

Recovery Strategy for the Scarlet Ammannia (*Ammannia robusta*) in Canada

Scarlet Ammannia



2015



Government
of Canada

Gouvernement
du Canada

Canada

Recommended citation:

Environment Canada. 2015. Recovery Strategy for the Scarlet Ammannia (*Ammannia robusta*) in Canada. *Species at Risk Act Recovery Strategy Series*. Environment Canada, Ottawa. 22 pp. + Annex.

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](http://www.sararegistry.gc.ca/)¹.

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Également disponible en français sous le titre
« Programme de rétablissement de l'ammannie robuste (*Ammannia robusta*) au Canada »

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ISBN 978-0-660-02283-3

Catalogue no. En3-4/194-2015E-PDF

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¹ <http://www.sararegistry.gc.ca/>

RECOVERY STRATEGY FOR THE SCARLET AMMANNIA (*Ammannia robusta*) IN CANADA

2015

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 scarlet ammannia (*Ammannia robusta*) in British Columbia and Ontario” (Part 2) under Section 44 of the *Species at Risk Act* (SARA). 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.

The federal Recovery Strategy for the Scarlet Ammannia (*Ammannia robusta*) in Canada consists of two parts:

Part 1: Federal Addition to the “Recovery Strategy for the scarlet ammannia (*Ammannia robusta*) in British Columbia and Ontario”, prepared by Environment Canada.

Part 2: “Recovery Strategy for the scarlet ammannia (*Ammannia robusta*) in British Columbia and Ontario”, prepared by the Scarlet Ammannia Recovery Team, for the British Columbia Ministry of Environment and the Ontario Ministry of Natural Resources.

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PART 2: "Recovery Strategy for the scarlet ammannia (*Ammannia robusta*) in British Columbia and Ontario", prepared by the Scarlet Ammannia Recovery Team, for the British Columbia Ministry of Environment and the Ontario Ministry of Natural Resources

PART 1: Federal Addition to the “Recovery Strategy for the scarlet ammannia (*Ammannia robusta*) in British Columbia and Ontario”, prepared by Environment Canada

PREFACE

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

The federal Minister of the Environment is the competent minister for the recovery of the Scarlet Ammannia 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 Province of British Columbia (B.C.) and the Province of Ontario (ON). SARA section 44 allows the Minister to adopt all or part of an existing plan for the species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Province of British Columbia provided the attached recovery strategy for the Scarlet Ammannia (Part 2) as science advice to the jurisdictions responsible for managing the species in British Columbia. It was prepared 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 Scarlet Ammannia 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.

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

ACKNOWLEDGEMENTS

Many people are to be acknowledged for their involvement in the preparation of this federal recovery strategy addition. This document was prepared by Kella Sadler (Environment Canada, Canadian Wildlife Service - Pacific and Yukon Region). Substantial input and collaborative support was provided by Kathy St. Laurent and Angela Darwin (CWS - Ontario Region). Clarification on extant populations in British Columbia was provided from Terry McIntosh (consultant), and in Ontario from Michael Oldham and Robert Craig (Ontario Ministry of Natural Resources and Forestry, OMNRF). Helpful comments on the manuscript were provided by the B.C. Ministry of Environment (Leah Westereng), as well as from OMNRF: Amelia Argue, Eric Snyder and Bree Walpole (SAR Branch); Brianne Fennema (Aylmer District). Allison Haney, Pablo Jost, Angela Darwin, Marie-Claude Archambault, Richard Post, and Clare O'Brien provided assistance with mapping and figure preparation.

ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT

The following sections have been included to address specific requirements of SARA that are either not addressed, or which need more detailed comment, in the “Recovery Strategy for the scarlet ammannia (*Ammannia robusta*) in British Columbia and Ontario” (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 provincial recovery strategy for adoption by Environment Canada.

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

1. Species Status Information

Legal Status: SARA Schedule 1 (Endangered) (2003)

Table 1. Conservation Status (from NatureServe 2013, B.C. Conservation Data Centre 2013, B.C. Conservation Framework 2013, and Ontario Natural Heritage Information Centre 2012).

Global (G) Rank*	National (N) Rank*	Sub-national (S) Rank*	COSEWIC ³ Designation	B.C. List	B.C. Conservation Framework	ON Status - SARO ⁴
G5	Canada (N1N2) United States (NNR)	Canada: British Columbia (S1), Ontario (S1); United States: multiple states**	Endangered (2001)	Red	Highest priority: 1, under Goal 3***	Endangered

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

** United States (S) Ranks: Arizona (SNR), Arkansas (SNR), California (SNR), Colorado (SNR), Idaho (SNR), Illinois (SNR), Indiana (SNR), Iowa (SNR), Kansas (SNR), Kentucky (SNR), Louisiana (SNR), Michigan (SNR), Minnesota (SNR), Missouri (SNR), Montana (S1), Nebraska (SNR), Nevada (SNR), New Jersey (SNA), North Dakota (SNR), Ohio (SNR), Oklahoma (SNR), Oregon (SNR), South Dakota (SNR), Tennessee (SNR), Texas (SNR), Utah (SNR), Washington (S1), Wisconsin (SU), Wyoming (S1)

*** 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 less than 1% of the species’ global range occurs in Canada.

³ Committee on the Status of Endangered Wildlife in Canada

⁴ The Species at Risk in Ontario (SARO) List is a regulation under the *Endangered Species Act, 2007* similar in context to Schedule 1 of the *Species at Risk Act*.

2. Socio-economic Considerations

The provincial recovery strategy contains a short statement on socio-economic considerations. As a socio-economic analysis is not required under Section 41(1) of SARA, the Socio-economic Considerations section of the provincial recovery strategy is not considered part of the federal 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 Scarlet Ammannia (*Ammannia robusta*) 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, there are six extant⁵ populations in Canada, each with reproductively capable individuals. This species is an annual plant, and therefore subject to fluctuating population size from year-to-year; the available data are insufficient to determine naturally sustainable range in population size, and/or related trends, at any of the sites.

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 at the currently occupied sites, and habitat at some of the previously occupied sites could be restored to support the species. Additional suitable habitat (i.e., currently not occupied by Scarlet Ammannia) may be available.

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

Yes, stewardship and cooperation with landowners and land managers can prevent or mitigate major threats through recovery methods including habitat protection, inventory and monitoring, invasive species management, and habitat restoration/rehabilitation.

⁵ An “extant” population is one which is considered to be still in existence, i.e., not destroyed or lost (extirpated).

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 are known. Standard propagation techniques exist for raising new stock for translocation.

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 Scarlet Ammannia to be:

To maintain the distribution, and to maintain or (where feasible and appropriate) increase the abundance of all extant populations of this species in Canada, including any extant populations which may be identified or re-established in the future.

Rationale:

Abundance and distribution information for this species show six extant populations⁶ in British Columbia and Ontario. There are two extant populations in the south interior of British Columbia, occurring near Osoyoos, BC (2004, 2005 surveys). There are four extant populations in southwestern Ontario at Lake Erie, with two occurring on Pelee Island (2003, 2001 surveys), one in the Hillman Marsh area near Elmdale (2001 survey) and one near Kingsville (2007 survey). In addition to the six known extant populations described above, there are two newly reported populations on Pelee Island in Ontario (2014, M. McFarlane pers. comm.): (1) north island in an artificially created wetland “Lollipop Pond site”, and (2) south island in an artificially created drainage canal “South Pelee Island site”. However, these new reports represent recent, deliberate, introduction attempts as opposed to naturally occurring populations. Further monitoring is required to confirm success and long-term persistence of these introductions.

Two populations are considered to be extirpated⁷ in British Columbia (i.e., “Osoyoos Lake Motel” and “Haynes Point” populations described in the provincial recovery strategy). The Osoyoos Lake Motel population has not been observed since 1953; the previously occupied habitat at this site has been rendered permanently unsuitable by motel development. Likewise the Haynes Point population has not been observed since 1953, despite intensive search efforts between 1991 and 2014. The previously occupied habitat at this site has been altered, where the natural substrate was removed and replaced with coarse sand for beach management purposes (Douglas and Oldham 1999).

⁶ “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.

⁷ An “extirpated” population is one which was previously known to occur (i.e., for which there is historical record), but that no longer exists.

There are three areas in Ontario which may potentially have extant populations of Scarlet Ammannia, based on additional records of the species. These are located at: Hillman Marsh (i.e., other areas of the marsh, beyond where the 2001 extant population was recorded), on Pelee Island (at a site named “north end quarry”), and one site near the town of LaSalle.

The additional records at Hillman Marsh have a high degree of location uncertainty (i.e., ≥ 1 km) and/or years since observed (>25 years). Michael Oldham (2011 pers. comm.), species expert and original observer of these occurrences, indicated that since Scarlet Ammannia is a seed-banking⁸ species of exposed mudflats, if water levels in Hillman Marsh are low, the species might occur virtually anywhere in the wetland. Further, Oldham stated that although he is not aware of any records (or detailed searches), he considers that Scarlet Ammannia may occur in either of the tributary streams flowing into Hillman Marsh. Based on this information, the status of Scarlet Ammannia in other areas of Hillman Marsh (beyond the site of the 2001 population record) is considered to be “unknown”.

The additional records at Pelee Island “north end quarry” site and the “LaSalle” site have not been observed since 1987 and 1992 (respectively), although these areas were surveyed in 1997. These existing records are also associated with a high degree of location uncertainty (i.e., >1 km). The area at LaSalle is now a subdivision; much of the previously occupied habitat has been rendered permanently unsuitable by housing development. The “north end quarry” site at Pelee Island was noted to be overgrown with willow (*Salix* spp.) and dogwood (*Cornus* spp.), absent of Scarlet Ammannia, and presumably unsuitable for the species in 1997 (Douglas and Oldham 1999). However, Ontario species expert M. Oldham (2011 pers. comm.) believes it might be possible for the species to have persisted at one or both sites, i.e., in the seed bank. The chances of persistence are lower for the population at the LaSalle, since that location has now been developed. Depending on the current habitat conditions at the Pelee Island “north end quarry” location, Oldham believes it may be possible that the species (or its propagules) could have persisted at that site. This hypothesis is supported by the outcome of two new introduced populations (2014, M. FcFarlane pers. comm) that resulted from depositing sediment taken from the “north end quarry” site into artificially-created suitable habitat. Based on the above information, the status of Scarlet Ammannia at the Pelee Island “north end quarry” site is currently considered “unknown” and its status at the “LaSalle” site is considered to be extirpated.

Canadian populations of Scarlet Ammannia represent the northern distribution limit for this species in North America; in Canada it occurs in both south-central British Columbia, and in south-western Ontario. Current recovery efforts focus on maintenance of six known extant populations. However focussed surveys have not been conducted to confirm or dispute the species persistence at sites of “unknown” status (i.e., additional

⁸ Seed bank – refers to the natural storage of seeds, often dormant, within the soil. Annual plants may rely heavily on banked seeds for successful perpetuation from year to year, particularly in early successional and/or dynamic and naturally transient/patchy habitats; germination is favoured when and where ideal microhabitat conditions occur.

sites at Hillman Marsh, and the “north end quarry” site on Pelee Island), and continued monitoring of the two newly introduced (2014) Pelee Island populations is needed to determine long-term success in establishment. If additional naturally-occurring populations are discovered, re-discovered, or are able to be re-established at any extirpated sites (for example where habitat restoration is considered still feasible, such as at Haynes Point in British Columbia), these should also be maintained.

The trend in population size (including direction, rate of change) 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 increase abundance (e.g., through seeding or change in land use management) should be considered.

5. Critical Habitat

5.1 Identification of the Species’ Critical Habitat

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

Section 41 (1)(c) of SARA requires that recovery strategies include an identification of the species’ critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. The 2008 provincial recovery strategy for Scarlet Ammannia noted that critical habitat could not be identified at that time, owing to a lack of information on habitat and area requirements for the species. Environment Canada has reviewed the available information and concluded that sufficient information is available to identify critical habitat at this time. More precise boundaries may be mapped, and additional critical habitat may be added in the future if additional information supports the inclusion of areas beyond those currently identified. 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 Scarlet Ammannia is identified for a total of five extant populations, one in British Columbia and four in Ontario. Critical habitat has not been identified at this time for one⁹ of the two extant populations in the southern interior of British Columbia, or for the two new (2014) populations resulting from deliberate, recent, introduction attempts at Pelee Island in Ontario. Environment Canada will work with the applicable organizations to complete the identification of critical habitat on those lands. The schedule of studies (Section 5.2) outlines the activities required to identify additional critical habitat necessary to support the population and distribution objectives of the species.

For the purpose of identifying critical habitat, attributes of critical habitat are as follows:

⁹ Osoyoos Lake, “Mica Spit” population in the provincial recovery strategy.

1. It is found in south-central British Columbia, and southwestern Ontario, both in areas noted for hot dry summer conditions relative to surrounding environments, specifically:
 - a. In BC: it is found in the southern Okanagan Valley, in the Osoyoos Lake area, which has a semi-arid steppe climate, with cold winters. Summers are hot and dry, with low average annual rainfall (300 mm) and relatively short growing seasons.
 - b. In ON: it is found in the Essex County area, which has the province's mildest climate. In the summer the area tends to have an influx of hot humid air from the south; unlike elsewhere in the province, in winter the frost does not penetrate very deeply into the ground. Annual precipitation averages 762 mm, often with summer drought conditions.
2. Within these environments, it is restricted to open, shoreline and semi-aquatic habitats, where sites are submerged early in the year and plants emerge when water levels recede in summer months:
 - a. In BC: moist to wet, often alkaline, muddy flats and shorelines of lagoons or ponds, or sandy shorelines. Associated vegetation includes semi-aquatic species or species able to withstand early season flooding.
 - b. In ON: mudflats, sand beaches, wetland edges, dried-up pond bottoms, drainage canals/ditches, and moist sandy depressions. Associated vegetation includes semi-aquatic species, e.g., Needle Spike-rush (*Eleocharis acicularis*) and Creeping Loosestrife (*Lysimachia nummularia*).

Critical habitat for Scarlet Ammannia in Canada is identified as the area occupied by individual plants or patches of plants (all records within the last 25 years, unless there is reason to consider that the occurrence is extirpated, e.g., the habitat has been removed or degraded to the extent that it is clearly unsuitable), including the associated potential location error from Global Positioning System (GPS) units (ranging from 10 m to 100 m uncertainty distance), plus an additional 50 m (i.e., critical function zone distance¹⁰) to encompass immediately adjacent areas. Critical habitat also includes distinct ecological features¹¹ which are associated with, and are integral to, the production and maintenance of suitable habitat conditions, and which provide ecological context for occupied

¹⁰ Critical function zone distance has been defined as the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g., critical light, moisture, humidity levels necessary for survival). Existing research provides a logical basis for including a minimum critical function zone distance of 50 m as part of critical habitat for rare plant species occurrences. Accounting for up to a maximum of 100 m GPS error, the default critical function zone distance (in the absence of distinct ecological features, see below), is a maximum 150 m.

¹¹ "Distinct" ecological, or landscape features are features that are able to be distinguished through the use of detailed ecosystem mapping or aerial photos, which appear as ecologically contiguous features with distinct boundaries at that scale (e.g. cliffs, banks, or slopes, drainage basins, seepage plateaus, shoreline inlets/lagoons, or distinct vegetation assemblages), and which comprise the context for a species occurrence. Distinct ecological features may be contained within, or extend beyond, the critical function zone distance; in the latter circumstance the critical habitat identification will be increased where appropriate.

microhabitats. Distinct ecological features identified as critical habitat for Scarlet Ammannia include: open, sandy, or muddy, seasonally-flooded shorelines (down to the lowest documented water level), as well as the associated draw-down zone¹² adjacent to shorelines. Where areas of critical habitat based on occurrences are in close proximity (outer boundaries of location uncertainty plus critical function zone areas are less than 100 m apart), and/or where they occur in association with the same distinct ecological feature, showing continuous ecological attributes (as described above) between them, the connective habitat (i.e., the area in-between occurrences) is identified as critical habitat. Scarlet Ammannia is an annual plant that exists in a dynamic shoreline habitat, and must re-establish each year from a seed bank. Connective habitat is critical to the survival and recovery of Scarlet Ammannia because it provides an avenue in which plants can propagate and be replenished from closely-associated areas, genetic interchange can be maintained, and fine-scale distributions can shift in response to environmental changes.

A total of 143.0 ha of critical habitat for Scarlet Ammannia is identified using the above methods. Critical habitat is presented in Figures A1-A4 (Appendix 1). Presentation methods differ between the provinces of British Columbia and Ontario, to be consistent with the manner in which location information is publically presented for species at risk by these jurisdictions. Critical habitat in British Columbia is presented using detailed polygons that closely encompass the occurrences, plus location error, plus critical function zone distance as well as connective habitat, where appropriate. Excepting the features identified in the paragraph that follows, the detailed polygons on each map for British Columbia populations thus represent an approximation of actual critical habitat. The 1 km x 1 km Universal Transverse Mercator (UTM) grid overlay shown on these figures is a standardized national grid system that indicates the general geographic area containing critical habitat, for land use planning and/or environmental assessment purposes. In order to be consistent with the manner in which location information is publically presented for species at risk in Ontario, detailed critical habitat polygons are not shown for Ontario populations. More detailed information on the location of critical habitat to support protection of the species and its habitat may be requested, on a need-to-know basis, by contacting Environment Canada's Recovery Planning section at: RecoveryPlanning_PI@ec.gc.ca.

Where existing anthropogenic features (including the running surface of active roads and existing dock structures) do not possess the ecological attributes required for the Scarlet Ammannia, they are not identified as critical habitat, even when they occur within the detailed polygons and/or associated UTM grid squares. 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.

¹² 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.

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) outlines the activities required to complete the identification of critical habitat for the population of Scarlet Ammannia occurring at Mica Spit at Osoyoos Lake, British Columbia, and for the populations of Scarlet Ammannia at Hillman Marsh and Pelee Island in Ontario.

Table 2. Schedule of Studies to Identify Additional Critical Habitat

Activity	Rationale	Timeline
Work cooperatively with applicable organizations to complete the identification of critical habitat for the “Osoyoos Lake, Mica Spit” population of Scarlet Ammannia occurring at Osoyoos Lake, B.C.	This activity is required such that sufficient critical habitat is identified to meet the population and distribution objectives.	2015-2020
Obtained detailed and recent occurrence information for the population of Scarlet Ammannia at Hillman Marsh, Ontario.	The identification of critical habitat for this population is based solely on the 2001 occurrence record, although there are a number of historical records with high location uncertainty within the broader Hillman Marsh area. Recent, targeted surveys of these locations are lacking. Without further information on the current status and locations of these occurrences, it is unknown whether there is sufficient critical habitat identified at Hillman Marsh.	2015-2020
Obtain recent occurrence information for one population of Scarlet Ammannia at Pelee Island, Ontario.	Critical habitat could not be identified at the “north end quarry” site owing to its “unknown” extant status, and the high location uncertainty associated with existing historical records. Recent, targeted surveys are lacking. Without further information on the status of and location of this population, it is unknown whether there is sufficient critical habitat identified at Pelee Island.	2015-2020
Monitor newly identified locations of Scarlet Ammannia on Pelee Island to determine whether establishment of these introduced populations are successful, and/or to evaluate long-term persistence (i.e. over a minimum time period of 5 years)	This activity is required such that sufficient critical habitat is identified to meet the population and distribution objectives.	2015-2020

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. Activities described in Table 3 include those likely to cause destruction of critical habitat for Scarlet Ammannia; destructive activities are not limited to those listed.

Table 3. Examples of activities likely to result in destruction of critical habitat for Scarlet Ammannia.

Activity	Description of activity resulting in or contributing to the destruction of critical habitat	Threat level
Inappropriate lake water level control (via 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 patterns and processes are beyond the biological tolerance range of Scarlet Ammannia. If water levels are artificially maintained at too-high or too-low levels, or are prevented from fluctuating the required amounts at appropriate times ¹³ , this will prevent successful completion of one or more life history stages, i.e., germination, growth, and/or flowering. Also, changes in natural flood/drought cycles can result in an altered disturbance regime such that ecological succession is facilitated (e.g., the area becomes grown-in with willows), to the extent that habitat is no longer suitable for Scarlet Ammannia.	High (ON)
Destruction of natural shoreline, including: – Shoreline development (e.g., building docks, boat houses, sheds, or other infrastructure) – Beach maintenance or lawn creation – Agricultural activities (crop-planting or livestock use)	Results in direct habitat loss by removal and/or covering of seed bank and natural substratum required for growth, or changing other required components of habitat to the extent that it is unsuitable for Scarlet Ammannia.	High (BC), Moderate (ON)

¹³ 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 Scarlet Ammannia growth and abundance at all life history stages is required for appropriate water level control (i.e., time, level, and duration of artificial flooding).

Introduction of alien invasive plants	Alien invasive plants cause direct reduction of habitat available for Scarlet Ammannia by physical displacement, and indirect effects, e.g., alteration of shade, water, and nutrients available, which can make the habitat unsuitable for Scarlet Ammannia.	Moderate (ON), Low/Unknown (BC)
Activities related to the control of invasive plant species (mechanical or chemical)	Efforts to control invasive plants through mechanical or chemical means can likewise result in destruction of critical habitat by disturbing or removing natural substratum required for survival (as a consequence of weed-pulling), or microhabitat toxicity resulting from the application of herbicides.	Moderate (ON), Low/Unknown (BC)

Habitat destruction from water level stabilization and/or abnormal fluctuations has been identified as a major threat in both British Columbia and Ontario. The water level of Osoyoos Lake in British Columbia is managed by outlet dams. Critical habitat has not yet been identified for the population of Scarlet Ammannia at Osoyoos Lake (see section 5.2 Schedule of Studies), however once this has been completed Table 3 should be updated to reflect high likelihood of this activity causing destruction in B.C. In Ontario, Lake Erie shoreline populations are subject to a general and widespread trend of decreasing water levels; the creation of dykes and dams also threatens natural hydrological processes for extant populations. Scarlet Ammannia requires a fluctuating water regime. 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 Scarlet Ammannia, as well as the successful persistence or emergence of seeds from the seed bank, and any subsequent recruitment. Alteration or suppression of natural hydrological processes can also impact disturbance regimes, which can be linked to ecological succession. Scarlet Ammannia demonstrates a preference for early-successional habitat with reduced competition from other vegetation. Succession has been identified as a potential threat for three of the four extant sites in Ontario, where native species (mainly willows and poplars) have overgrown shoreline habitat to the extent that it is less suitable for Scarlet Ammannia. In both provinces, further research is required to determine the relationships of this species and its critical habitat with hydrological patterns (e.g., water-level), during all life history phases.

Habitat loss through shoreline destruction and development has been identified as a significant threat to Scarlet Ammannia in British Columbia. The ecological preference of Scarlet Ammannia for shoreline habitat makes it particularly threatened by cottage and housing developments, and local recreational activities (e.g., for boating, camping, or swimming). In Ontario, the extirpation of one Scarlet Ammannia population has been attributed to housing development.

Invasive alien species have been identified as a threat in Ontario, where introduced taxa (e.g., European Common Reed, *Phragmites australis* ssp. *australis*; Creeping Jenny, *Lysimachia nummularia*) threaten to shade out Scarlet Ammannia populations at some sites. In British Columbia, invasive plant species (e.g., Russian Olive, *Elaeagnus*

angustifolia; and non-native willows, *Salix* spp.) pose a potential threat to Scarlet Ammannia populations. In both provinces, invasive alien species reduce available habitat by competing for resources. However, efforts to control these species may also cause inadvertent mechanical or chemical damage to Scarlet Ammannia habitat. Where best management practices have been developed for the removal or control of invasive alien plant species, these practices should be followed. Where established best management practices do not exist, expert advice should be obtained, i.e., in consultation with species experts, land managers, and/or appropriate conservation groups with experience in the control of invasive alien plant species in habitats that support species at risk.

Also of potential concern in both B.C. and Ontario is the threat of repeated and/or excessive disturbance of shoreline, including: operation of all-terrain vehicles, hiking, trampling by beach-users, or livestock, and boat damage (dragging, heavy wake damage). These activities may have direct/immediate, or cumulative effects in the quality and availability of habitat for Scarlet Ammannia; for example, by the compaction, disturbance or removal of natural substratum, including seed bank.

Landscape development activities occurring within associated watershed drainage pathways can also cause critical habitat to become unsuitable for Scarlet Ammannia as a result of indirect and/or cumulative damage occurring within the landscape. For example, forest harvesting, water diversion, or vegetation clearing in nearby or associated areas may change hydrological patterns, sunlight, and wind exposure, etc., to the extent that local habitat for Scarlet Ammannia is destroyed. The extent of the above activities occurring, and the thresholds where these activities (individually or cumulatively) cause destruction of critical habitat for Scarlet Ammannia, are currently unknown.

6. Measuring Progress

This section replaces the “Performance Measures” section in the provincial recovery strategy.

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives:

- The distribution of Scarlet Ammannia in Canada has been maintained (i.e., extent of occurrence has not decreased);
- The abundance of Scarlet Ammannia in Canada has been maintained (i.e., population sizes have not decreased);
- The distribution and abundance of Scarlet Ammannia in Canada is increased, where feasible, through newly identified and/or re-established populations.

Measurements are to allow for annual effects and related variation in annual monitoring results, i.e., trends in repeated annual estimates are to be evaluated over the course of a longer time period, for example, over a five year interval (2015-2020).

7. Statement on Action Plans

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

One or more action plans for Scarlet Ammannia will be posted on the Species at Risk Public Registry by 2020.

8. 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](#)¹⁴. 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.

Scarlet Ammannia occurs in the South Okanagan Valley B.C., and the critical habitat identified for the species here is known to overlap with occurrences of other shoreline plants in the area that are characterized as species at risk. For example, the SARA Schedule 1 plant species Toothcup (*Rotala ramosior*), Small-flowered Lipocarpha (*Lipocarpha micrantha*), and Bent Spike-rush (*Eleocharis geniculata*) also occur at the Osoyoos Lake and/or East Osoyoos sites in the Okanagan Valley. The provincially (BC) rare plants Awned Cyperus (*Cyperus squarrosus*), Thyme-leaved Spurge (*Chamaesyce serpyllifolia* ssp. *serpyllifolia*), and Beaked Spike-rush (*Eleocharis rostellata*) are known to co-occur in these areas as well. In Ontario, other federally-listed species at risk at the Lighthouse Point site on Pelee Island include: Eastern Foxsnake (*Pantherophis gloydi*), Blanding's Turtle (*Emydoidea blandingii*), Lake Erie Watersnake (*Nerodia sipedon insularum*), Swamp Rose-mallow (*Hibiscus moscheutos*), and American Water-willow (*Justicia americana*), all within similar habitat as Scarlet Ammannia; and, more generally, Blue Racer (*Coluber constrictor foxii*), Red Mulberry (*Morus rubra*), Climbing Prairie Rose (*Rosa setigera*), Common Hoptree (*Ptelea trifoliata*), and Blue Ash (*Fraxinus quadrangulata*) (Oldham 1983). At the Hillman Marsh site, federally-listed species at risk within similar habitat as Scarlet Ammannia include: Spotted Turtle (*Clemmys guttata*), Eastern Foxsnake, Common Hoptree, King Rail (*Rallus elegans*), and Swamp Rose-mallow; Prothonotary Warbler (*Protonotaria citrea*) (historical breeder) is also known from the area (Oldham 1983). Critical habitat identified for the SARA Schedule 1

¹⁴ <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

plant Common Hoptree overlaps with Scarlet Ammannia critical habitat on Pelee Island (Lighthouse Point, Gibwood populations), and at the Hillman Marsh site.

The proposed recovery approaches are not expected to negatively affect any other native species of conservation concern. The recommended habitat protection will indirectly benefit other species, including species at risk in the area. Increased public education and awareness may limit harmful recreational activities at these locations, and proper 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 Scarlet Ammannia may potentially pose a threat to co-occurring species (e.g., via trampling, increased herbivory as a consequence of animals using human-made trails, or inadvertent dispersal of alien species during disposal), unless care is taken to avoid damage.

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Appendix 1. Maps of Critical Habitat for Scarlet Ammannia in Canada

Critical habitat for Scarlet Ammannia in Canada is identified at five locations on federal and non-federal land; one is in the south interior of British Columbia (Figure A1), and four are in southwestern Ontario (Figure A2-A4).

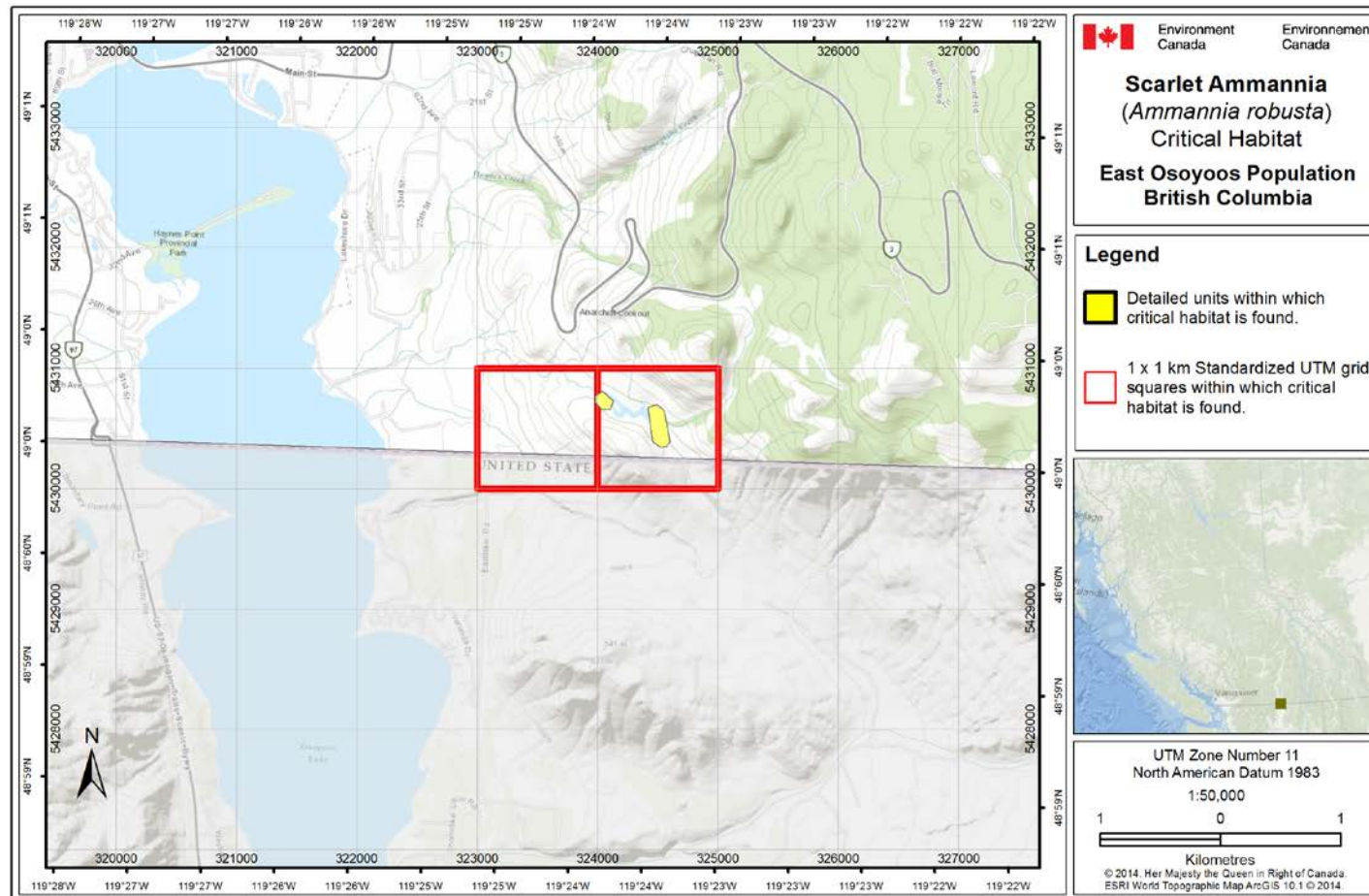


Figure A1. Critical habitat for Scarlet Ammannia at East Osoyoos, B.C. (corresponds with “Private site, Osoyoos” population” in Provincial Recovery Strategy) is represented by the yellow shaded polygons (units), where the criteria and methodology set out in Section 5.1 are met (i.e., 6.0 ha in total). The 1 km x 1 km UTM grid overlay shown on this figure is a standardized national grid system that indicates the general geographic area containing critical habitat. Areas outside of the shaded yellow polygons do not contain critical habitat. USA landbase is excluded from this critical habitat identification, where it occurs within standardized UTM grid squares.

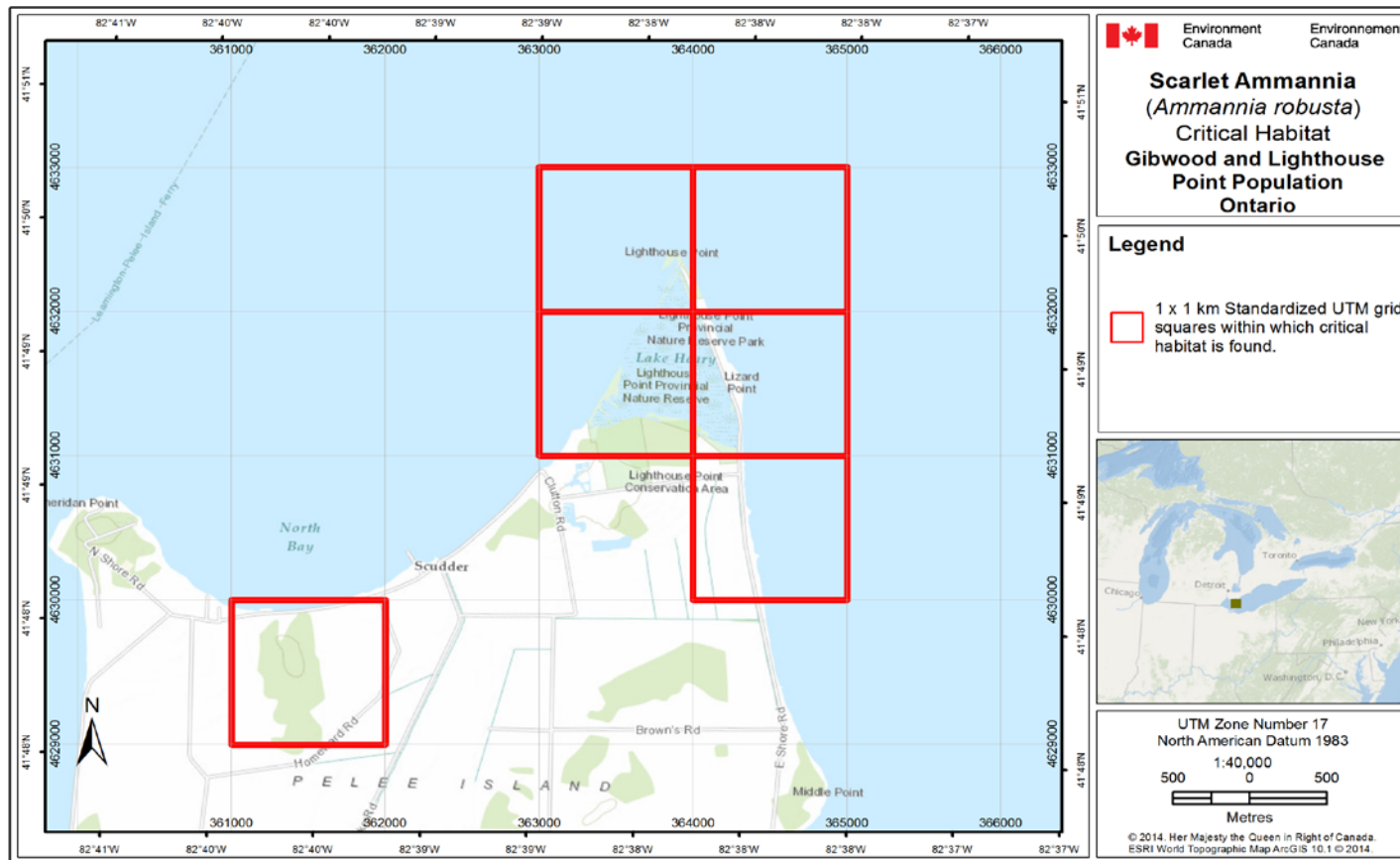


Figure A2. Critical habitat for Scarlet Ammannia on Pelee Island, Ontario: Gibwood Nature Preserve (southwest grid square - corresponds with “Gibwood Nature Preserve” population in Provincial Recovery Strategy), and Lighthouse Point (corresponds with “Lighthouse Point Provincial Nature Reserve” population in Provincial Recovery Strategy) occurs within the 1 km x 1 km standardized UTM grid squares indicated, where the criteria set out in Section 5.1 are met (i.e., 1.5 ha and 105.3 ha, respectively). This standardized national grid system indicates the general geographic area containing critical habitat; polygons representing the detailed critical habitat identification are not shown.

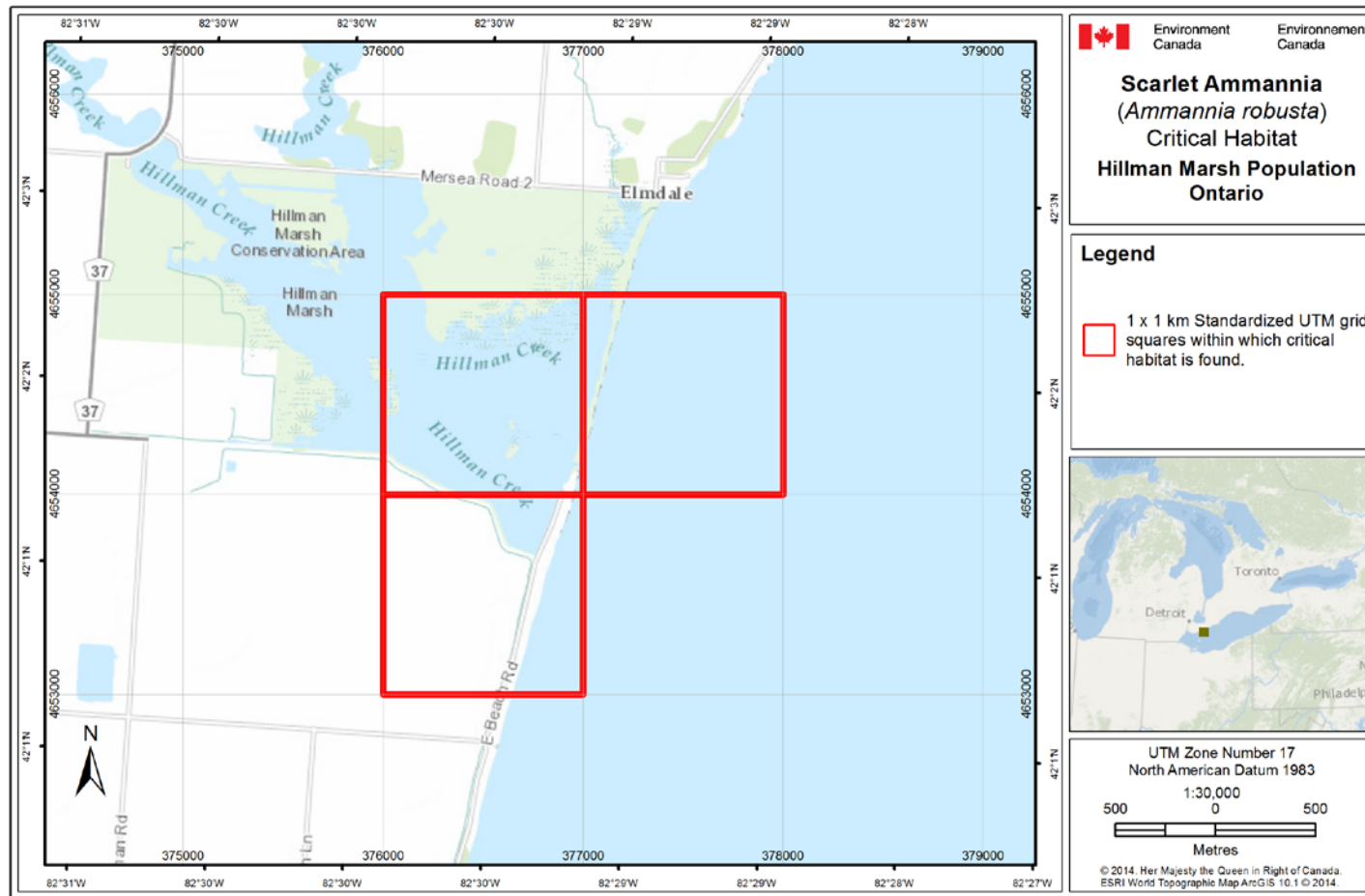


Figure A3. Critical habitat for Scarlet Ammannia at Hillman Marsh, Ontario (corresponds with “Hillman Marsh Conservation Area” population in Provincial Recovery Strategy) occurs within the 1 km x 1 km standardized UTM grid squares indicated, where the criteria set out in Section 5.1 are met (i.e., 26.1 ha in total). This standardized national grid system indicates the general geographic area containing critical habitat; polygons representing the detailed critical habitat identification are not shown.

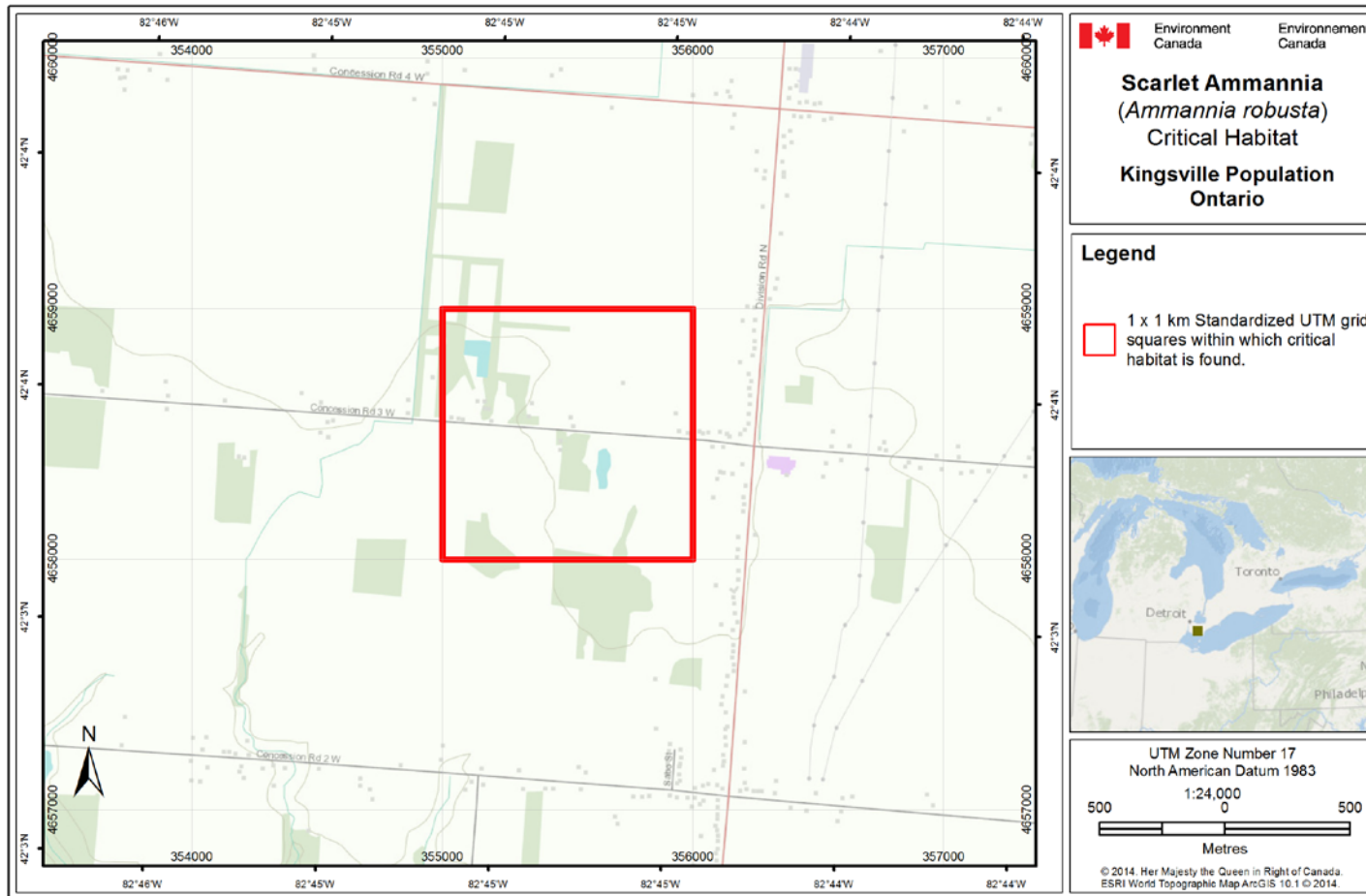


Figure A4. Critical habitat for Scarlet Ammannia near Kingsville, Ontario (corresponds with “Kingsville” population in Provincial Recovery Strategy) occurs within the 1 km x 1 km standardized UTM grid squares indicated, where the criteria set out in Section 5.1 are met (i.e., 4.2 ha in total). This standardized national grid system indicates the general geographic area containing critical habitat; polygons representing the detailed critical habitat identification are not shown.

PART 2: “Recovery Strategy for the scarlet ammannia (*Ammannia robusta*) in British Columbia and Ontario”, prepared by the Scarlet Ammannia Recovery Team, for the British Columbia Ministry of Environment and the Ontario Ministry of Natural Resources

Recovery Strategy for the scarlet ammannia (*Ammannia robusta*) in British Columbia and Ontario



Prepared by the Scarlet Ammannia Recovery Team



Ministry of
Environment

June 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 scarlet ammannia (*Ammannia robusta*) in
British Columbia and Ontario**

Prepared by the Scarlet Ammannia Recovery Team

June 2008

Recommended citation

Scarlet Ammannia Recovery Team. 2008. Recovery strategy for the scarlet ammannia (*Ammannia robusta*) in British Columbia and Ontario. Prepared for the British Columbia Ministry of Environment, Victoria, BC, and the Ontario Ministry of Natural Resources, Peterborough, ON. 20 pp.

Cover illustration/photograph

Al Woodliffe

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: 978-0-7726-6057-2

Cataloguing in Publications: Pending

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Disclaimer

The British Columbia Ministry of Environment and the Ontario Ministry of Natural Resources led the development of this recovery strategy for scarlet ammannia, under the *Accord for the Protection of Species at Risk in Canada*.

This recovery strategy has been prepared as advice to the responsible jurisdictions and the many different constituencies that may be involved in recovering the species. The recovery strategy does not necessarily represent the views of all individuals of the recovery team or the official positions of the organizations with which the individual recovery team members are associated.

The goals, objectives, and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

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.

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RESPONSIBLE JURISDICTIONS

The British Columbia Ministry of Environment and the Ontario Ministry of Natural Resources are responsible for producing a recovery strategy for scarlet ammannia under the *Accord for the Protection of Species at Risk in Canada*. Environment Canada's Canadian Wildlife Service participated in the preparation of this recovery strategy.

ACKNOWLEDGEMENTS

The strategy was originally prepared by George W. Douglas and Shyanne J. Smith in cooperation with the members of the Scarlet Ammannia Recovery Team. The B.C. Ministry of Environment and the Ontario Ministry of Natural Resources led the development of this recovery strategy for the species, in cooperation with the Canadian Wildlife Service - Pacific and Yukon Region and Ontario Region, Environment Canada.

The Southern Interior Rare Plants Recovery Implementation Team members are thanked for their work and their review comments on the final draft strategy. The Osoyoos Indian Band provided access to sites in B.C. and participated in stewardship actions on the reserve. Funding for the

draft recovery strategy was provided by B.C. Ministry of Water, Land and Air Protection (now the Ministry of Environment) through the Habitat Conservation Trust Fund and Okanagan College. The Ontario Ministry of Natural Resources funded the inclusion of information on Ontario populations in the initial draft.

EXECUTIVE SUMMARY

Scarlet ammannia (*Ammannia robusta*) was designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered in April 1999; the designation was confirmed in May 2001. Scarlet ammannia is listed as Endangered under Schedule 1 of the federal *Species at Risk Act*. This species is ranked as an S1 (critically imperiled) species in both British Columbia and Ontario. In British Columbia, it appears on the Ministry of Environment Red-list; in Ontario, it is listed as Endangered under Ontario's *Endangered Species Act, 2007*.

Scarlet ammannia ranges from south-central British Columbia south to Mexico (Hitchcock 1961; McClintock 1993; Douglas et al 1999). It also ranges eastward throughout central North America to Ohio and southwestern Ontario. From Ontario, it ranges south to the extreme southern United States and Mexico. The total number of populations in Canada has declined 40%, from 10 historic populations to 6 extant populations over the last 50 years.

In British Columbia, scarlet ammannia inhabits moist to wet, often alkaline, muddy shorelines of lagoons or ponds; sandy shorelines; or moist or dried alkaline flats. These sites are submerged early in the year, with plants emerging when lake levels drop in late July to early September. Ontario sites are on mudflats; sand beaches; wetland edges; dried-up pond bottoms; and moist, sandy depressions.

Threats to scarlet ammannia in BC include: habitat loss or degradation; changes in ecological dynamics or natural processes (flood regime); invasive species; cattle grazing, trampling and recreational vehicle activity are considered minor potential threats. Threats in Ontario include: changes in ecological dynamics or natural processes (flood regime and succession); invasive species and habitat loss or degradation.

No critical habitat can be identified for scarlet ammannia in Canada at this time, but it may be identified at a later date in a federal addendum 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.

Recovery actions could potentially affect the following socioeconomic sectors: land development along foreshore areas; recreational users of provincial parks; agriculture (irrigation), and domestic animal grazing. The expected magnitude of these effects is unknown and will be further addressed in the recovery action plan.

The recovery goal for scarlet ammannia is to protect and maintain the four extant populations in Ontario and the two extant populations in BC, and to restore the species at historic sites if deemed necessary. Specific targets for population numbers are not possible at this time due to the species being an annual and also a lack of survey data for determining long-term population trends.

Recovery objectives for the species are as follows:

1. Ensure the persistence of the species at all known extant sites, with no loss or degradation of currently occupied habitat, for the next five years.
2. Assess the extent of the four main threats to the six populations (habitat loss or degradation, invasive species, flood regime, and succession) by 2012.
3. Confirm the distribution of scarlet ammannia in Ontario and British Columbia (historic and new locations), and update population and distribution objectives as needed by 2012.
4. Investigate the feasibility of restoring populations at extirpated sites or in suitable habitat near historical areas by 2012.

Approaches to achieve these recovery objectives include: habitat protection, public outreach, inventory and monitoring, habitat management, scientific research and habitat restoration.

In British Columbia, a multi-species action plan will be completed by 2012 for four sand spit species (and others), including scarlet ammannia, small-flowered lipocarpa (*Lipocarpa micrantha*), short-rayed alkali aster (*Symphyotrichum frondosum*), and toothcup (*Rotala ramosior*). An action plan for Ontario scarlet ammannia sites will be completed by 2013.

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BACKGROUND

Species Assessment Information from COSEWIC

Common Name (population): scarlet ammannia

Scientific Name: *Ammannia robusta*

Status: Endangered

Last Examination and Change: May 2001

Canadian Occurrence: British Columbia, Ontario

Reason for designation: Annual shoreline aquatic found at fewer than five remaining sites and occupying very small areas of habitat where it exhibits fluctuating population sizes and numbers due to dependence on low water levels and at continued risk from shoreline development, recreational activities and natural or artificial maintenance of high water levels.

Status history: Designated Endangered in April 1999. Status re-examined and confirmed in May 2001. Last assessment based on an existing status report.

Description of the Species

Ammannia robusta (scarlet ammannia) is a glabrous (smooth, without hairs or glands), decumbent (lying on the ground with the end curved upward) to erect, simple or branched annual plant 15–100 cm tall (Figure 1; Graham 1985; McClintock 1993; Douglas *et al.* 1999). The opposite leaves are entire, oblong to oblong-lanceolate, 1.5–8 cm long and heart-shaped and clasping at the base. One to three, or sometimes four, unstalked, pale lavender flowers are 3–5 mm long and occur in the leaf axils. The fruits are unstalked, globular, and 4–6 mm long (Douglas *et al.* 1999). Seeds are small (ca. 0.5–0.8 mm long) and numerous (ca. 250–450) in each fruit, with each mature plant producing between 15 and 45 fruits (G.W. Douglas, unpublished data, 2004).

The ecological role of scarlet ammannia remains unstudied and there is no record of the plant being used for cultural resources (food, clothing, medicine, ceremonial, or symbolic purposes) or for ecotourism.

Populations and Distribution

Scarlet ammannia ranges from south-central British Columbia south to Mexico (Hitchcock and Cronquist 1961; McClintock 1993; Douglas *et al.* 1999). It also ranges eastward throughout central North America to Ohio and southwestern Ontario. From Ontario, it ranges south to the extreme southern United States and Mexico.

It is absent from the east coast of North America, except for New Jersey, where it is reported as an exotic species (Figure 2; NatureServe 2005). Scarlet ammannia also occurs in the Caribbean, and on the coast north of Rio de Janeiro in South America, where it is apparently an early, but persistent, introduction (Graham 1985). The British Columbia populations are about 200 km northwest of the nearest populations in Spokane County, Washington (WTU 2003). The nearest occurrences to the Ontario populations are in Michigan or Ohio, where the species is unranked (NatureServe 2005).

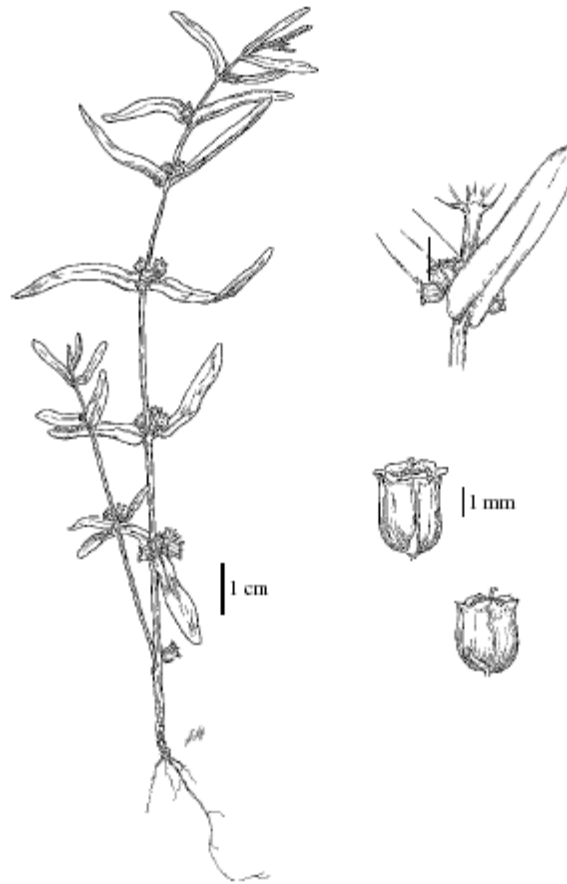


Figure 1. Illustration of scarlet ammannia (from Douglas *et al.* 1999, with permission).

In British Columbia, the species is restricted to the Osoyoos Lake area (Figure 3; Douglas and Oldham 1997; Douglas *et al.* 2002). In this area, populations have been recorded from Haynes Point just east of Osoyoos (extirpated), the Osoyoos Indian Reserve, and private land near Osoyoos (Figure 3). Populations in Ontario are restricted to Essex County, the most southwesterly county in the province (Figure 4) in three mainland locations and two locations on Pelee Island in Lake Erie.

Globally, scarlet ammannia is ranked G5, indicating that in most of its range the plant is “apparently common, demonstrably secure and essentially ineradicable under present conditions” (NatureServe 2004). In the United States, it is ranked S1 (critically imperiled) in Wisconsin, Idaho, Wyoming, and Washington and SNR (not ranked) in 27 other states. In Canada, the species has a national rank of N1 (Critically Imperiled). In British Columbia, the Conservation Data Centre has ranked scarlet ammannia as S1, and it appears on the British Columbia Ministry of Environment Red-list (Douglas *et al.* 2002). In Ontario, the Natural Heritage Information Centre (NHIC) has also ranked the species S1. Critically imperiled species are extremely rare (typically five or fewer occurrences or very few remaining individuals) and are especially vulnerable to extirpation or extinction.

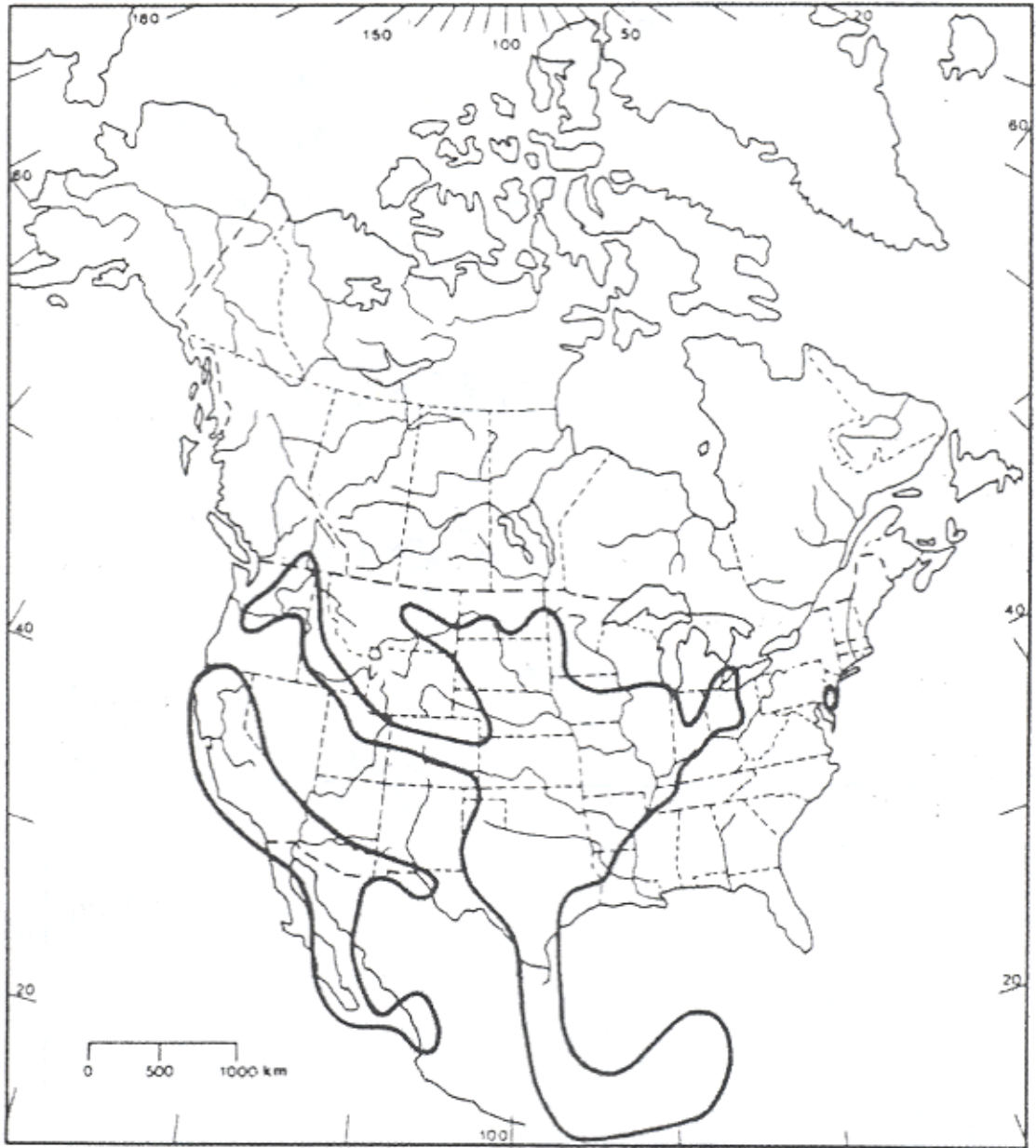


Figure 2. Range of scarlet ammannia in North America (Pryer and Keddy 1987).

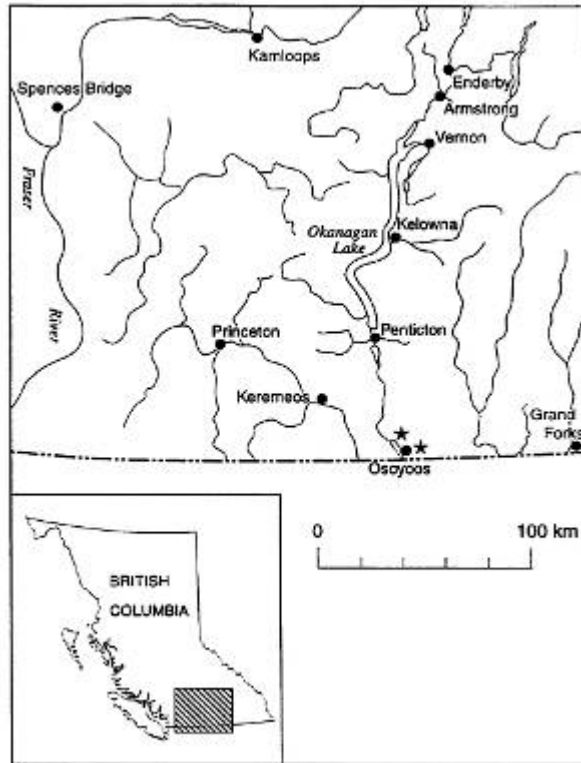


Figure 3. British Columbia distribution and extant occurrences of scarlet ammannia (stars).



Figure 4. Ontario distribution and occurrences of scarlet ammannia (stars).

Less than 1 percent of the species’ global distribution is currently located in Canada. Over the past 10 years in British Columbia, the population numbers and amount of available seasonal habitat have fluctuated widely; this is possibly due to annual changes in water levels, which contribute to the moisture levels required for germination and subsequent growth.

Rescue effect, from more southerly populations, may occur but it would be rare due to the distance (200 km). The total number of populations in Canada has declined 40%, from 10 historic populations to 6 extant populations over the last 50 years.

As this species is an annual plant, and therefore subject to fluctuating numbers, data are insufficient to determine population trends at any of the sites. Two extant populations are confirmed, as well as two extirpated populations of scarlet ammannia in British Columbia (Table 1). The total number of plants varies considerably from zero plants in most years to 150,000 plants in the most optimum year.

Four of six recorded Ontario populations are currently believed to be extant, including one recently (2003) discovered population on Pelee Island (Table 2). Repeat surveys have been completed for several Ontario sites, but no quantitative trend data are available. Observations are recorded below (Table 2).

Table 1. Observation data for British Columbia scarlet ammannia populations (extant and extirpated locations).

Extant locations	Date	Plant numbers	Area	Observer(s)
Osoyoos Lake Mica Spit Subpopulation #1 (Osoyoos Indian Reserve)	1994, July 27	0		Douglas & Illingworth
	1995, August 15	100	50 m ²	Douglas
	1997, July 15	0		Douglas
	1999, August 20	0		Douglas
	2001, August 29	0		Douglas & Paige
	2002, August 11	0		Douglas
	2003, August 5	0		Douglas
	2004, August 30	0		Douglas & Fenneman
Osoyoos Lake Mica Spit Subpopulation #2 (Osoyoos Indian Reserve)	1994, July 27	0		Douglas & Illingworth
	1995, August 15	ca. 150,000	0.7 ha	Douglas
	1997, July 15	0		Douglas
	1999, August 20	0		Douglas
	2001, August 29	0		Douglas & Paige
	2002, August 11	ca. 75,000	0.7 ha	Douglas
	2003, August 5	0		Douglas
	2004, August 30	ca. 15,000	0.2 ha	Douglas & Fenneman
2005, August 18	ca. 300	0.4 ha	Bjork & McIntosh	
Private site, Osoyoos	2004	300–400	3 m ²	Douglas & Fenneman
Extirpated locations	Date	Plant numbers	Area	Observer

Osoyoos Lake Motel Population (private motel east of Osoyoos)	1953, August 6	Not recorded	Not recorded	Calder ¹
Osoyoos Lake Haynes Point Populations (provincial park)	1953, August 6	Not recorded	Not recorded	Calder ²

Table 2. Observation data for scarlet ammannia populations in Ontario.

Location	Last observation	Rank ³	Ownership	Comments
Gibwood Nature Preserve, Pelee Island	2003 (G. Buck)	A	Nature Conservancy of Canada	125 plants appeared in a wetland created in 2003, likely from a dormant seed bank; also present in low numbers in other areas of disturbed soil nearby.
Lighthouse Point Provincial Nature Reserve, Pelee Island	2001, September 21 (M. Oldham and K. Brodribb)	B	Ontario Parks, Ministry of Natural Resources	Several hundred scattered plants on sandbars and mudflats. Searched for in 2003–2006 (all high water years) and none observed (A. Woodliffe).
Hillman Marsh Conservation Area	2001, September 20 (M. Oldham and K. Brodribb)	B	Essex Region Conservation Authority	Several dozen scattered plants seen in 1985; not observed in 1997; single plant observed in 2001.
Kingsville	2001, September 21 (M. Oldham and K. Brodribb)	B	Private	Single plant seen in 1986; about 50 plants in 1997; 21 plants counted (but could have been an equal number missed).
LaSalle	1992, August 6 (M. Oldham and T. Reznicek)	Extirpated	Private	Formerly very rare and local in sandy track (< 20 plants seen). Searched for in 1997 (M. Oldham); area now a subdivision.
Pelee Island	1987, August 14 (M. Oldham)	Presumed extirpated	Private	In 1987, several hundred plants within 10–20 m ² . Searched for in 1997 with no trace of ammannia. Area is now overgrown with willow and dogwood; presumed extirpated as habitat appears unsuitable.

¹ Royal British Columbia Museum (1991)

² Royal British Columbia Museum (1991)

³ A - Excellent predicted viability; B - Good predicted viability.

Needs of the scarlet ammannia

Biological needs

Scarlet ammannia is an annual plant. In British Columbia, it is known that plants germinate in late July to early September. Germination takes place on a warm (maximum temperatures in late summer usually range from 30 to 45°C), muddy substrate that has been recently exposed due to evaporation of the pond or lagoon. The plant then grows to maturity with fruiting in September to early October. Senescence occurs with the onset of frost in mid to late October. The seed bank is then submerged over winter. Recovery is possible only if this annual cycle occurs within the life span of the submerged seeds (G.W. Douglas, pers. comm., 2004). At this time, no information is available on maximum seed bank age of scarlet ammannia. Germination requirements for Ontario plants are not known, though they are likely similar to those in B.C.

Baskin *et al.* (2002) have studied germination on the related species *Ammannia coccinea* (red ammannia) and *Rotala ramosior* (toothcup; also known as toothcup-meadow foam in B.C.). Scarlet ammannia was overlooked in the North American flora for many years because of its close morphological similarity to *A. coccinea* (Graham 1979, 1985), a species not known from Canada. Although these species have life cycles and taxonomy similar to scarlet ammannia (Graham 1979, 1985; Baskin *et al.* 2002), this does not necessarily mean inferences can be made regarding germination for scarlet ammannia from these studies. However, due to the lack of specific data for scarlet ammannia, these studies are outlined as guidelines for further research.

Baskin *et al.* (2002) found, during greenhouse experiments, that seeds of red ammannia germinated significantly better when seeds were flooded than when they were not flooded for various periods during the dormant stage. The optimum germination temperature of this species was 15°C nights and 30°C days. They also concurred that the ability of the seeds, under flooded field temperatures, to come out of dormancy during fall to winter indicated that the seeds were not dormant when the mudflats were exposed in summer.

Since toothcup is mainly self-pollinated (Matricker 2001), it is likely that scarlet ammannia is also self-pollinated. Matricker (2001) also stated that toothcup was insect-pollinated. Since scarlet ammannia flowers, and all other flowers in the habitat, are small and inconspicuous and likely unattractive to most insect pollinators, self-pollination is probably advantageous for consistent seed production.

The small size (ca. 0.5–0.8 mm long; G.W. Douglas, unpublished data, 2004) and lightness of the seed suggest that they are easily transported by wind, gravity, and water (Matricker 2001). Seeds could also be potentially carried by waterfowl on feet or in feathers.

Habitat needs

Scarlet ammannia depends on water-level fluctuations for the creation and maintenance of suitable habitat. In British Columbia, scarlet ammannia inhabits moist to wet, often alkaline, muddy shorelines of lagoons or ponds, or sandy shorelines. These sites are submerged early in the year, with plants emerging when lake levels go down in late July to early September. Scarlet ammannia

usually occurs in dense stands, although scattered individuals may occur over wide areas some years. At the lagoon on the east side of Osoyoos Lake, *Eleocharis parvula* (small spike-rush) is a constant companion along with various small herbaceous species, including *Gnaphalium* spp. (cudweed). Both at the Osoyoos Lake Mica Spit site and at the privately owned site near Osoyoos, many other rare species occur with scarlet ammannia. These include *Chamaesyce serpyllifolia* ssp. *serpyllifolia* (thyme-leaved spurge), *Cyperus squarrosus* (awned cyperus), *Eleocharis rostellata* (beaked spike-rush), and *Rotala ramosior* (toothcup).

Ontario sites are on mudflats, sand beaches, wetland edges, dried-up pond bottoms, and moist sandy depressions created by dirt bikes. Examples of associated plant species at the Ontario sites include *Eleocharis acicularis* (needle spike-rush), *Xanthium strumarium* (common cocklebur), *Cyperus esculentus* (yellow nut-grass), *Alisma plantago-aquatica* (American water plantain), *Bidens* spp. (beggarticks), *Juncus torreyi* (Torrey's rush), *Epilobium coloratum* (purpleleaf willow-herb), and *Lysimachia nummularia* (creeping loosestrife).

Threats

Threat categories are arranged in order of descending priority.

British Columbia

Habitat loss or degradation: Shoreline development presents the most significant known threat to scarlet ammannia and its habitat in British Columbia. Cottage and housing development affect existing and potential scarlet ammannia habitat via the creation of docks, boat ramps, boathouses, and sheds along the shoreline. Significant development beside or near the lagoon at Osoyoos Lake (Mica Spit sub-population) may irreversibly alter lagoon hydrology, and affect scarlet ammannia populations. The removal of native substrate and subsequent replacement with coarse sand has contributed to population extirpation at the Haynes Point Provincial Park site (Douglas and Oldham 1997).

Changes in ecological dynamics or natural processes – flood regime: Scarlet ammannia requires a fluctuating water regime; however, due to water levels being artificially controlled at all of the extant sites in B.C., the natural flood/drought cycles are no longer in effect. For example, if water levels were maintained at a higher level, the seed bank would not be exposed and scarlet ammannia would not germinate. Conversely, if water levels were maintained at a lower level, the plant would not flower, or seeds would not be able to germinate (T. McIntosh, pers. comm., 2006).

In the case of the Mica Spit site on Osoyoos Lake, water levels are maintained under the International Joint Commission agreement between Canada and the United States. The Mica Spit site for scarlet ammannia occurs on and around a lagoon, the water level of which is directly related to lake levels.

Invasive species: Invasive non-native plants (e.g., Russian olive, willows) potentially threaten scarlet ammannia by reducing available habitat and competing for resources (T. McIntosh, pers. comm., 2006). Efforts to control invasive plants through mechanical or chemical means may inadvertently harm extant and currently unknown populations or individuals of scarlet ammannia.

Other potential threats include cattle grazing, trampling, and recreational activities such as all-terrain vehicle use.

Ontario

Changes in ecological dynamics or natural processes – flood regime and succession: Lake Erie shoreline populations are subject to a general and widespread trend of decreasing water levels in the Great Lakes. The creation of dykes and dams also threatens Ontario populations, although there may be an opportunity to manage the existing dyke at Hillman Marsh to imitate natural fluctuations. Succession by native species, mainly willows and poplars, is probably a threat in at least three of four extant sites (Douglas and Oldham 1997).

Invasive species: Exotic species such as the introduced (genetic) form of *Phragmites australis* (common reed) and *Lysimachia radicans* (creeping loosestrife) threaten to shade out scarlet ammannia populations at some sites.

Habitat loss or degradation: One Ontario population has been extirpated due to housing development (Douglas and Oldham 1997).

Actions Already Completed or Underway

Invasive species removal

At Osoyoos Lake, efforts have been made to reduce threats at the Mica Spit site through fencing and removal of invasive plant species. Removal of invasive species by the Osoyoos Indian Band was funded by the Habitat Stewardship Program from 2004 to 2007.

Protection from motorized vehicles

A fence erected by the Osoyoos Indian Band across the base of the Osoyoos Lake Mica Spit site should eliminate habitat and population destruction by motorized vehicles. The condition of the fence will require monitoring from time to time since it has been breached on several occasions and subsequently repaired.

Water levels

There have been discussions with the International Joint Commission (IJC) for Osoyoos Water Levels and the recovery team regarding potential research projects to determine the water-level requirements of the species during all life phases.

Monitoring

Some sites have occasionally been monitored in Ontario. In both provinces, local botanists continue to monitor known sites and surveys for new populations.

Knowledge Gaps

To accurately identify recovery objectives and activities, the following areas should be investigated:

- additional inventory for other populations of scarlet ammannia, or potential recovery habitat;
- habitat surveys and monitoring at potential sites;
- determination of population trends (through development of standardized monitoring protocols);
- research on germination requirements and seed bank viability and longevity, and habitat attributes such as lake levels, alkalinity, and soil texture; and
- research on species biology, including demography, genetics and pollination mechanisms, and impacts of invasive species.

RECOVERY

Recovery Feasibility

Maintaining scarlet ammannia in Canada is considered by the recovery team to be biologically and technically feasible (Table 3).

If the habitat and suitable conditions can be maintained, scarlet ammannia is expected to remain at known sites. The level of effort required to recover this population is moderate and includes habitat preservation, stewardship, restoration and management, as well as population introduction, monitoring, and inventory.

Also, additional populations may be discovered if thorough surveys are conducted at potential habitat and historical sites. Within Ontario, there is the potential for further discoveries of the species on or near Lake Erie (e.g., Canard River, Big Creek Marsh, Wheatley Provincial Park, Rondeau Provincial Park), although these sites have all been searched in the past. There is also the potential for discovery of scarlet ammannia along the Detroit River, or in artificial ponds in the Windsor area. A recently discovered population appeared within a shallow wetland created on Pelee Island, demonstrating that re-establishment from the seed bank may be possible where suitable habitat and germination conditions exist (G. Buck, pers. comm., 2007).

Table 3. Biological and technical recovery feasibility. Criteria from Environment Canada *et al.* (April 2005).

Criteria	Scarlet ammannia
1. Are individuals capable of reproduction currently available to improve the population growth rate or population abundance?	YES – there are six extant populations in Canada, with approximately 150,000 individuals present in an optimal year.
2. Is sufficient suitable habitat available to support the species or could it be made available through habitat management and/or restoration?	YES – the habitat at the currently occupied sites is suitable, and habitat at some of the previously occupied sites could be restored. Additional suitable habitat may also be available.
3. Can significant threats to the species or its habitat be avoided or mitigated through recovery actions?	YES – recovery actions such as stewardship and cooperation with landowners and land managers can prevent major threats.
4. Do the necessary recovery techniques exist and are they known to be effective?	YES – standard propagation techniques exist for raising new stock for translocation; also, general restoration methods/techniques are known.

Recovery Goal

The recovery goal for scarlet ammannia is to protect⁴ and maintain the four extant populations in Ontario and the two extant populations in BC, and to restore the species at historic sites if deemed necessary.

Population and Distribution Objectives

Specific targets for population numbers are not possible due to the species being an annual and survey data are not available for determining long-term population trends.

Recovery Objectives

1. Ensure the persistence of the species at all known extant sites, with no loss or degradation of currently occupied habitat, for the next five years.
2. Assess the extent of the four main threats to the six populations (habitat loss or degradation, invasive species, flood regime, and succession) by 2012.
3. Confirm the distribution of scarlet ammannia in Ontario and British Columbia (historic and new locations), and update population and distribution objectives as needed by 2012.
4. Investigate the feasibility of restoring populations at extirpated sites or in suitable habitat near historical areas by 2012.

Specific steps to be taken to meet the recovery objectives are listed in Table 4.

⁴ Protection can be achieved through various mechanisms including: voluntary stewardship agreements; conservation covenants; sale by willing vendors on private lands; land use designations on Crown lands; and legal and other protection on federal, provincial, and local government lands.

Approaches Recommended to Meet Recovery Objectives

The general approaches that will be taken to address identified threats are:

- habitat protection
- outreach and stewardship
- inventory and monitoring
- habitat management
- habitat restoration/rehabilitation
- scientific research

Recovery planning table

Table 4. Strategies to effect recovery.

Priority	Obj. no.	Broad approach/ strategy	Threat addressed	Specific steps	Outcomes or deliverables (identify measurable targets)
High	1, 2	Habitat protection – water levels	Changes in ecological dynamics or natural processes	<ul style="list-style-type: none"> • Work in cooperation with the U.S., International Joint Commission, and private landowners to manage water levels • Develop management options for Essex Region Conservation Authority, Ontario Parks, and Nature Conservancy sites 	<ul style="list-style-type: none"> • Lower/raise water levels at appropriate times at all sites where this option is feasible
High	1, 2	Public outreach – stewardship with land owners and land managers	Habitat loss and degradation; mortality due to cattle grazing, trampling, recreational activities	<ul style="list-style-type: none"> • Encourage landowners and land managers to steward and manage lands for persistence of the species. • Continue to support the Osoyoos Indian Band with site stewardship activities 	<ul style="list-style-type: none"> • Populations maintained • Reduced mortality due to development and recreation • Increased understanding and stewardship of species at risk and their habitats among landowners • Stimulated community support for recovery • Increased stewardship and habitat quality on Band Lands at extant sites
High	3, 4	Inventory and monitoring	ALL	<ul style="list-style-type: none"> • Obtain permission to inventory and monitor populations from landowners and land managers • Develop and implement standardized habitat survey and monitoring protocol • Monitor extant sites and survey historical and potentially suitable sites • Report monitoring results annually and assess trends in populations, area of occupancy and habitat condition • Submit all data to provincial Conservation Data Centre and the Natural Heritage Information Centre (NHIC) • Complete exploratory surveys at potential sites in a low-water year 	<ul style="list-style-type: none"> • Regular, standardized monitoring of sites range-wide • Summary of monitoring results by site and assessment of trends in populations, area of occupancy and habitat conditions • Ability to assess status of populations and effectiveness of recovery actions
High	1, 2	Habitat management	Habitat loss and degradation	<ul style="list-style-type: none"> • Control trampling by humans and vehicle impacts, including boats (e.g. fencing) 	<ul style="list-style-type: none"> • Reduced mortality and quality of habitat maintained
High	1, 2	Habitat	Invasive	<ul style="list-style-type: none"> • Monitor populations to assess 	<ul style="list-style-type: none"> • Maintenance of current

Priority	Obj. no.	Broad approach/ strategy	Threat addressed	Specific steps	Outcomes or deliverables (identify measurable targets)
		management	species (inter-specific competition); changes in ecological dynamics or natural processes-succession	the effects of invasive species <ul style="list-style-type: none"> • Manage invading vegetation to protect the species occurrences as appropriate 	suitable habitat for the species
Medium	1	Habitat protection – legal/policy protection	Habitat loss and degradation	<ul style="list-style-type: none"> • Encourage municipal and provincial planning agencies to implement protection including zoning and policies 	<ul style="list-style-type: none"> • Legal and policy protection for populations on Crown and private land • Reduced mortality and loss of habitats/populations due to development and associated recreational activities • Populations maintained on public land • Increased understanding of scarlet ammannia ecology to manage the life history stages to ensure recovery
Medium	2, 3, 4	Scientific research	ALL	<ul style="list-style-type: none"> • Determine pollination mechanism, seed viability, dispersal mechanisms, and success • Research specific habitat requirements and other ecological factors • Conduct research on site-specific water level needs of scarlet ammannia • Assess potential for determining population viability • Determine feasibility of restoration • Determine whether seed supply is limiting 	
Low	4	Habitat restoration	Habitat loss and degradation	<ul style="list-style-type: none"> • Identify sites suitable for restoration and establishment of populations if appropriate • Implement restoration activities 	<ul style="list-style-type: none"> • Conditions favourable for scarlet ammannia • Restored populations established (as feasible and as necessary)

Performance Measures

Criteria for evaluation of the progress towards the goals and objectives of this strategy include:

1. Population monitoring indicates that the numbers of plants at the sites are stable or increasing, by 2012 (Objective 1);
2. Impact of the four main threats to the populations has been investigated as well as a reduction of threats by 2012 (Objective 2);
3. Agreements with appropriate resource managers are developed to mitigate the impacts of fluctuating water levels and support scarlet ammannia and other rare plant populations from this threat by 2012 (Objective 2).
4. Surveys of suitable habitat for new populations has been conducted and documented by 2012 (Objective 3);
5. Historic sites are investigated as potential habitat for re-introduction and restoration, where appropriate, in the Okanagan Valley, BC, and in Ontario by 2012 (Objective 4).

Critical Habitat

Identification of the species' critical habitat

No critical habitat can be identified for scarlet ammannia 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.

Scarlet ammannia requires newly exposed shores or nearby depressions following a water drawdown. In British Columbia, scarlet ammannia is found only on moist, sandy-muddy depressions near shorelines or muddy, alkaline flats that are submerged early in the year and become exposed in late July and August. In Ontario, the habitat requirement is very similar, although it has not been observed on strongly alkaline soils, suggesting that scarlet ammannia may not require alkalinity.

The schedule of studies included in the section below outlines the additional research and analysis required to address the biological and technical limitations that prevent identification of critical habitat in this recovery strategy.

Recommended schedule of studies to identify critical habitat

The following three studies will be done in both British Columbia and Ontario, and will allow for the identification of critical habitat for extant populations:

1. Identify habitat attributes at extant sites (e.g., moisture regime, length of inundation and exposure, soil and water chemical properties, plant cover, water clarity) by 2012.

2. Using established survey and mapping techniques (applied during phenologically appropriate periods), delineate the boundaries of all occupied habitats by 2012.
3. For each occupied habitat, delineate the boundaries and condition of the associated shoreline with respect to fluctuations in water levels (temporal and spatial) and any large-scale hydrological changes by 2012.

The following three studies will be done in British Columbia only, and will facilitate the identification of additional critical habitat:

1. Identify, map, and describe all suitable sites in the Southern Okanagan Valley that are currently unoccupied by species at risk. Rate these habitats for their potential to support scarlet ammannia, as well as other species at risk by 2012.
2. Identify, map, and rate for restoration potential any significant shorelines in the Southern Okanagan Valley where the habitat attributes indicate that suitable habitat may exist but the structure and/or function has been lost or compromised as a result of alien plant invasion, urbanization, or water-level changes by 2012.
3. Through experimental trials, test the suitability of high-ranking sites for plant translocations/reintroductions by 2012.

A comprehensive survey of suitable habitat in southwestern Ontario may reveal additional populations of scarlet ammannia. The extent of occurrence of populations and associated vegetation communities may be mapped in years where the populations are evident, to contribute to critical habitat identification.

Existing and Recommended Approaches to Habitat Protection

None of the habitat associated with extant populations (Indian Reserve lands and private land) in British Columbia is formally protected. There is a need to work with landowners and managers to maintain this species. The Osoyoos Indian Band is continuing with stewardship activities, including fencing, outreach, and removal of invasive shrubs.

Scarlet ammannia is listed on the Species at Risk in Ontario (SARO) list regulation as Endangered and receives species protection under the province's *Endangered Species Act*. The habitat of this species receives protection through the provisions of the Provincial Policy Statement (PPS), issued under Section 3 of the *Planning Act*. The Act requires that planning decisions be consistent with the PPS which states that "development and site alteration are not permitted in significant habitat of endangered and threatened species." Of the four extant sites in Ontario, one is publicly owned and three are on private land. One site is a Provincial Nature Reserve managed by Ontario Parks; the second is within a Conservation Area managed by the Essex Region Conservation Authority; the third lies within a private nature reserve managed by the Nature Conservancy of Canada; and the fourth is in a private site. Ensuring the persistence of populations at these locations will depend on implementing appropriate management strategies for all of these sites.

Stewardship approach

For successful implementation in protecting species at risk, there will be a strong need to engage in stewardship on various land tenures. Stewardship involves the voluntary cooperation of landowners to protect species at risk and the ecosystems they rely on. The Preamble to the federal *Species at Risk Act* (SARA) states 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.” The Bilateral Agreement on Species at Risk between British Columbia and Canada recognizes 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.”

Stewardship approach for private lands

It is possible that additional populations of this species may occur on private lands. As with other species at risk found on private property, stewardship efforts will be the key to their conservation and recovery. To successfully protect many species at risk in British Columbia and Ontario, there will have to be voluntary initiatives by landowners to help maintain areas of natural ecosystems that support these species of risk. This stewardship approach will cover many different kinds of activities, such as: following guidelines or best management practices to support species at risk; voluntarily protecting important areas of habitat on private property; conservation covenants on property titles; ecogifting part or all of their property to protect certain ecosystems or species at risk; or selling their property for conservation. For example, both government and non-governmental organizations have successfully conserved lands in British Columbia.

Effects on Other Species

Scarlet ammannia recovery efforts will generally benefit other rare plant species. In British Columbia, scarlet ammannia occurs on the Osoyoos Lake Mica Spit with small-flowered lipocarpha (*Lipocarpha micrantha*) and toothcup, two species at risk that have similar, but not identical, habitat requirements and face similar threats. It is possible that scarlet ammannia and toothcup could also occur in the same habitat at the Osoyoos private land site. In total, 18 British Columbia Red- or Blue-listed⁵ rare species occur on the Osoyoos Lake Mica Spit and 11 occur at the private Osoyoos site. These include red-rooted cyperus (*Cyperus erythrorhizos*; S1), hairy water-clover (*Marsilea vestita*; S1), *Eleocharis geniculata* (assessment anticipated by COSEWIC in 2009), and bushy cinquefoil (*Potentilla paradoxa*; S1) (G.W. Douglas, pers. comm., 2004). Awned cyperus (*Cyperus squarrosus*; S2 - imperiled) always occurs with small-flowered lipocarpha and is Red-listed by the B.C. Conservation Data Centre. Because the entire Okanagan-Similkameen area contains a large number of endangered and threatened species, several of which are found in riparian/wetland areas, recovery efforts will focus on an ecosystem- or landscape-level plan.

⁵ B.C. Conservation Data Centre ranks S1 and S2 species as Red-listed and S3 species as Blue-listed.

In Ontario, the management of water levels at Hillman Marsh and other sites has the potential to have an impact on a number of other species. The risk of impact (which may be positive or negative) will not be known until site-specific management plans are made. However, potential effects on other species at risk and natural features and functions should be considered in all recovery actions undertaken. Some other species at risk that occur in the same areas as scarlet ammannia include Blue Racer (*Coluber constrictor foxii*), Lake Erie Watersnake (*Nerodia sipedon insularum*), Eastern Foxsnake (*Elaphe gloydi*), Spiny Softshell Turtle (*Apalone spinifera*), Spotted Turtle (*Clemmys guttata*), Fowler's Toad (*Bufo fowleri*), King Rail (*Rallus elegans*), Prothonotary Warbler (*Protonotaria citrea*), and blue ash (*Fraxinus quadrangulata*).

Socioeconomic Considerations

Recovery actions could potentially affect the following socio-economic sectors: land development along foreshore areas, recreational users, agriculture (irrigation), and domestic animal grazing. The expected magnitude of these effects is unknown and will be further addressed in the recovery action plan. The extent of area presently covered by the species is approximately one hectare.

Recommended Approach for Recovery Implementation

A multi-species recovery approach is recommended for scarlet ammannia, small-flowered lipocarpa, toothcup, short-rayed alkali aster, and other provincially listed species in British Columbia. These species all share similar threats and have similar property ownership in the southern Okanagan valley. Any activities for recovery will be done in conjunction with the Southern Okanagan-Similkameen Conservation Program.

Although all three of these species occur in Ontario, scarlet ammannia does not share sites or property ownership with the others. A species-specific approach is the most appropriate for the recovery of the species in that province.

Statement on Action Plans

In British Columbia, a multi-species action plan will be completed by 2012 for four sand spit species (and others), including scarlet ammannia, small-flowered lipocarpa, short-rayed alkali aster, and toothcup.

An Action Plan for Ontario sites will also be completed by 2013.

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