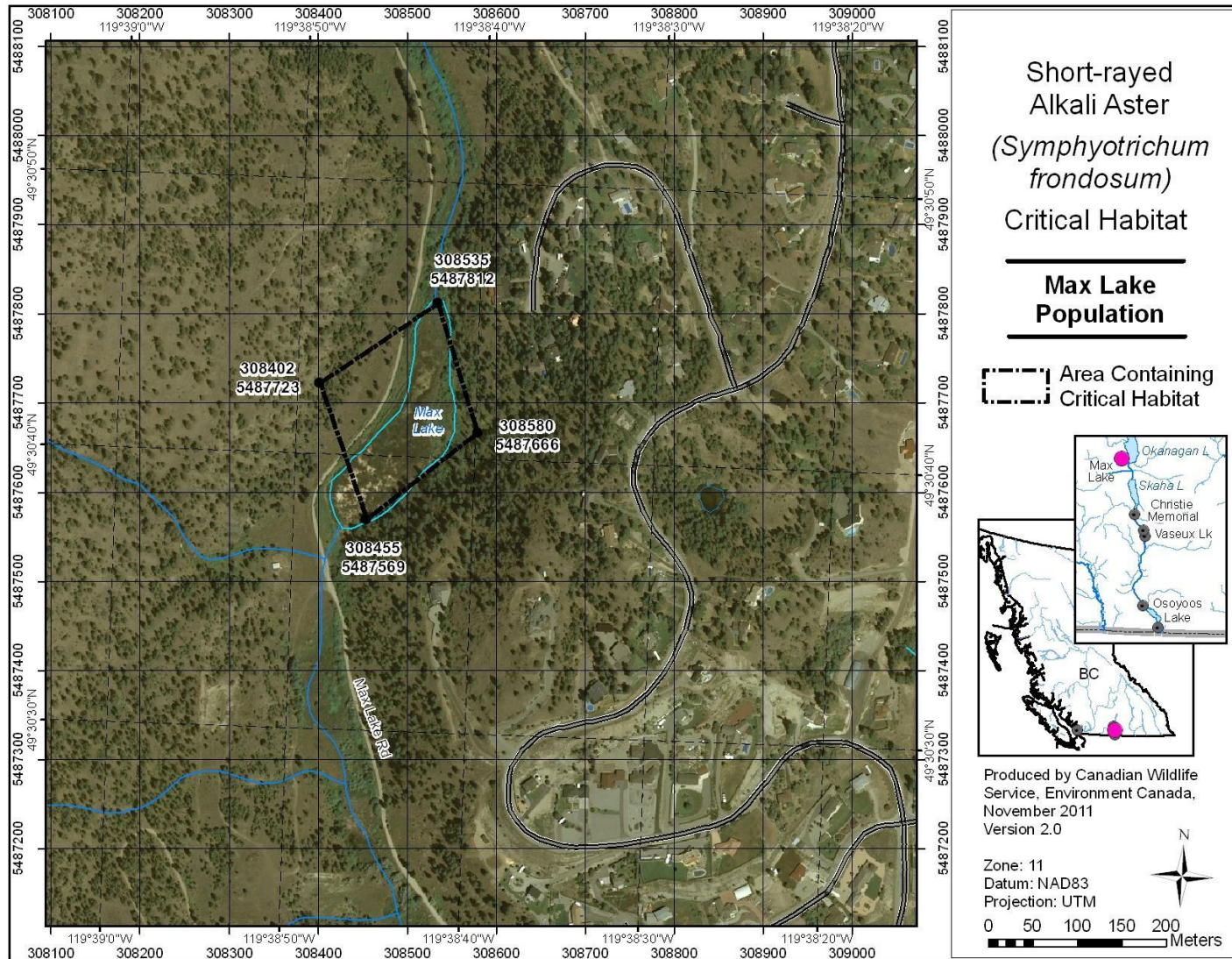


Figure A1. Area containing critical habitat for Short-rayed Alkali Aster near Penticton, B.C. (Madeline Lake/Max Lake, EO7 in Provincial Recovery Strategy). The polygon indicates an area of 2.4 ha. Existing anthropogenic features within the indicated polygon, including active roads, are not identified as critical habitat. Permanent standing water (i.e., below the lowest documented water-level line) is not identified as critical habitat.

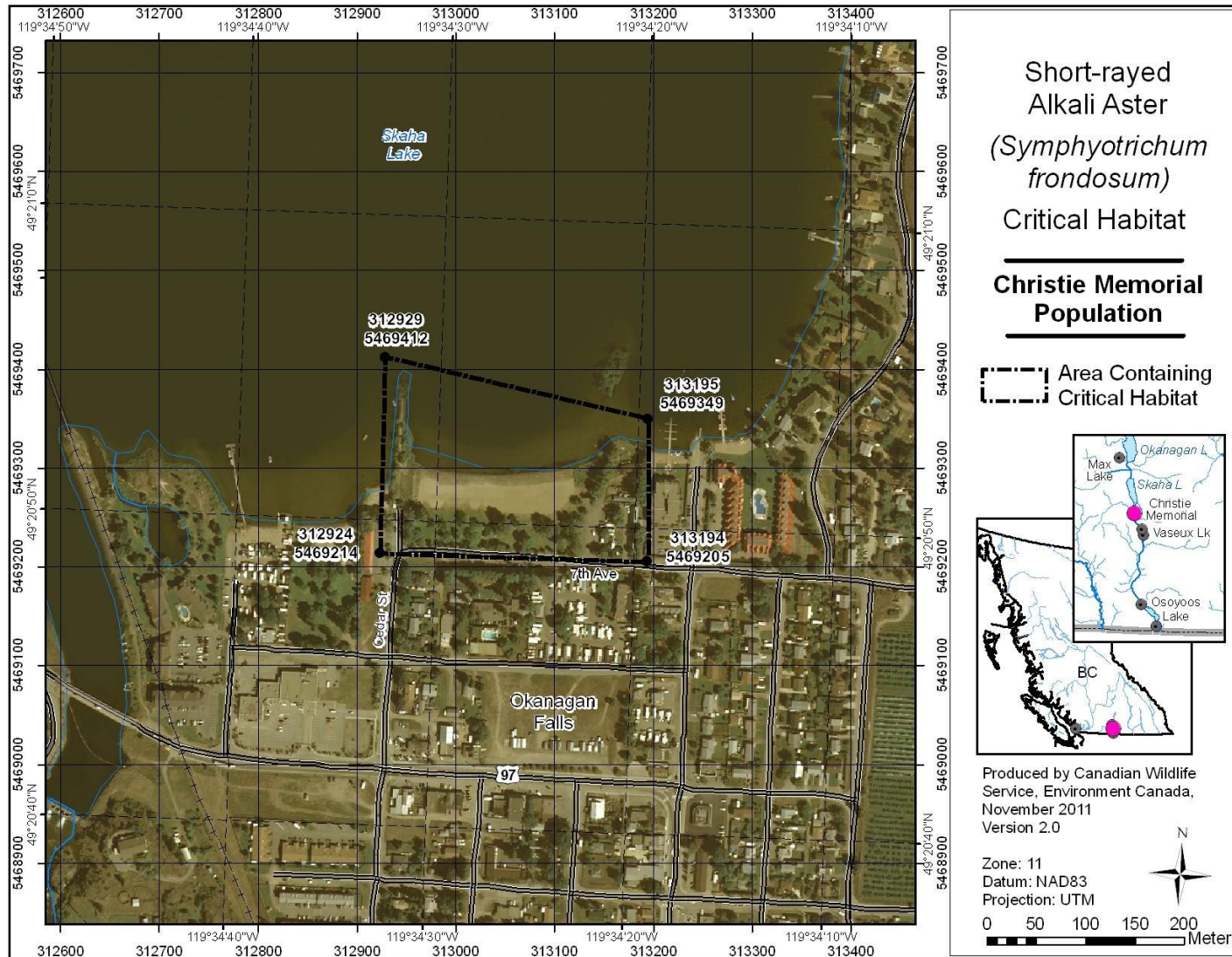


Figure A2. Area containing critical habitat for Short-rayed Alkali Aster near Okanagan Falls, B.C. (Christie Memorial Provincial Park, EO5 in Provincial Recovery Strategy). The polygon indicates an area of 4.6 ha. Existing anthropogenic features within the indicated polygon, including active roads and houses, are not identified as critical habitat. Permanent standing water (i.e., below the lowest documented water-level line) is not identified as critical habitat.

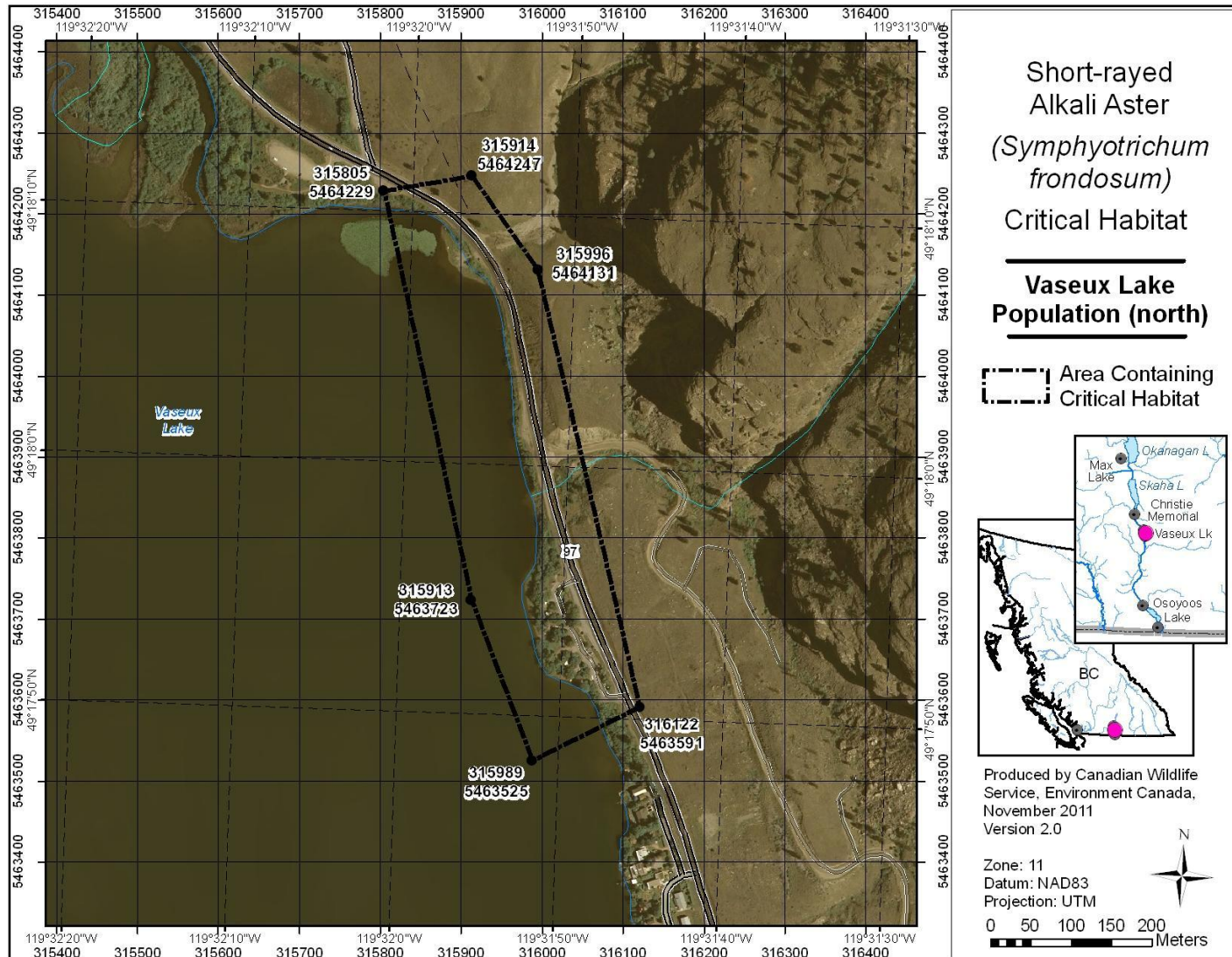


Figure A3. Area containing critical habitat for Short-rayed Alkali Aster at Vaseux Lake, B.C. (north sub-population of EO4, comprising the portion of the population described in Provincial Recovery Strategy). The polygon indicates an area of 11.4 ha. Existing anthropogenic features within the indicated polygon, including active roads and houses, are not identified as critical habitat. Permanent standing water (i.e., below the lowest documented water-level line) is not identified as critical habitat.

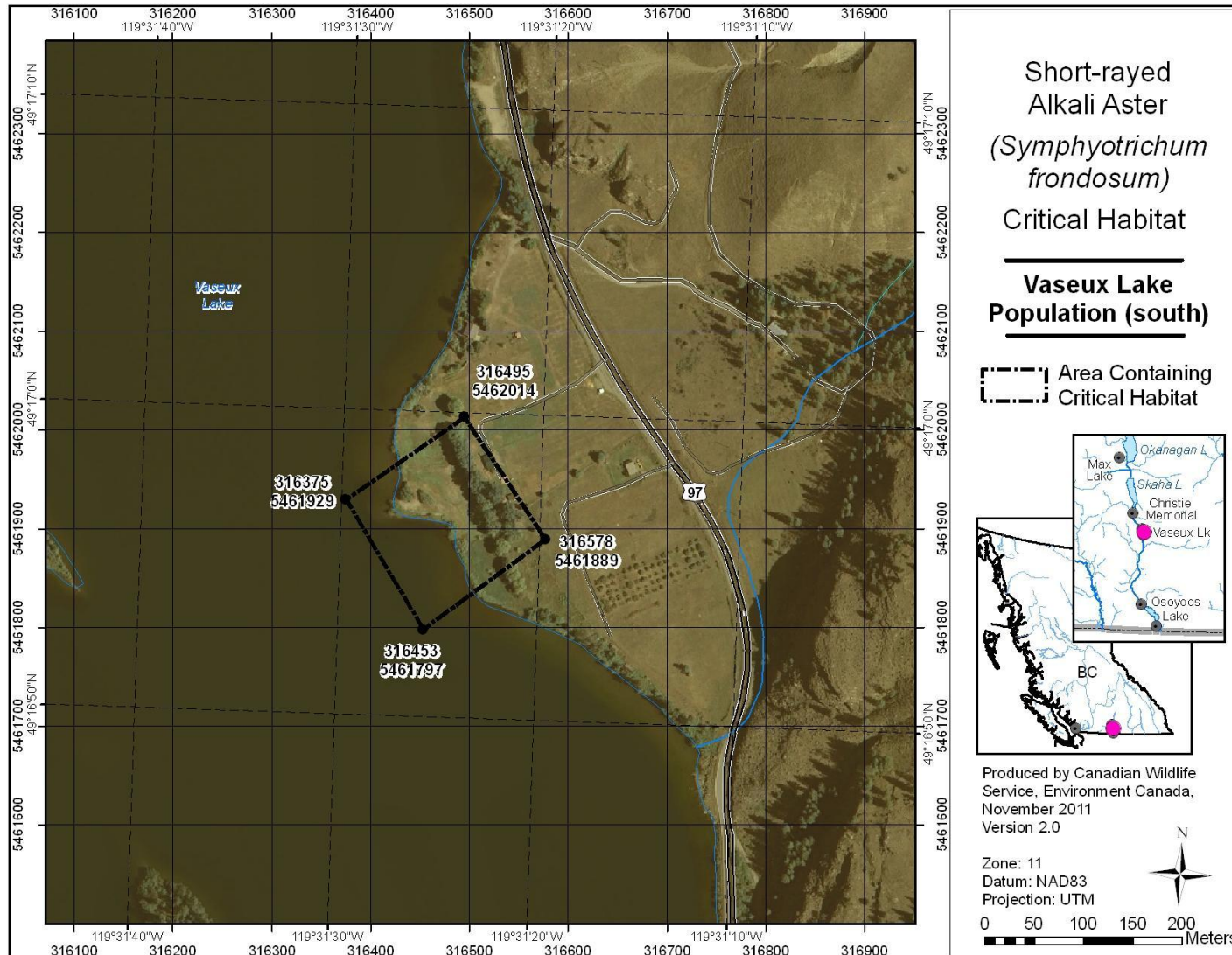


Figure A4. Area containing critical habitat for Short-rayed Alkali Aster at Vaseux Lake (south sub-population of EO4, not included in Provincial Recovery Strategy), B.C. The polygon indicates an area of 2.3 ha. Existing anthropogenic features within the indicated polygon, including active roads and houses, are not identified as critical habitat. Permanent standing water (i.e., below the lowest documented water-level line) is not identified as critical habitat.

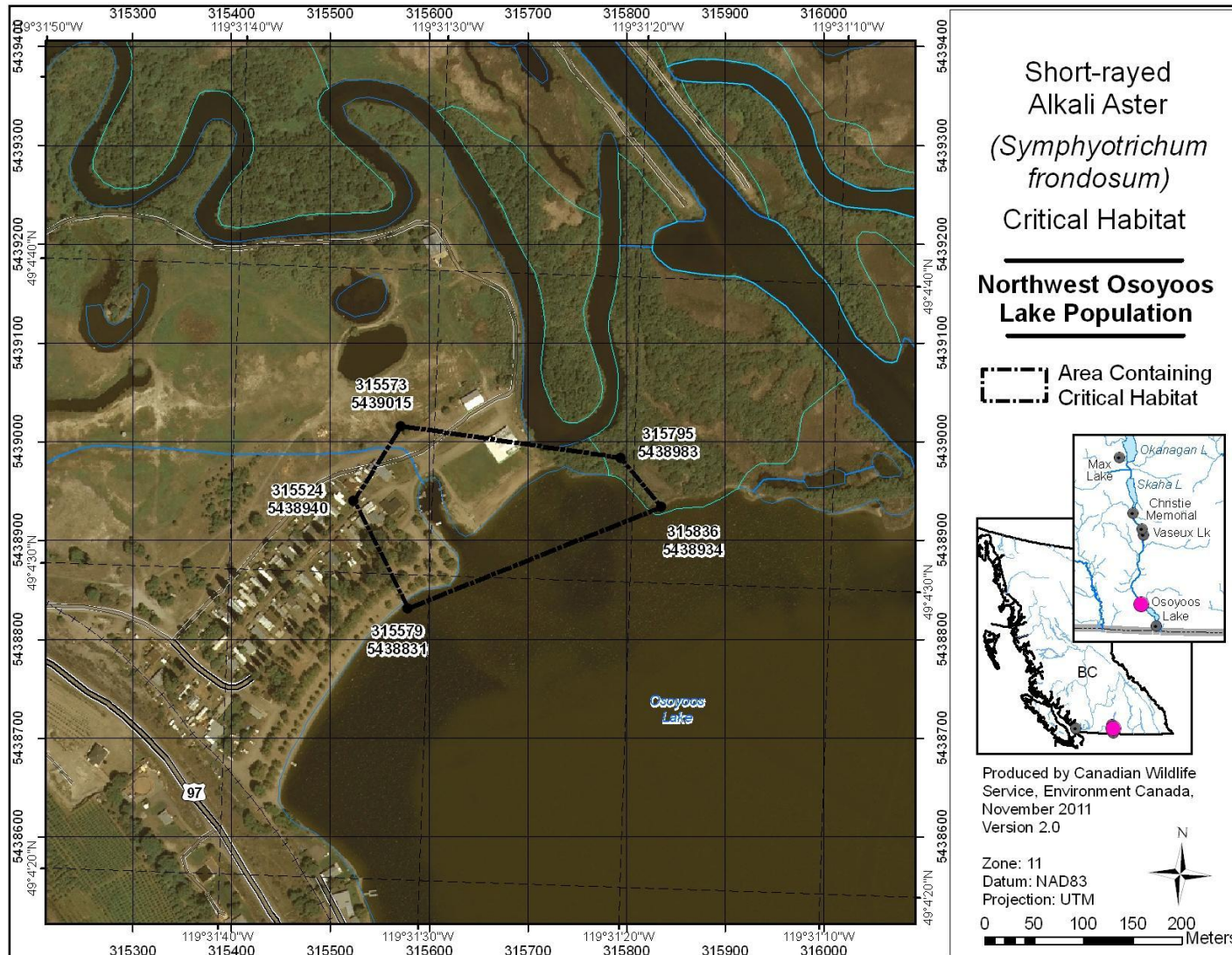


Figure A5. Area containing critical habitat for Short-rayed Alkali Aster at northwest Osoyoos Lake, B.C. (EO9 in Provincial Recovery Strategy). The polygon indicates an area of 3.4 ha. Existing anthropogenic features within the indicated polygon, including active roads and houses, are not identified as critical habitat. Permanent standing water (i.e., below the lowest documented water-level line) is not identified as critical habitat.

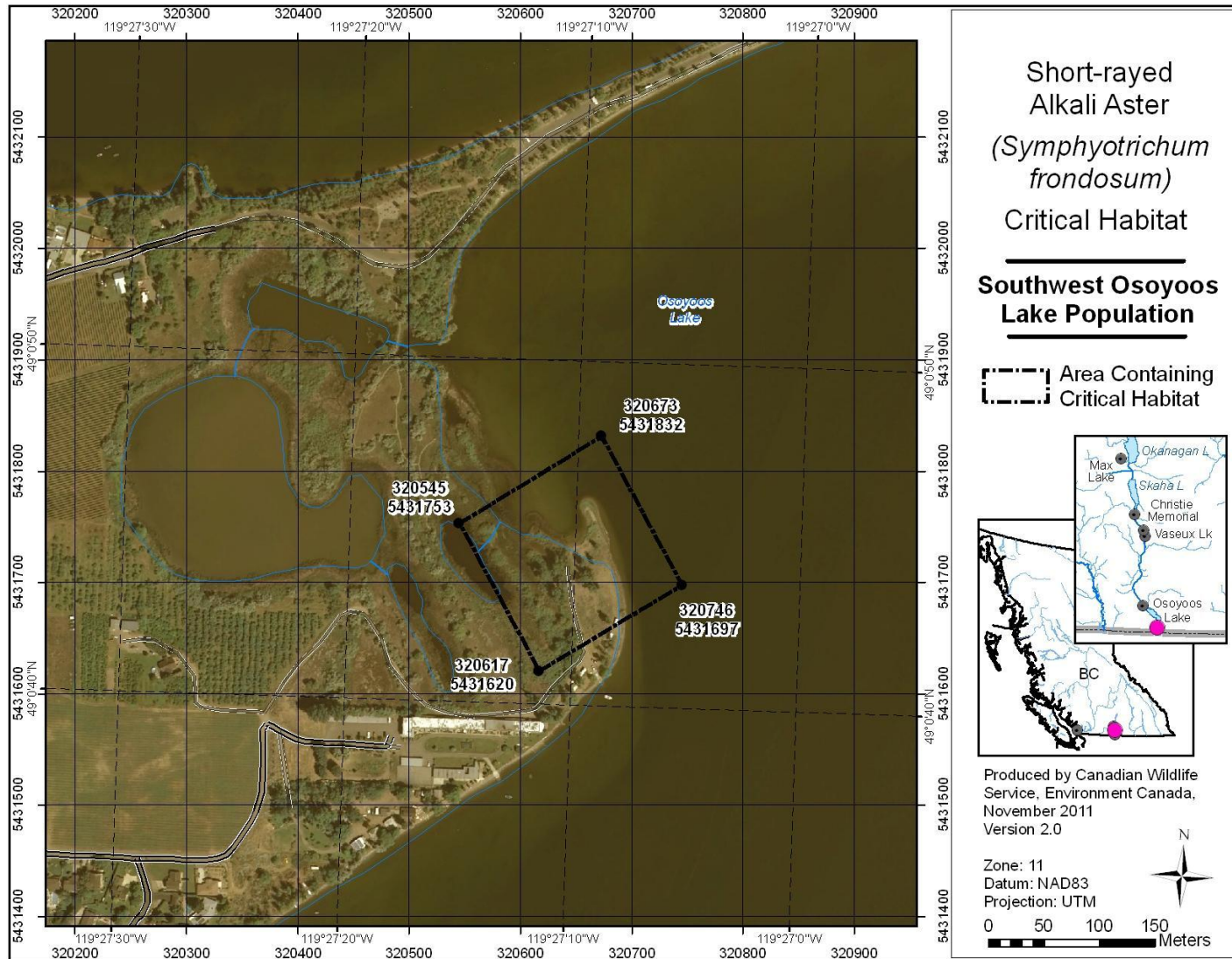


Figure A6. Area containing critical habitat for Short-rayed Alkali Aster at southwest Osoyoos Lake, B.C. (EO8 in Provincial Recovery Strategy). The polygon indicates an area of 2.3 ha. Existing anthropogenic features within the indicated polygon, including active roads, houses, and the associated developed urban and residential landscape, are not identified as critical habitat. Permanent standing water (i.e., below the lowest documented water-level line) is not identified as critical habitat.

**PART 2: Recovery Strategy for the short-rayed alkali aster
(*Symphotrichum frondosum*) in British Columbia, prepared
by the Short-rayed Alkali Aster Recovery Team, for the
British Columbia Ministry of Environment**

Recovery Strategy for the short-rayed alkali aster (*Symphotrichum frondosum*) in British Columbia



Prepared by the Short-rayed Alkali Aster Recovery Team



August 2009

About the British Columbia Recovery Strategy Series

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

What is recovery?

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

What is a recovery strategy?

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

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

What's next?

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

For more Information

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

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

Recovery Strategy for the short-rayed alkali aster (*Symphyotrichum frondosum*) in British Columbia

Prepared by the Short-rayed Alkali Aster Recovery Team

August 2009

Recommended citation

Short-rayed Alkali Aster Recovery Team. 2009. Recovery strategy for the short-rayed alkali aster (*Symphyotrichum frondosum*) in British Columbia. Prepared for the B.C. Ministry of Environment, Victoria, BC. 16 pp.

Cover illustration/photograph

Brian Klinkenberg

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 978-0-7726-6194-4

Date: August 6, 2009

British Columbia. Ministry of Environment

Recovery strategy for the short-rayed alkali aster (*Symphyotrichum frondosum*) in British Columbia [electronic resource]

Disclaimer

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

This document identifies the recovery strategies that are deemed necessary, based on the best available scientific and traditional information, to recover short-rayed alkali aster 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 short-rayed alkali aster.

RECOVERY TEAM MEMBERS

Short-rayed Alkali Aster Recovery Team

Harold Baumbrough, Biologist Naramata, BC

Brenda Costanzo (co-chair), British Columbia Ministry of Environment, Victoria, BC

Orville Dyer (co-chair), British Columbia Ministry of Environment, Penticton, BC

Matt Fairbarns, Botanist, Victoria, BC

Terry McIntosh, Botanist, Vancouver, BC

Former recovery team members

Pam Krannitz (retired), formerly Environment Canada's Canadian Wildlife Service, Vancouver, BC

Ted Lea (retired), Vegetation Ecologist, Victoria, BC

Technical advisors

Ron Hall, Osoyoos Indian Band, Oliver, BC

AUTHOR

Brian Klinkenberg

RESPONSIBLE JURISDICTIONS

The British Columbia Ministry of Environment is responsible for producing a recovery strategy for short-rayed alkali aster under the *Accord for the Protection of Species at Risk in Canada*. Environment Canada's Canadian Wildlife Service, Pacific-Yukon Region participated in the preparation of this recovery strategy.

ACKNOWLEDGEMENTS

Thanks to the following individuals for contribution of key information on the populations of *Symphyotrichum frondosum* in B.C.: Harold Baumbrough, Eva Durance, Orville Dyer, Matt Fairbarns, and Frank Lomer.

EXECUTIVE SUMMARY

Short-rayed alkali aster is an annual late summer flowering species reported in British Columbia from lakeshores and pond margins in the Okanagan Valley. There it is found in eight extant populations on the shoreline of four lakes - Osoyoos, Vaseux, Skaha, and Max. Additionally, two ephemeral records for the species have been identified in the lower Fraser Valley, but as they are only single plants, further surveys are required to determine if populations will persist in the area. These occurrences are not considered in this recovery strategy.

Suitable habitat for short-rayed alkali aster includes the narrow shoreline of lakes and ponds on the moist sandy/muddy beaches. These areas are influenced by seasonal water variation and wave action, and in very proximal, drier, narrow upper beach areas that may periodically be subject to flooding. Short-rayed alkali aster is a seed banking species, and recruitment in some years is seed bank dependent. As a shoreline species, the plants and the seed bank are tied to lake dynamics, including wave action that removes organic build up and disperses seeds, high water levels that control encroachment by woody and other species, and summer draw down that allows germination from the seed bank.

At three of the five populations on Osoyoos Lake, and the populations at Vaseux Lake and Skaha Lake, this species is threatened by recreational beach use and development, and associated beach management activities.

The long-term recovery goal for short-rayed alkali aster is to maintain the existing populations within the known range of the species in Canada.

The recovery objectives are:

1. Protect populations and their habitat at the known occupied sites in the Okanagan Valley by 2013.
2. Address knowledge gaps relating to optimal habitat, effects of water levels on germination and survival, impacts from recreation and management activities and impacts from invasive plant species by 2013.
3. Determine population trends for all known populations (from 2009 through 2013).
4. Determine whether other viable populations exist in the Fraser River drainage and in the South Okanagan valley by 2013.

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

A recovery action plan will be completed by 2013.

TABLE OF CONTENTS

RECOVERY TEAM MEMBERS	iv
AUTHORS	iv
RESPONSIBLE JURISDICTIONS.....	iv
ACKNOWLEDGEMENTS	iv
EXECUTIVE SUMMARY	v
BACKGROUND	1
Species Assessment Information from COSEWIC	1
Description of the Species.....	1
Population and Distribution	1
Needs of the short-rayed Alkali Aster	5
Habitat and biological needs.....	5
Ecological role	5
Limiting factors	6
Threats.....	6
Threats classification	6
Description of the threats.....	8
Actions Already Completed or Underway	9
Knowledge Gaps.....	9
RECOVERY.....	10
Recovery Feasibility	10
Recovery Goal	10
Rationale for the Recovery Goal	10
Recovery Objectives	11
Approaches Recommended to Meet Recovery Objectives.....	11
Recovery planning table	11
Performance Measures	12
Critical Habitat.....	12
Identification of the species' critical habitat	12
Recommended schedule of studies to identify critical habitat	12
Existing and Recommended Approaches to Habitat Protection.....	13
Effects on Other Species.....	13
Socioeconomic Considerations	13
Recommended Approach for Recovery Implementation.....	13
Statement on Action Plans	14
REFERENCES	15

LIST OF TABLES

Table 1. Extant populations of short-rayed alkali aster in British Columbia.....	4
Table 2. Threat classification table for short-rayed alkali aster	6
Table 3. Recovery planning table for short-rayed alkali aster	11
Table 4. Schedule of studies	12

LIST OF FIGURES

Figure 1. North American distribution of short-rayed alkali aster	2
Figure 2. Distribution of short-rayed alkali aster in British Columbia and Canada.....	3

BACKGROUND

Species Assessment Information from COSEWIC

Date of Assessment: April 2006

Common Name (population): short-rayed alkali aster

Scientific Name: *Symphyotrichum frondosum*

COSEWIC Status: Endangered

Reason for designation: An annual herb of lake shorelines present at only a few remaining sites in restricted habitats. The small populations are subject to disruption from such activities as trampling, beach management, spread of invasive plants and potential development of a major facility at one of the primary sites.

Canadian Occurrence: British Columbia

COSEWIC Status History: Designated Endangered in April 2006. Assessment based on a new status report.

Description of the Species

Short-rayed alkali aster (*Symphyotrichum frondosum*; previously known as *Aster frondosus*) is an annual, rarely perennial tap-rooted species of flowering plant in the *Asteraceae* family (Douglas et al. 1998). In British Columbia, it is small to medium sized (1-60 cm), with small daisy-like flowers that have narrow, pink to whitish ray petals and yellow disk flowers. Larger plants are strongly branched and produce multiple flowers. Leaves are alternate on the stem and usually oblanceolate in shape. The lower leaves are petioled (with a short stalk), becoming sessile (stalkless) towards the top of the plant. Seeds are achenes (dry single-seeded fruit that do not open when mature) with numerous short bristles at their apices.

Populations and Distribution

Short-rayed alkali aster is found only in North America, where it occurs from British Columbia (B.C.) south to Utah, Arizona, New Mexico, California, and Mexico (COSEWIC 2006; Figure 1). In B.C., there are currently eight extant populations in the southern Okanagan Valley (COSEWIC 2006; Figure 2; Table 1).

On Osoyoos Lake there are five populations distributed around the lake, on the northwest, northeast, east, southeast, and southwest shores (Table 1). One population (southeast shore) has three subpopulations: Cottonwood Park, and two others¹, however, the Cottonwood Park subpopulation was extirpated in 2002. Two of the five Osoyoos Lake populations were discovered after the publication of the status report (COSEWIC 2006), these being the southwest and the northwest shore populations identified in Table 1. The other three populations are: the

¹ Locations of these two subpopulations are not disclosed to protect the privacy of the landowners.

south end of Skaha Lake² (at Christie Memorial Provincial Park), the east shore of Vaseux Lake² (3 subpopulations), and the shoreline of Max Lake.



Figure 1. North American distribution of short-rayed alkali aster (from COSEWIC 2006).

² Note: Reference to Vaseux or Skaha populations in this document refers to populations surveyed within Vaseux Lake Provincial Park or Christie Memorial Provincial Park, respectively. The plants are also on adjacent private lands which were not surveyed as land owner permission was not requested to do so.

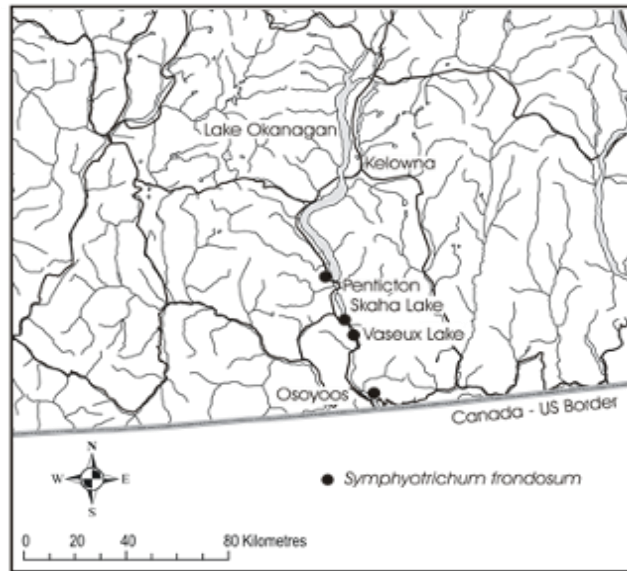


Figure 2. Distribution of short-rayed alkali aster in British Columbia and Canada³ (COSEWIC 2006). Dots may represent multiple populations.

One new subpopulation was found at the Vaseux Lake population after publication of the 2006 COSEWIC status report (Dyer et al 2007). The new subpopulation (#3) was 370m north of the Vaseux Lake Provincial Park subpopulation #1 and contained thousands of individuals, including 305 flowering individuals. This subpopulation established naturally on recently created habitat made by a debris torrent that flowed into Vaseux Lake in 2004. The debris torrent area was surveyed between 2004 and 2007, but no plants were observed until 2007. Dyer et al (2007) also revisited subpopulation #2 within Vaseux Lake Provincial Park, which was 93 m north of subpopulation #1 at the Park campground, counting 15 plants in 2007. Frank Lomer previously observed 2 plants at subpopulation #2 in 2005 (CDC 2008).

There are two historic populations that could not be accurately reconciled (due to geographic imprecision of the original data) with the current B.C. Conservation Data Centre (B.C. CDC) data. These are the “Osoyoos Lake” and “Penticton” records from Eastham in 1939 and 1947 respectively (B.C. CDC 2008). The former has been incorporated into the Osoyoos lake northeast shore population by the B.C. CDC. There are no herbarium specimens for the latter, therefore it has not been incorporated into any existing population data and is not considered in this recovery strategy. However, it could be the Max Lake population.

As well, two additional records are reported for this species, one previously reported in the status report: Surrey, BC, in a dredging pile along the Fraser River, 1 plant (1994); New Westminster, BC, along the river edge, 1 plant (September 2006). These records may indicate that the species is present in the upper Fraser drainage (Lomer pers. comm. 2007), but they do not appear to be viable populations. As such, we are not considering them in this recovery strategy unless they are re-discovered as viable populations.

³ Distribution excludes Fraser Valley collection sites.

Table 1. Extant populations of short-rayed alkali aster in British Columbia.

Location of population ⁴	Subpopulation	Abundance data and last observation date	Tenure status ⁵
Osoyoos Lake, northwest shore (EO9)	N/A	2007: one plant	Withheld
Osoyoos Lake, northeast shore (EO2)	N/A	1993: 50-70 plants	Withheld
Osoyoos Lake, east shore (EO6)	N/A	1999: 40+ plants over 200m ²	Withheld
Osoyoos Lake, southeast shore (EO3)	Subpopulation #1 Cottonwood Park	2000: one plant/2m 2002: extirpated	City of Osoyoos
	Subpopulation #2	1992: no data	Withheld
	Subpopulation #3	2002: 5 plants/m ²	Withheld
Osoyoos Lake, southwest shore (EO8)	N/A	2007: 10 plants	Withheld
Vaseux Lake (EO4)	Subpopulation #1	1999: 100 plants/20m ² 2002: 100 plants/20m ² 2003: 12 plants/4m ² 2005: 287 flowering plants 2006: 59 flowering plants 2007: 186 flowering 2008: 0 plants	Provincial Park
	Subpopulation #2 – (2005)	2005: 2 plants 2007: 15/20m ²	Provincial Park (93m north of subpopulation #1)
	Subpopulation #3 – (2007; debris torrent)	2007: thousands, (305 flowering plants) 2008: fewer than previous year	Provincial Park (370m north of subpopulation #1)
Skaha Lake (Christie Beach = Christie Memorial Provincial Park, EO5)	N/A	1999: 4900 plants/500m ² ; 2002: 525 plants/500m ² ; 2003: > 100 plants. 2005: 13 flowering 2006: 191 plants flowering 2007: 63 plants flowering	Provincial Park
Max Lake (Madeline Lake) West Bench campground, Penticton (EO7)	N/A	2003: 5 plants 2005: 0 2006: 0 2007: not checked 2008: 0	Private (The Land Conservancy and South Okanagan Regional District)

Less than one percent of the species' global distribution is found in Canada. The percentage of historical range lost is unknown, and the rate of change over the last ten years is also unknown. However, this is a species that can fluctuate in numbers from year to year (see abundance information in Table 1). The Canadian extent of occurrence of this species is 56 km², excluding

⁴ EO numbers refer to Element Occurrences tracked by the BC Conservation Data Centre

⁵ Tenure may be withheld to respect the privacy of the land owners.

the Fraser River records which are thought to be ephemeral (material potentially washed down the Fraser River). The combined area of occupancy in Canada is 900 m².

This species is globally ranked as G4 (apparently secure). In the United States short-rayed alkali aster is ranked as S2 (imperilled) in Wyoming, and not ranked (SNR) in Arizona, California, Colorado, Idaho, Maine, Nevada, New Mexico, Oregon, Utah, and Washington. In Montana it is ranked as SH (possibly extirpated) (NatureServe 2008). It is ranked as S1 (critically imperiled) in B.C. and is a priority 1 species under goal 3 of the B.C. Conservation Framework (see <http://www.env.gov.bc.ca/conservationframework/> for details).

Needs of the Short-rayed Alkali Aster

Habitat and biological needs

In B.C., short-rayed alkali aster is found in the bunchgrass biogeoclimatic zone in the southern Okanagan Valley (COSEWIC 2006). Short-rayed alkali aster is a late emergent, wet shoreline species that is reported from lakeshore habitats on sandy beaches (Osoyoos Lake), and from the lightly sloping draw down zone of lakes and ponds (Vaseux Lake, Skaha Lake, Max Lake) (COSEWIC 2006).

In California, this species is known from granitic soils of meadow and mountain slopes, and around moist alkaline flats, marshes, ponds and ditches, and is often found in steppes (COSEWIC 2006, Flora North America 2007). In Oregon, this species is found in mud flats (Fertig 2000).

For species that are adapted to the shoreline environment, fluctuating water levels are important to population dynamics. Fluctuating water levels mean that shoreline plants are subject to wave energy that can reduce organic accumulations and competition from other plant species, as well as potentially enhance seed dispersal.

Germination has been observed in May or June when the water levels drop (Baumbrough pers. comm. 2007), although it is possible germination may occur earlier. Flowering is reported from late July to early October during the draw down period. As asters are commonly wind-dispersed, further dispersal is possible via wave action, lake currents, and waterfowl (COSEWIC. 2006).

Seed banks allow the vegetation to replace itself during low water periods (Keddy and Reznicek 1986), and high water levels are essential to the survival of shoreline species because they reduce invasions by other, often woody, species (Keddy and Reznicek 1982).

Ecological role

This is a rare species that occurs in B.C. at the northern limits of its range, representing a significant peripheral occurrence. Information on the ecological role of this species is unknown.

Limiting factors

Specific information on limiting factors for this species is not available. However, the ecology of shoreline species in general is well known (Keddy 2000) and this points to limiting factors relevant to short-rayed alkali aster:

- As a shoreline species, short-rayed alkali aster is influenced by wave exposure, water level fluctuations, and associated siltation which can bury the seeds too deep for emergence. However, annual shoreline species depend on fluctuating water levels to maintain periodic open sandy shorelines or flats with reduced competition. During low water periods, if climatic conditions are favourable, plants sprout abundantly from newly exposed seedbanks.
- As a species occurring at the northern limits of its range in B.C., short-rayed alkali aster may also be influenced by climatic fluctuations and may be temperature limited.

Threats

Threat classification

Table 2. Threat classification table for short-rayed alkali aster.

1 Recreational degradation (Vaseux Lake, Skaha Lake, Osoyoos Lake)		Threat attributes		
Threat category	Habitat loss or degradation	Extent	widespread (3 populations)	
			Local	Range-wide
General threat	Recreational activities	Occurrence	current	
		Frequency	seasonal	
Specific threat	Beach use – sunbathing, digging, boat launching and storage, trampling and compaction	Causal certainty	unknown	
		Severity	moderate	
Stress	Reduced numbers of plants	Level of concern	high	
2 Beach management (Skaha Lake, Osoyoos Lake)		Threat attributes		
Threat category	Habitat loss or degradation	Extent	widespread (2 of 4 populations)	
			Local	Range-wide
General threat	Habitat alteration	Occurrence	current	
		Frequency	seasonal	
Specific threat	Roto-tilling of the beach	Causal certainty	Unknown, but potentially moderate to high at Skaha Lake population. Low at Osoyoos Lake southeast shore subpopulation #3.	

		Severity	high	
Stress	Loss of seedlings, mature plants, and seeds	Level of concern	high	
3 Invasive plant species (Vaseux Lake, Max Lake, Osoyoos Lake, Skaha Lake)		Threat attributes		
Threat category	Exotic or invasive species	Extent	Widespread (4 populations)	
			Local	Range-wide
General threat	Alteration of habitat characteristics	Occurrence		current
		Frequency		recurrent
Specific threat	Resource competition leading to shading of seedlings	Causal certainty		medium
		Severity		high
Stress	Reduced growth	Level of concern	high	
4 Livestock (Osoyoos Lake)		Threat attributes		
Threat category	Habitat loss or degradation	Extent	localized	
			Local	Range-wide
General threat	Livestock use — shoreline impact	Occurrence	unknown	
		Frequency	occasional	
Specific threat	Alteration of habitat characteristics ; trampling of plants	Causal certainty	low	
		Severity	unknown	
Stress	Reduced numbers of plants.	Level of concern	low	
5 Shoreline development (Osoyoos Lake)		Threat attributes		
Threat category	Habitat loss or degradation	Extent	localized	
			Local	Range-wide
General threat	Shoreline development	Occurrence	One historical loss (Osoyoos lake southeast subpopulation #1); one potential	
		Frequency	unknown	
Specific threat	Habitat conversion, fragmentation	Causal certainty	high	
		Severity	unknown	
Stress	Reduced population size and viability, population extirpation	Level of concern	high	
6 Loss of natural lake dynamics: water level control (Skaha Lake, Vaseux Lake, Osoyoos Lake)		Threat attributes		

Threat category	Habitat loss or degradation	Extent	Widespread (3 populations)	
		localized	Local	Range-wide
General threat	Managed lake levels	Occurrence	current	
		Frequency	continuous/seasonal	
Specific threat	Alteration of natural water levels	Causal certainty	medium	
		Severity	high	
Stress	Reduced population size and viability.	Level of concern	high	

Description of the threats

1. Recreational degradation (Vaseux Lake, Skaha Lake, Osoyoos Lake)

Recreational activities may have a negative effect on three populations due to trampling and soil compaction by people. While this potential threat is seasonal in nature (e.g. bathers, boat launching, and storage), it may impact directly on populations.

2. Beach management (Skaha Lake, and Osoyoos Lake)

Beach management activities at two populations, in particular roto-tilling the beach at Skaha, can result in a threat to the populations (e.g., by spreading seeds of invasive plants such as sweet white clover [*Melilotus alba*]), but can also positively influence the populations by reducing competition from other plants. Roto-tilling may have serious adverse affects when carried out post-germination and pre-seed set, resulting in loss of seedlings, mature plants, and seeds.

3. Invasive plant species (Vaseux Lake, Skaha Lake, Max Lake, Osoyoos Lake)

In drought years in particular, conditions along lake and pond shorelines can favour dry ground, non-shoreline species, including invasive species. This may be exacerbated by lake level changes that result in reduced wave action and a subsequent reduction in organic matter removal from shoreline areas. Invasive species were noticeable at Vaseux Lake, and reported from Max Lake (Baumbrough pers. comm. 2007). In particular, white sweet clover (*Melilotus alba*) was abundant at Vaseux Lake in 2004, but not noticeable in the preceding two years. It dominated the site at the north edge, shading seedlings of short-rayed alkali aster. Invasives reported from Max Lake in 2005 included: purple loosestrife (*Lythrum salicaria*), houndstooth (*Cynoglossum officinale*), giant burdock (*Arctium lappa*), Canada thistle (*Cirsium arvense*), diffuse knapweed (*Centaurea diffusa*) and sulphur cinquefoil (*Potentilla recta*). As well, at Max Lake, encroachment by native common cattail (*Typha latifolia*) and bulrush (*Scirpus sp.*) into the area previously occupied by short-rayed alkali aster has occurred. This encroachment throughout Max Lake is likely contributing to altered lake level dynamics, and the site may no longer be suitable for the species.

4. Livestock (Osoyoos Lake)

Livestock are reported at subpopulation #3 on Osoyoos Lake south east shore population (COSEWIC 2006). Although fencing was erected to control this (Douglas 1999), livestock have occasionally entered the area. Livestock are not known to graze on this species, but trampling may occur.

5. Shoreline development (Osoyoos Lake)

As lakeshore habitat is attractive for urban or commercial development, it is a future risk for unprotected populations. Shoreline development along the shores of Osoyoos Lake, (e.g. the causeway at the south side in Osoyoos where plants had been reported), has likely caused the loss of subpopulations of this species, or at least a loss of potential habitat into which the species could expand (J. Penny pers. comm. 2007). Lomer (pers. comm. 2002) reported a subpopulation lost at Cottonwood Park, Osoyoos Lake due to the dumping of rock fill to create a breakwater. One of the newly discovered populations along the northwest shore of Osoyoos Lake is within a proposed development footprint (McIntosh, pers. comm. 2007).

6. Changes in ecological dynamics or natural processes: Loss of natural lake dynamics - water level control (Skaha Lake, Vaseux Lake, Osoyoos Lake)

A series of dams along the Okanagan Valley, including the Zosel Dam in Oroville, Washington, regulates water levels in Osoyoos and Vaseux Lakes. Although an impact on this species is suspected, the actual impact of these dams and associated water level regulation on the short-rayed alkali aster populations within the Okanagan Valley is unknown. These dams have been in place for decades (e.g. Zosel Dam on Lake Osoyoos since 1929, Vaseux Lake Dam since 1921), and Eastham (1947) describes the species as abundant at Osoyoos Lake. However, historical and pre-dam population counts are unknown and prevalence of populations in the region prior to their constructions is unknown. Eastham's assessment may reflect a period (or perhaps cycle) of species abundance. In assessing threat to this species, we have taken into account that shoreline species are adapted to fluctuating water levels, including regular flooding and summer draw down with associated siltation and wave action that reduces organic matter, and, ultimately, competition. Water level regulation affects these parameters. Water level alteration in the lakes could potentially reduce the narrow shoreline band within which this species could occupy, and then alter the persistence or emergence of seeds from the seed bank and any subsequent recruitment. Lake level management may influence wave action dynamics that are an integral part of shoreline plant ecology in lakes (Keddy 2000; Keddy and Reznicek 1986).

Actions Already Completed or Underway

- Invasive plant species removal has been on-going at Max Lake by local naturalists (Baumbrough pers. comm. 2007).
- Invasive plant species removal at Osoyoos Lake and control at Vaseux Lake.
- Inventory and monitoring has been ongoing since 2003 at several populations.
- A conservation covenant has been placed on the property at which the Max Lake population is located (co-held by TLC The Land Conservancy of B.C. and Regional District of the Okanagan-Similkameen).
- Fencing was installed to protect one of the Osoyoos Lake sub-populations from ATV damage and livestock trespass.
- The Skaha and Vaseux Lake populations are within provincial parks.

Knowledge Gaps

- Research on habitat and ecological requirements, species biology (including demography, genetics, and pollination mechanisms), as well as the impacts of invasive species and

- nutrient loading⁶, are required for this species to define optimal habitat characteristics. Assessment of undisturbed United States populations will also add to our understanding.
- Monitoring the annual or biannual variation in lake levels in Osoyoos Lake over the next ten years is required to aid in assessing the impact of managed water levels and effects of climate change on this species.
 - The degree of impact for all identified threats must be clarified.
 - As plants have been found in the lower Fraser Valley twice, field work is required further upstream from Surrey to Kamloops to determine if viable populations exist outside of the Okanagan Valley.

RECOVERY

Recovery Feasibility

- 1) Are individuals capable of reproduction currently available to improve the population growth rate or population abundance? Yes, the current populations of short-rayed alkali aster are capable of reproducing (members of the Asteraceae family reproduce readily from seed), as shown by a recently established subpopulation at Vaseux Lake.
- 2) Is sufficient suitable habitat available to support the species or could it be made available through habitat management or restoration? Yes, there is sufficient habitat for this species, again using the Vaseux Lake example in which a small beach was formed from a storm in 2004, creating new habitat for the species to colonize.
- 3) Can significant threats to the species or its habitat be avoided or mitigated through recovery actions? Yes, through effective management for this species, including the potential control of invasive species, some of the threats can be mitigated.
- 4) Do the necessary recovery techniques exist and are they demonstrated to be effective? Yes, recovery techniques already exist for recovery of this species.

Based on the above assessment, recovery for this species is biologically and technically feasible.

Recovery Goal

The long-term recovery goal for short-rayed alkali aster is to maintain the existing populations within the known range of the species in Canada.

Rationale for the Recovery Goal

Since this species is an annual (fluctuation in population numbers from year to year) and there are no population trend data available, it is not possible to set numerical recovery goals. As well, there is no historical evidence that this species was more abundant in the past. Mitigation of threats through restoration activities such as the removal of invasive plants or controlling water levels, are more likely to affect the recovery of the species than reintroduction.

⁶ Nutrient loading was mentioned in the COSEWIC status report and needs to be investigated further.

Recovery Objectives

1. Protect populations and their habitat at the known occupied sites in the Okanagan Valley by 2013.
2. Address knowledge gaps relating to optimal habitat, effects of water levels on germination and survival, impacts from recreation and management activities and impacts from invasive plant species by 2013.
3. Determine population trends for all known populations (from 2009 through 2013).
4. Determine whether other populations exist in the Fraser River drainage and in the South Okanagan valley by 2013.

Approaches Recommended to Meet Recovery Objectives

A broad strategy to address threats will include habitat protection, habitat management, inventory and monitoring, research, and outreach. These tasks generally will be accomplished through voluntary stewardship and partnerships such as the South Okanagan-Similkameen Conservation Program (SOSCP). Habitat protection may take many forms including stewardship agreements and conservation covenants on private lands, land use designations on Crown lands, and protection in federal, provincial, and local government areas. A multi-species approach, including other COSEWIC listed or provincially red-listed beach dependant plant species, is recommended where ranges overlap.

Recovery planning table

Table 3. Recovery planning table for short-rayed alkali aster.

Priority	Obj.	Threat or concern addressed	Broad strategy to address threats	Recommended approaches to meet recovery objectives
Urgent	1	Habitat loss or degradation - mortality due to recreational degradation, beach management, shoreline development, invasive plant species, livestock	Public outreach – stewardship and communication with land owners and land managers, site management	<ul style="list-style-type: none"> • Encourage all landowners and land managers to steward and manage lands for persistence of the species including use of best management practices for mitigating threats • Work with landowners or managers to develop effective stewardship agreements at all occupied sites.
Urgent	2	Knowledge gaps	Scientific research	<ul style="list-style-type: none"> • Develop a prioritized research program to clarify knowledge gaps including optimal habitat, effects of water levels on germination and survival, effects from recreation and management activities, and from invasive plant species. The research program should include options for academic partnerships.
Necessary	1, 2	Changes in ecological	Manage water levels	<ul style="list-style-type: none"> • Work in cooperation with the U.S. International Joint Commission, and

		dynamics or natural processes		private landowners to manage water levels
Urgent	1, 3	Knowledge gaps	Population monitoring	<ul style="list-style-type: none"> Determine population trends by monitoring known sites annually
Necessary	4	Knowledge gaps	Inventory	<ul style="list-style-type: none"> Inventory potential habitats in the Upper Fraser Basin and South Okanagan valley.

Performance Measures

1. Population monitoring indicates that the trend in numbers of plants at the sites are stable or increasing by 2013 (Objective 1);
2. Agreements established with appropriate land managers and land owners, best management practices developed, and annual monitoring to determine the impacts of threats by 2013 (Objective 1 and 3);
3. Knowledge gaps have been addressed by scientific research by 2013 (Objective 2);
4. Impact of the threats to the populations has been investigated as well as a reduction of threats by 2013 (Objective 2);
5. Surveys of suitable habitat for new populations has been conducted in the Fraser River drainage and the South Okanagan by 2013 (Objective 4);

Critical Habitat

Identification of the species' critical habitat

No critical habitat as defined under the *Federal Species at Risk Act* can be identified for short-rayed alkali aster at this time. It is expected that critical habitat will be proposed following the completion of outstanding work required to quantify specific habitat and area requirements for the species, further research on the biology of the species, and monitoring of the populations to determine population trends. Consultation with affected landowners and organizations will also be necessary.

Recommended schedule of studies to identify critical habitat

Table 4. Schedule of studies.

Description of activity	Outcome/rationale	Timeline
Characterize habitats of existing populations. Assessment of undisturbed United States populations will be important.	Quantify habitat variables for a detailed understanding of growing conditions that will help define/delineate critical habitat.	2009-2013
Inventory for undocumented populations in the South Okanagan valley and the Upper Fraser Basin.	Identify additional important habitat and populations.	2009-2013

Research into seed bank ecology, including assessment of duration of viability, frequency of seed dormancy and areal coverage of the bank.	Knowledge about the areal coverage of the seed bank, depth of seed bank, and width of areas that might be defined as supporting the seed bank will guide definition of critical habitat. Understanding dormancy is important to understanding possible areas a species may actually be occupying, although plants are not visible.	2009-2013
Conduct research to clarify identified threats.	Knowledge of impacts that might affect critical habitat.	2009-2013

Existing and Recommended Approaches to Habitat Protection

Two populations are in provincial parks (Vaseux Lake and Skaha Lake). One population at Max Lake, on private land, is protected by a conservation covenant administered by The Land Conservancy and the Regional District of the Okanagan-Similkameen. Management practices are being examined to reduce potential impacts on the aster. Discussions with land owners and land managers regarding stewardship options are necessary at the remaining locations.

Effects on Other Species

Douglas (1999) reports the following species in association with short-rayed alkali aster at Osoyoos Lake sites: *Rotala ramosior*, (toothcup), *Ammannia robusta* (scarlet ammannia), *Eleocharis acicularis* (needle spike-rush), *Cyperus aristatus*, (*C. squarrosus*; awned cyperus), *Eleocharis geniculata* (capitate spike rush), and *Lipocarpha micrantha* (small-flowered lipocarpha). Toothcup, scarlet ammannia, and small-flowered lipocarpha are listed on Schedule 1 of the federal *Species at Risk Act*. Specific interactions with these and other species are unknown, but it is expected that recovery actions for short-rayed alkali aster will benefit these other plant species at risk.

Socioeconomic Considerations

Recovery actions may impact the following socioeconomic sectors: recreation, livestock grazing, and development. The degree of impact is likely to be low because the total occupied area is less than 1 ha.

Recommended Approach for Recovery Implementation

For successful implementation in protecting species at risk there will be a strong need to engage in stewardship on a variety of land tenures. Stewardship involves the voluntary cooperation of landowners to protect species at risk and the ecosystems they rely on. It is recognized in the preamble to the federal *Species at Risk Act* (SARA) that "stewardship activities contributing to the conservation of wildlife species and their habitat should be supported" and that "all Canadians have a role to play in the conservation of wildlife in this country, including the prevention of wildlife species from becoming extirpated or extinct". It is recognized in the *Canada – British Columbia Agreement on Species at Risk* that: "stewardship by land and water owners and users is fundamental to preventing species from becoming at risk and in protecting and recovering species

that are at risk"; and that "cooperative, voluntary measures are the first approach to securing the protection and recovery of species at risk".

Recovery actions will be integrated with the South Okanagan-Similkameen Conservation Program (SOSCP). As well, if the lower mainland occurrences are deemed to be viable populations, recovery actions will be integrated with the South Coast Conservation Program (SCCP) using a multi-species approach.

Statement on Action Plans

A recovery action plan(s) will be completed by 2013.

REFERENCES

- British Columbia Conservation Data Centre. 2006. *BC Species and Ecosystems Explorer*. British Columbia Ministry of Environment. Victoria, BC. Available: <http://srmapps.gov.bc.ca/apps/eswp/> (accessed [Accessed January 2007]).
- <http://www.calflora.org/> CalFlora: *Information on California plants for education, research and conservation*. [web application]. 2007. Berkeley, California: The Calflora Database [a non-profit organization]. Available: <http://www.calflora.org/>. (Accessed: Jan 24, 2007).
- Channell, R. 2005. The Conservation Value of Peripheral Populations: the Supporting Science. *In: Species at Risk 2004: Pathways to Recovery*. Victoria 2004.
- COSEWIC, 2006. COSEWIC assessment and status report on the short-rayed alkali aster *Symphyotrichum frondosum* in Canada. Committee on the Status of Endangered Wildlife in Canada. vi + 22 pp. (www.saragregistry.gc.ca/status/status_e.cfm).
- Douglas, G.W. 1999. *Status of Toothcup in British Columbia*. Wildlife Bulletin B-94. BC Environment. Available: <http://wlapwww.gov.bc.ca/wld/documents/statusrpts/b94.pdf>
- Douglas, G.W., D.V. Meidinger and J. Pojar (editors). 2001. *Illustrated Flora of British Columbia, Volume 6: Monocotyledons (Acoraceae Through Najadaceae)*. B.C. Ministry of Environment, Lands and Parks and B.C. Ministry of Forests. Victoria.
- Dyer, O, C. Klym and S. Bunge. 2007. Short-rayed aster (*Aster frondosum*) Vaseux Lake and Christie Memorial (2003, 2005, 2006, 2007). Unpublished Ministry of Environment Report, Penticton, B.C. 21 pp.
- Fertig, W. 2000. *Survey for Ute Ladies' Tresses (Spiranthes diluvialis) Along the Sweetwater River in Pathfinder National Wildlife Refuge*. Prepared for the Bureau of Reclamation. University of Wyoming, Laramie.
- Flora North America. 2006. *Symphyotrichum frondosum* description. Available: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250067649
- Keddy, P. A. 2000. *Wetland Ecology: Principles and Conservation*. Cambridge University Press, Cambridge.
- Keddy, P. A. and Reznicek, A. A. 1982. Seed Banks and Persistent Relict Shoreline Flora. *BioScience* 32 (2): 132-133.
- Keddy, P.A. and Reznicek, A.A. 1986. Great Lakes vegetation dynamics: The role of fluctuating water levels and buried seeds. *Journal of Great Lakes Research* 12(1):25-36.

Klinkenberg, B. (Editor). 2006. *E-Flora BC: Electronic Atlas of the Plants of British Columbia* [www.eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver. [Accessed: 1/24/2007 11:36:53 AM].

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: November 7, 2008).

Wisheu, I. C. and P. A. Keddy. 1991. Seed banks of a rare wetland plant community: distribution patterns and effects of human-induced disturbance. *Journal of Vegetation Science* 2: 181-188.

Personal communications

Baumbrough, Harold, Biologist, Naramata, BC. 2007. Personal communication to R. Klinkenberg.

Dyer, Orville, Wildlife Biologist, Ministry of Environment, Penticton, BC. 2007. Personal communication to B. and R. Klinkenberg.

Durance, Eva. Naturalist, Penticton. 2007. Personal communication to R. Klinkenberg.

Fairbarns, Matt. Botanist, Victoria, BC. 2007. Personal communication to R. Klinkenberg.

Lea, Ted. Vegetation Ecologist, Ministry of Environment, Victoria. 2007. Personal communication to B. and R. Klinkenberg.

Lomer, Frank. Botanist, New Westminster. 2007. Personal communication to R. Klinkenberg.