PROPOSED

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

Recovery Strategy for the Bent Spike-rush (*Eleocharis geniculata*) Great Lakes Plains population in Canada

Bent Spike-rush

2015

Government of Canada
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For copies of the recovery strategy, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk Public Registry[1].

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RECOVERY STRATEGY FOR THE BENT SPIKE-RUSH (*Eleocharis geniculate*) GREAT LAKES PLAINS POPULATION 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 Ontario has given permission to the Government of Canada to adopt the *Recovery Strategy for the Bent Spike-rush (*Eleocharis geniculata*) in Ontario* (Part 2) under Section 44 of the *Species at Risk Act.* Environment Canada has included an addition (Part 1) which completes the SARA requirements for this recovery strategy.

Environment Canada is adopting the provincial recovery strategy with the exception of section 2, Recovery. In place of section 2, Environment Canada is establishing its own performance indicator; adopting the Government of Ontario's goal and the government-led and government-supported actions of the *Bent Spike-rush Ontario Government Response Statement*[2] (Part 3) as the population and distribution objective and the broad strategies and general approaches to meet the population and distribution objective; and is adopting the habitat regulated under Ontario's *Endangered Species Act, 2007* as critical habitat for the Bent Spike-rush.

The federal recovery strategy for the Bent Spike-rush in Canada consists of three parts:

Part 1 – Federal Addition to the *Recovery Strategy for the Bent Spike-rush (*Eleocharis geniculata) *in Ontario*, prepared by Environment Canada.

Part 2 - *Recovery Strategy for the Bent Spike-rush (*Eleocharis geniculata) *in Ontario,* prepared by J. M. Bowles for the Ontario Ministry of Natural Resources[3].

Part 3 – *Bent Spike-rush: Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources.

[2]The Government Response Statement is the Ontario Government's policy response to the recovery strategy and summarizes the prioritized actions that the Ontario Government intends to take and support.
[3] On June 26, 2014, the Ontario Ministry of Natural Resources became the Ontario Ministry of Natural Resources and Forestry.

Table of Contents

PART 1 - Federal Addition to the *Recovery Strategy for the Bent Spike-rush (*Eleocharis geniculata) *in Ontario*, prepared by Environment Canada.

PART 2 - *Recovery Strategy for the Bent Spike-rush (*Eleocharis geniculata) *in Ontario* prepared by J.M. Bowles for the Ontario Ministry of Natural Resources

PART 3 - *Bent Spike-rush: Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources.

PART 1 - Federal Addition to the *Recovery Strategy for the Bent Spike-rush (*Eleocharis geniculata*) in Ontario*, prepared by Environment Canada

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[4] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years.

The Minister of the Environment is the competent minister for the recovery of the Bent Spike-rush and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. SARA section 44 allows the Minister to adopt all or part of an existing plan for the species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Ontario Ministry of Natural Resources (now the Ontario Ministry of Natural Resources and Forestry) led the development of the attached recovery strategy for the Bent Spike-rush (Part 2) in cooperation with Environment Canada.

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

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

Acknowledgements

The federal addition was prepared by Angela McConnell and Rachel deCatanzaro (Environment Canada, Canadian Wildlife Service – Ontario) with support from Krista Holmes, Lee Voisin (Environment Canada, Canadian Wildlife Service – Ontario) and Andrew MacDonald (formerly Environment Canada, Canadian Wildlife Service – Ontario). Elizabeth Rezek, Madeline Austen and Lesley Dunn (Environment Canada, Canadian Wildlife Service – Ontario), Paul Johanson (Environment Canada – Canadian Wildlife Service, National Capital Region), Jay Fitzsimmons, Aileen Wheeldon, Leanne Jennings and Eric Snyder (Ontario Ministry of Natural Resources and Forestry) reviewed and provided comments and advice during the development of this document.

Acknowledgement and thanks is given to all other parties that provided advice and input used to help inform the development of this recovery strategy including various Aboriginal organizations and individuals, landowners, citizens and stakeholders who provided input and/or participated in consultation meetings.

Additions and Modifications to the Adopted Document

The following sections have been included to address specific requirements of the federal *Species at Risk Act* (SARA) that are not addressed in the Province of Ontario's *Recovery Strategy for the Bent Spike-rush (*Eleocharis geniculata) *in Ontario* (Part 2) and to provide updated or additional information.

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Therefore, statements in the provincial recovery strategy referring to protection of the species' 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 final federal recovery strategy.

1. Species Status Information

Since the publication of the provincial recovery strategy (Part 2), the Bent Spike-rush (Great Lakes Plains population) has been listed as Endangered[5] on Schedule 1 of the federal SARA. In Ontario, the Bent Spike-rush remains listed as Endangered[6] under the Ontario *Endangered Species Act*, 2007 (ESA). The species also occurs in British Columbia (BC) and is listed as Endangered under SARA as Bent Spike-rush (Southern Mountain population). The BC population will be addressed in a separate recovery strategy.

The Bent Spike-rush's global conservation status is Secure (G5)[7]. However, it should be noted that the species has not been reviewed by NatureServe since 1990 (NatureServe 2013).

In Canada, the species' national conservation status is Critically Imperilled/Imperilled[8] (N1N2). Its conservation status in British Columbia and Ontario is Critically Imperilled[9] (S1). The national conservation status for the Bent Spike-rush in the United States is Unranked[10] (NNR) and it is considered Critically Imperilled or Imperilled in 6 of 21 (29%) American states within its range (NatureServe 2013) (Appendix A).

[5] A wildlife species facing imminent extirpation or extinction in Canada.
[6] A species that lives in the wild in Ontario but is facing imminent extinction or extirpation.
[7] Secure: At very low risk of extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
[8] Critically Imperilled/Imperilled: The risk level ranges from high to very high risk of extirpation in the jurisdiction due to very restricted range, few populations or occurrences, very steep decline, severe threats, or other factors.
[9] Critically Imperilled: At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
[10] Unranked: Conservation status not yet assessed

In Ontario, the Bent Spike-rush is extant in two locations, one of which occurs along the Lake Erie shoreline at Long Point National Wildlife Area, and the other of which occurs just inland of Lake Erie at Cedar Springs (on a beach ridge along the shoreline of former glacial Lake Warren). Less than 1% of the global range of the Bent Spike-rush occurs in Canada, where the species is at the northern extent of its North American distribution (COSEWIC 2009).

2. Recovery Feasibility

Based on the following four criteria outlined by the Government of Canada (2009), there are unknowns regarding the feasibility of recovery for the Bent Spike-rush – Great Lakes Plains population. In keeping with the precautionary principle, a full recovery strategy has been prepared as would be done when recovery is determined to be feasible.

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. Individuals capable of reproduction were recently confirmed to be present in Ontario, as evidenced by the estimated number of mature individuals in 2007: 1,000 to 2,000 found at Long Point and 300 to 500 at Cedar Springs (COSEWIC 2009). There are also individuals capable of reproduction in states near Ontario, including Illinois, Indiana, Michigan, Ohio, and Pennsylvania (COSEWIC 2009). Globally, this species is widespread and found within North America, West Indies, Bermuda, Central and South America, Asia, Africa, Pacific Islands, and Australia (COSEWIC 2009).

   Species' abundance, and the number of mature individuals available, may fluctuate from year to year due to the dynamic nature of its habitat, and detectability may vary due to the difficulty of identifying the plant at different life stages. However, the species is maintained over the long term by the local seedbank that contains achenes[11] which can remain dormant for many years (COSEWIC 2009). Thus, although the number of reproducing individuals may be low in one year, the overall population is supported by the seedbank which will continue to produce individuals under the appropriate growing conditions for a number of years.

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

   Yes. Sufficient habitat is available to support the current population. In Ontario, the Bent Spike-rush utilizes "wet, sandy to muddy soil in open flats on or along

[11] An achene is a dry fruit which contains one seed.

the edges of ephemeral[12] ponds and wet meadows" (COSEWIC 2009). The extent of interdunal ponds and meadow marsh habitat changes in response to changes in water levels. Water levels in habitats located along the shore of Lake Erie are linked at least partially to changes in the Lake Erie water level. Thus, the amount of suitable habitat can vary from one year to the next. Long term changes in water levels may affect the amount and/or quality of suitable habitat available.

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

   Unknown. The primary threat to the Great Lakes Plains population of the Bent Spike-rush is competition with non-native Common Reed (*Phragmites australis*) (COSEWIC 2009). In areas where the non-native Common Reed has invaded or continues to invade, habitat quality is declining for many native species of flora and fauna, as it quickly outcompetes native species for resources. The invasion of Common Reed threatens both extant Ontario populations of the Bent Spike-rush at Cedar Springs (COSEWIC 2009) and Long Point (COSEWIC 2009; Korol pers. comm. 2014). Although there are techniques available to control Common Reed (OMNR 2011), it is unknown how the Bent Spike-rush will respond to control measures, nor is it known whether control of Common Reed at the Bent Spike-rush sites is logistically feasible. In addition, residential development may pose a potential threat to the Cedar Springs population (Bowles 2010); although, it is possible for habitat to be protected from development through legislation and stewardship.

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

   Unknown. There are management techniques available to address the threat of non-native Common Reed (OMNR 2011); however, as noted above, the feasibility of employing these techniques at extant sites of the Bent Spike-rush needs to be evaluated. In addition, little is known about the species' reproductive biology, including factors affecting seed dormancy, germination, as well as seed dispersal, fruiting success, and seed bank characteristics. Therefore, it is unknown what types of recovery techniques would benefit the Bent Spike-rush. It is also unknown whether these knowledge gaps can be filled and whether any subsequent development of recovery techniques can be undertaken in a reasonable timeframe.

The reason for the small and uneven distribution of the Bent Spike-rush in southern Ontario at present is unknown. Because the Bent Spike-rush has only been recorded at three locations in south-western Ontario to date (two of which are considered extant), it is possible that the species has always been rare in the province, in which case the

[12] Ephemeral: exists for only a portion of the year or for a short period of time.

species may always be vulnerable to anthropogenic and natural stressors despite maintaining the currently existing populations, by virtue of its small distribution.

3. Population and Distribution Objectives

The provincial recovery strategy contains the following recovery goal for the recovery of Bent Spike-rush in Ontario:

- To prevent further loss of habitat within the area of occupancy at both populations where it occurs so that populations are maintained.

The *Government Response Statement* for the province of Ontario lists the following goal for the recovery of Bent Spike-rush in Ontario:

- The government's goal for the recovery of Bent Spike-rush is to prevent further loss and degradation of habitat at both locations where it occurs so that populations are maintained.

Under SARA, a population and distribution objective for the species must be established. Environment Canada is adopting the recovery goal in the *Bent Spike-rush Ontario Government Response Statement* (Part 3) as the population and distribution objective for the Bent Spike-rush (Great Lakes Plains population) under SARA.

4. Broad Strategies and General Approaches to Meet Objectives

The government-led and government-supported actions table from the *Bent Spike-rush Ontario Government Response Statement* (Part 3) are adopted as the broad strategies and general approaches to meet the population and distribution objective. Environment Canada is not adopting the approaches identified in section 2 of the *Recovery Strategy for the Bent Spikerush (*Eleocharis geniculata*) in Ontario* (Part 2).

5. Critical Habitat

5.1 Identification of the Species' Critical Habitat

Section 41(1)(c) of SARA requires that recovery strategies include an identification of the species' critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. Under SARA, critical habitat is "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species".

Identification of critical habitat is not a component of the provincial recovery strategy under the Province of Ontario's ESA. However, following the completion of the

provincial recovery strategy for this species, a provincial habitat regulation was developed for the Bent Spike-rush, effective July 2012. A habitat regulation is a legal instrument that prescribes an area that will be protected[13] as the habitat of the species by the Province of Ontario. The habitat regulation identifies the geographic area within which the habitat for the species is prescribed and the regulation may apply and explains how the boundaries of regulated habitat are determined (based on biophysical and other attributes).The regulation is dynamic and automatically in effect whenever the conditions described in the regulation are met.

Environment Canada adopts the description of the Bent Spike-rush habitat under section 24.1.1 of Ontario Regulation 242/08[14] made under the provincial ESA as the critical habitat in the federal recovery strategy. The area defined under Ontario's habitat regulation contains the biophysical attributes required by the Bent Spike-rush to carry out its life processes. To meet specific requirements of SARA, the biophysical attributes of critical habitat are further detailed below.

The areas prescribed **under Ontario Regulation 242/08 – Bent Spike-rush habitat** are described as follows:

24.1.1 (1) For the purpose of clause (a) of the definition of "habitat" in subsection 2

(1) of the Act [ESA], the areas described in subsection (2) that are located in the following geographic townships are prescribed as the habitat of Bent Spike-rush:

1. The geographic Township of Walsingham within the County of Norfolk.

2. The geographic Township of Raleigh within the Municipality of Chatham-Kent.

(2) Subsection (1) applies to the following areas:

1. An interdunal pond in which Bent Spike-rush exists or on which Bent Spike-rush depends to carry on its life processes.

2. An area belonging to a Great Lakes coastal meadow marsh or any other ecosite identified under the land classification system for southern Ontario if Bent Spike-rush exists in that area or depends on the area to carry on its life processes.

3. Any other area in which Bent Spike-rush exists or on which Bent Spike-rush depends to carry on its life processes.

(3) For the purposes of paragraph 1 of subsection (2), the boundaries of an interdunal pond referred to in that paragraph shall be determined based on its maximum historic extent.

[13] Under the federal *Species at Risk Act* (SARA), there are specific requirements and processes set out regarding the protection of critical habitat. Protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.
[14] http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_080242_e.htm#BK53

The biophysical attributes of critical habitat for the Bent Spike-rush, which capture the characteristics required by the species to carry out its life processes (e.g., dispersal, reproduction, growth) include:

- Great Lakes coastal meadow marsh, interdunal pond[15], sand barren, shoreline beach, or any other natural or human-made area which possesses the following characteristics:

    - open, sandy to muddy soils; and
    - absence of dense, permanent[16] vegetation; and
    - inundated periodically or by fluctuating lake levels, with the water table near the ground surface, and soils remaining moist for most of the growing season[17]

The Bent Spike-rush is an annual species that inhabits dynamic habitat (due to fluctuating water levels, changes in sand deposition, etc.). The boundaries (i.e. spatial extent) of populations and the habitat it depends on to carry out its life processes may vary from year-to-year. For the purposes of identifying critical habitat, the boundaries of Great Lakes coastal meadow marsh and other ecosites where the Bent Spike-rush exists are defined using the Ecological Land Classification (ELC) for Southern Ontario (Lee et al. 1998) (OMNR 2012). The ELC framework provides a standardized approach to the interpretation and delineation of dynamic ecosystem boundaries and as such encompasses the biophysical attributes of the habitat for the Bent Spike-rush. Habitat assessments would be required to describe and map the specific ELC ecosites currently occupied by Bent Spike-rush; however, broader habitat information (i.e., ELC community series) is available and used in the identification. For areas where the Bent Spike-rush exists that are not well defined using the ELC framework, the boundary would be defined by the extent of the biophysical attributes described above and required to support the life processes of the species. The precise boundaries may need to be verified in the field.

Through this recovery strategy, the areas prescribed as habitat for the Bent Spike-rush under section 24.1.1 of Ontario Regulation 242/08 become critical habitat identified under SARA. Since the regulation is dynamic and automatically in effect whenever the conditions described in the regulation are met, if any new locations of the Bent Spike-rush are confirmed within the geographic areas listed under subsection (1) of the regulation (see Figure 1), the habitat regulation under the ESA applies. Refer to the

[15] A small body of standing water occurring within a depression between ridges of sand deposited by wind and wave action (OMNR 2012).
[16] The following would not be considered permanent: vegetation that may be reduced by dynamic processes such as fluctuations in water levels, and invasive vegetation species that may be reduced through management actions.
[17] Because the habitat of the Bent Spike-rush is dynamic, critical habitat may include areas where the soils are moist in only some years, as it is possible for the species to persist for many years in the seed bank.

Habitat Protection Summary for Bent Spike-rush (OMNR 2012) for further details on the provincial habitat regulation and its application. However, these new locations would only become critical habitat once identified in an updated recovery strategy or a subsequent action plan.

In applying the critical habitat criteria above to the best available data (as of April 2014), critical habitat is identified for the two known extant local populations of the Bent Spike-rush in Canada (Figure 2, See also Table 1). At this time, critical habitat is generalized to include broader habitat boundaries (i.e., ELC community series), totaling up to 20 ha[18], and this generalized description can be used to direct recovery and protection activities until more detailed habitat information to determine finer boundaries is obtained. The critical habitat identified is considered sufficient to meet the population and distribution objective for the Bent Spike-rush.

Critical habitat for the Bent Spike-rush is presented using a 1 X 1 km UTM grid. The 1 X 1 km UTM grid is part of a standardized grid system that indicates the general geographic areas containing critical habitat, which can be used for land use planning and/or environmental assessment purposes. In addition to providing these benefits, the 1 X 1 km Standardized UTM grid respects provincial data-sharing agreements. The areas of critical habitat within each grid square occur where the description of critical habitat is met. More detailed information on regulated habitat may be requested on a need-to-know basis from the Ontario Ministry of Natural Resources and Forestry. More detailed information on critical habitat to support protection of the species and its habitat may be requested on a need-to-know basis by contacting Environment Canada – Canadian Wildlife Service at RecoveryPlanning_PI@ec.gc.ca.

[18] This is the maximum extent of critical habitat based on habitat boundaries that can be estimated from high resolution aerial photography (comparable to ELC, community series). Within these boundaries, critical habitat is restricted to only those areas described in subsection 2 of the provincial regulation for Bent Spike-rush habitat and, therefore, the actual area could be less than this and would require field verification to determine accurately.

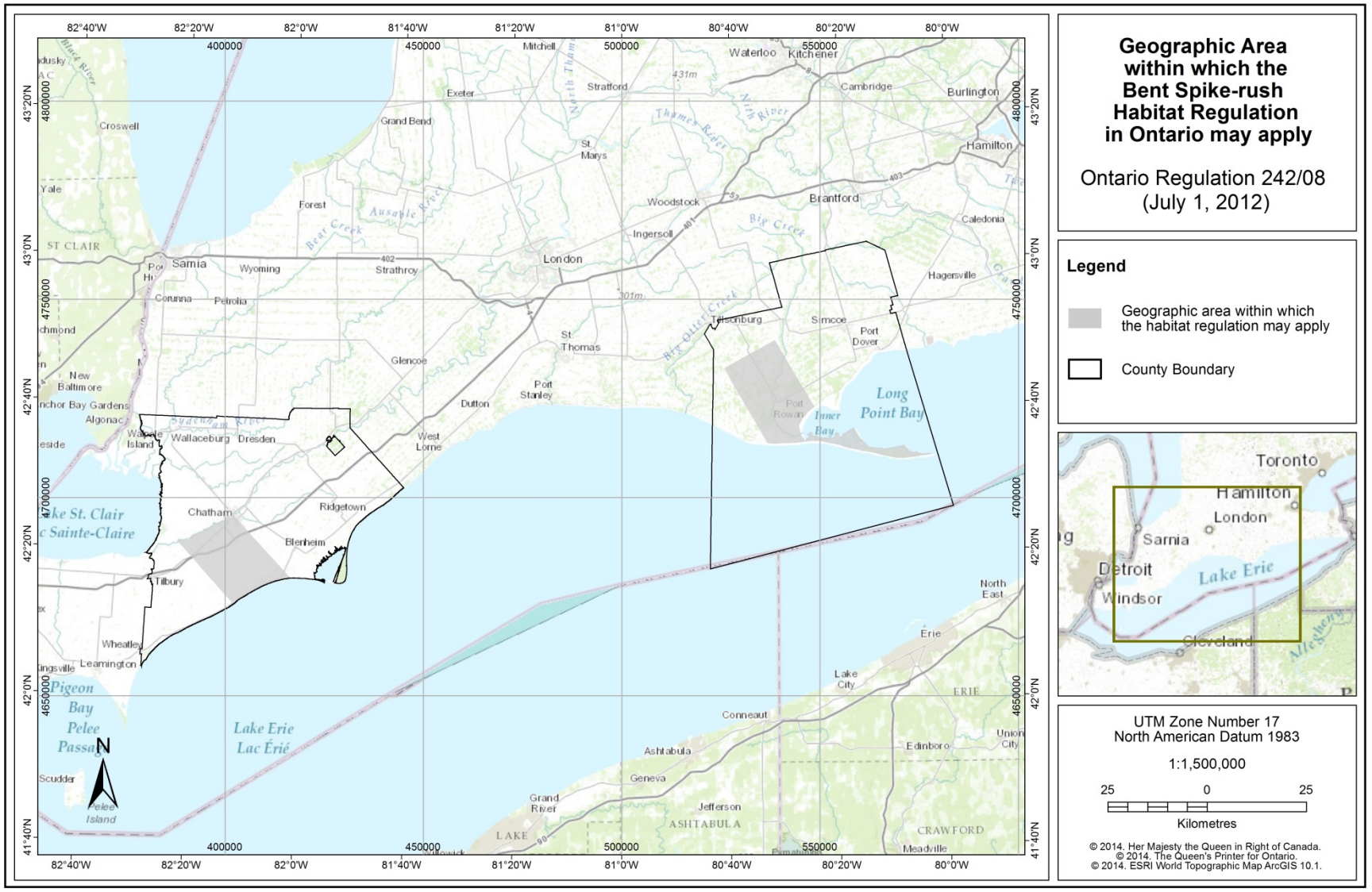

Figure 1. The Geographic Area within which the Habitat Regulation for the Bent Spike-rush may apply if the habitat meets the criteria described in section 24.1.1 of Ontario Regulation 242/08 under the provincial ESA.

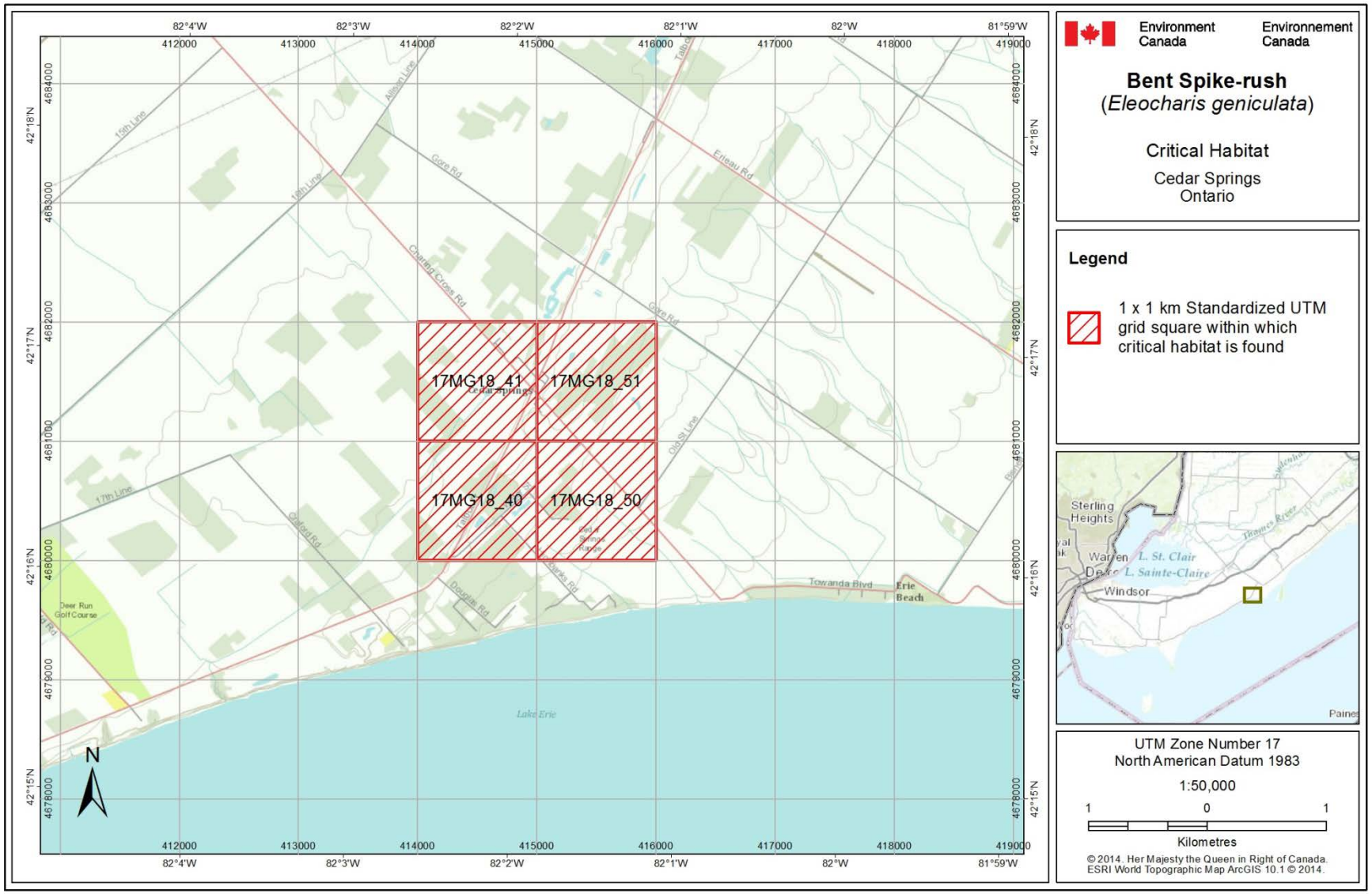

Figure 2. Grid Squares that Contain Critical Habitat for the Bent Spike-rush at Cedar Springs, Ontario. Critical habitat for the Bent Spike-rush occurs within these 1 x 1 km standardized UTM grid squares (red hatched squares), where the description of critical habitat is met.

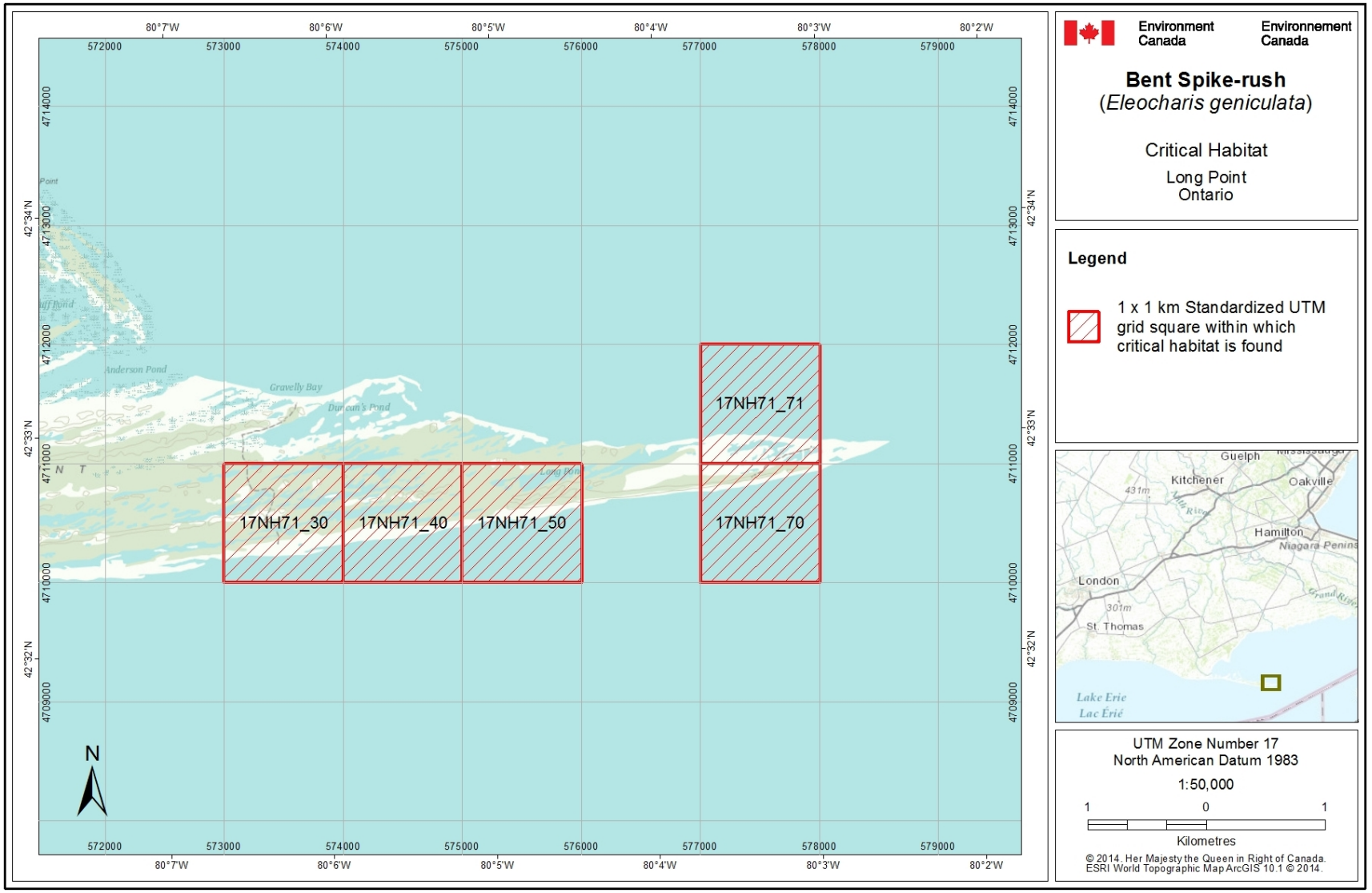

Figure 3. Grid Squares that Contain Critical Habitat for the Bent Spike-rush at Long Point, Ontario. Critical habitat for the Bent Spike-rush occurs within these 1 x 1 km standardized UTM grid squares (red hatched squares), where the description of critical habitat is met.

Table 1. Grid Squares that Contain Critical Habitat for the Bent Spike-rush in Ontario. Critical habitat for the Bent Spike-rush occurs within these 1 x 1 km standardized UTM grid squares, where the description of critical habitat is met.

Critical Habitat Unit	1 x 1 km Standardized UTM Grid Square ID[a]	UTM Grid Square Coordinates[b]		Critical Habitat Unit Area (ha)[c]	Land Tenure[d]
		Easting	Northing		
Cedar Springs	17MG18_40 17MG18_41 17MG18_50 17MG18_51	414000 414000 415000 415000	4680000 4681000 4680000 4681000	8	Non-federal Land
Long Point 1	17NH71_30	573000	4710000	1	Federal Protected Area – Long Point National Wildlife Area
Long Point 2	17NH71_30 17NH71_40	573000 574000	4710000 4710000	8	Federal Protected Area – Long Point National Wildlife Area
Long Point 3	17NH71_40 17NH71_50	574000 575000	4710000 4710000	2	Federal Protected Area – Long Point National Wildlife Area
Long Point 4	17NH71_70 17NH71_71	577000 577000	4710000 4711000	1	Federal Protected Area – Long Point National Wildlife Area
			Total of 20 ha in 5 critical habitat units		

[a]Based on the standard UTM Military Grid Reference System (see http://www.nrcan.gc.ca/earth-sciences/geography-boundary/mapping/topographic-mapping/10098), where the first two digits represent the UTM Zone, the following two letters indicate the 100 x 100 km standardized UTM grid, followed by two digits to represent the 10 x 10 km standardized UTM grid. The last two digits represent the 1 x 1 km standardized UTM grid containing all or a portion of the critical habitat unit. This unique alphanumeric code is based on the methodology produced from the Breeding Bird Atlases of Canada (See http://www.bsc-eoc.org/ for more information on breeding bird atlases).

[b]The listed coordinates are a cartographic representation of where critical habitat can be found, presented as the southwest corner of the 1 x 1 km standardized UTM grid square containing all or a portion of the critical habitat. The coordinates may not fall within critical habitat and are provided as a general location only.

[c] The area presented is an approximation of the area that contains critical habitat (rounded up to the nearest 1 ha); therefore, the exact area of critical habitat would require field verification.

[d]Land tenure is provided as an approximation of the types of land ownership that exist where critical habitat has been identified and should be used for guidance purposes only. Accurate land tenure will require cross referencing critical habitat boundaries with surveyed land parcel information.

5.2 Activities Likely to Result in the 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 was degraded, either

permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single activity or multiple activities at one point in time or the cumulative effects of one or more activities over time (Government of Canada 2009). It should be noted that not all activities that occur in or near critical habitat are likely to cause its destruction.

Activities described in Table 2 are examples of those likely to cause destruction of critical habitat for the species; however, destructive activities are not necessarily limited to those listed.

Table 2. Activities Likely to Destroy Critical Habitat of the Bent Spike-rush

Description of Activity	Description of Effect in Relation to Function Loss	Details of Effect
Conversion of habitat for residential or other developments, roads, or trails.	Conversion of habitat results in direct loss of critical habitat which the species relies on for basic survival, successful seed germination and seedling establishment. Direct removal or compaction of substrate would render the habitat unsuitable for the Bent Spike-rush. Water draw down as a result of new residential developments near critical habitat could permanently alter the hydrology of the area – see below.	If this activity were to occur within the bounds of critical habitat, effects would be direct and cumulative, at any time of the year. Also, the removal of a portion of the habitat could compromise the long-term sustainability of the population.
Activities that cause substantial alterations to the hydrological regime (e.g., draining, ditching)	Although Bent Spike-rush habitat is naturally dynamic, human activities that cause substantial changes to the hydrologic regime that alter natural flow or water levels (e.g., causing sustained drying or flooding of habitat) could reduce or eliminate suitable habitat.	If this activity were to occur within or outside the bounds of critical habitat, effects could be cumulative or may occur from a single event, at any time of the year.
Introduction of invasive exotic plant species (e.g., non-native Common Reed).	Invasive species may render the habitat unsuitable for the Bent Spike-rush by creating shaded conditions. Invasive species may compete with the Bent Spike-rush for resources, such as light, space and nutrients, leading to a reduction in population size and possibly local extirpations.	Effects are direct and cumulative and may occur at any time of the year. This activity must occur within the bounds of critical habitat to cause its destruction.
Activities which remove significant amounts of soil or substrate (e.g., dredging or construction).	Removal of significant amounts of the soil or substrate that is suitable for seed germination, seedling establishment, and/or the survival and growth of plants would render the habitat unable to support the dispersal, reproduction and growth of the Bent Spike-rush.	Effects are direct and cumulative and may occur at any time of the year. This activity must occur within the bounds of critical habitat to cause its destruction.

Planting of trees or shrubs that could shade out areas used by the species.	Planting of trees or shrubs may render the habitat unsuitable for the Bent Spike-rush by creating shaded conditions which the species cannot tolerate.	Effects are direct and cumulative and may occur at any time of the year. This activity must occur within the bounds of critical habitat to cause its destruction.

6. Measuring Progress

The performance indicator presented below provide a way to define and measure progress toward achieving the population and distribution objectives. Every five years, success of recovery strategy implementation will be measured against the following performance indicator:

- Existing populations of the Bent Spike-rush in southern Ontario have been maintained.

7. Statement on Action Plans

One or more action plans will be completed and posted on the Species at Risk Public Registry for the Bent Spike-rush, Great Lakes Plains population by December 31, 2022.

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*[19]. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the Federal Sustainable Development Strategy's[20] (FSDS) goals and targets.

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

This federal recovery strategy will clearly benefit the environment by promoting the recovery of the Bent Spike-rush, Great Lakes Plains population. The Bent Spike-rush is

[19] ttp://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[20] http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1

found on wet, sandy soil in open flats along edges of ephemeral ponds and wet meadows associated with Lake Erie (COSEWIC 2009). Efforts to create or recover the species' habitat could have positive impacts on associated species including Green Spike-rush (*Eleocharis flavescens* var. *olivacea*), Elliptic-fruited Spike-rush (*E. elliptica*), Square-stemmed Spike-rush (*E. quadrangulata*), Low Nut-rush (*Scleria verticillata*), Twig-rush (*Cladium autumnalis*), and Greater Canadian St. John's wort (*Hypericum majus*) (COSEWIC 2009). Maintaining the habitat for this species will require work to reduce or eliminate the invasive species, non-native Common Reed. The elimination of this invasive species would ensure the habitat remains in a natural and open state which would positively affect all species using this area. Treatment options are more limited for non-native Common Reed 'stands' found in wetland areas or immediately adjacent to water; therefore, alternate approaches need to be considered to protect these aquatic habitats and species found within them.

Several studies have demonstrated that non-native Common Reed is a fast-growing invasive species, which causes severe damage by decreasing biodiversity and destroying habitat for other species, particularly in wet or moist habitats (OMNR 2011). non-native Common Reed is considered a threat for many species, including species at risk such as the Bent Spike-rush, Virginia Mallow, Pink Milkwort and Fowler's Toad. Contribution towards the control of non-native Common Reed as part of habitat management for the Bent Spike-rush in open riparian habitats will benefit other species by promoting biodiversity and improving overall habitat conditions (Benoit and Askins 1999; OMNR 2011; Greenberg and Green 2013; Perez et al. 2013).

Some management activities, including prescribed burns and herbicides used to control invasive species, such as non-native Common Reed, have the potential to harm some species, at least in the short term. The ecological risks of such activities must be considered individually before undertaking them, in order to reduce possible negative effects. For example, the timing of management activities can be controlled (e.g., prescribed burning in the early spring or other suitable time periods) to minimize effects on amphibians, reptiles, and/or insects.

The SEA concluded that this strategy will clearly benefit the environment and will not entail any significant adverse effects. The reader should refer to the following sections of the provincial document in particular: habitat needs (Part 2, Section 1.4), knowledge gaps (Part 2, Section 1.7), and the government-led and government-supported actions tables from *Ontario's Government Response Statement for The Bent Spikerush* (Part 3).

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Appendix A: Subnational Conservation Ranks of Bent Spike-Rush (*Eleocharis Geniculata*) in Canada and the United States

Bent Spike-rush (*Eleocharis geniculata*)	
S-rank	**State/Province**
S1 (Critically Imperilled)	Ontario, British Columbia, Illinois, Kansas, Nebraska, Ohio
S1? (Critically Imperilled – inexact rank)	Louisiana
S2 (Imperilled)	Indiana
S3S4 (Vulnerable-Apparently Secure)	Mississippi
SNA (Not Applicable)	Hawaii
SU (Unrankable)	Maryland
SNR (Unranked)	Alabama, Arizona, California, Florida, Georgia, Michigan, New Jersey, North Carolina, Oklahoma, Pennsylvania, South Carolina, Texas

Rank Definitions (NatureServe 2013)

S1: Critically Imperilled - At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

S1?: Critically Imperilled (inexact rank) – This denotes inexact numeric rank of critically imperiled.

S2: Imperilled - At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

S3S4: Vulnerable/Apparently Secure – The risk level ranges from fairly low to moderate risk of extirpation in the jurisdiction. The species range may be extensive and/or have many populations or occurrences but with possible cause for some concern as a result of local recent declines, threats or other factors, to fairly restricted ranged, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

SNA: Not Applicable - A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities.

SU: Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

SNR: Unranked – Conservation status not yet assessed.

PART 2 - *Recovery Strategy for the Bent Spikerush* (Eleocharis geniculata) *in Ontario*, prepared by Jane M. Bowles for the Ontario Ministry of Natural Resources

Photo: Sam Brinker, NHIC

Bent Spike-rush
(Eleocharis geniculata) in Ontario
Ontario Recovery Strategy Series

Recovery strategy prepared under the *Endangered Species Act, 2007*

September 2010

Natural. Valued. Protected.

Ministry of Natural Resources

Ontario

About the Ontario Recovery Strategy Series

This series presents the collection of recovery strategies that are prepared or adopted as advice to the Province of Ontario on the recommended approach to recover species at risk. The Province ensures the preparation of recovery strategies to meet its commitments to recover species at risk under the Endangered Species Act, 2007 (ESA, 2007) and the Accord for the Protection of Species at Risk in Canada.

What is recovery?

Recovery of species at risk 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?

Under the ESA, 2007, a recovery strategy provides the best available scientific knowledge on what is required to achieve recovery of a species. A recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It also makes recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation. Sections 11 to 15 of the ESA, 2007 outline the required content and timelines for developing recovery strategies published in this series.

Recovery strategies are required to be prepared for endangered and threatened species within one or two years respectively of the species being added to the Species at Risk in Ontario list. There is a transition period of five years (until June 30, 2013) to develop recovery strategies for those species listed as endangered or threatened in the schedules of the ESA, 2007. Recovery strategies are required to be prepared for extirpated species only if reintroduction is considered feasible.

What's next?

Nine months after the completion of a recovery strategy a government response statement will be published which summarizes the actions that the Government of Ontario intends to take in response to the strategy. The implementation of recovery strategies depends on the continued cooperation and actions of government agencies, individuals, communities, land users, and conservationists.

For more information

To learn more about species at risk recovery in Ontario, please visit the Ministry of Natural Resources Species at Risk webpage at: www.ontario.ca/speciesatrisk

RECOMMENDED CITATION

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Cover illustration: Sam Brinker, NHIC

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Cette publication hautement spécialisée Recovery strategies prepared under the *Endangered Species Act, 2007*, *n'est disponible qu'en Anglais en vertu du Règlement 411/97 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec Pamela Wesley au ministère des Richesses naturelles au 705-755-1661.*

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DECLARATION

The Ontario Ministry of Natural Resources has led the development of this recovery strategy for the Bent Spike-rush in accordance with the requirements of the *Endangered Species Act*, 2007 (ESA 2007). This recovery strategy has been prepared as advice to the Government of Ontario, other 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 of the individuals who provided advice or contributed to its preparation, or the official positions of the organizations with which the individuals are associated.

The goals, objectives and recovery approaches identified in the strategy are based on the best available knowledge and are subject to revision as new information becomes available. 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.

RESPONSIBLE JURISDICTIONS

Ontario Ministry of Natural Resources
Environment Canada, Canadian Wildlife Service – Ontario

EXECUTIVE SUMMARY

Bent Spike-rush is a small (2-20 cm tall), annual, tufted plant that grows in open areas on the sheltered shorelines of ponds and lakes. The species is listed as endangered under the *Endangered Species Act, 2007* (ESA 2007). There are two populations in Ontario. One population is on the shoreline of a dug sand pit in the hamlet of Cedar Springs, in the Municipality of Chatham-Kent. The second, and larger population, is found scattered along the shores of ponds and in shallow interdunal swales near the tip of Long Point, Norfolk County. The total population sizes are estimated at 300-500 at Cedar Springs and 1300 to 2500 at Long Point, although a comprehensive survey has not been carried out at either site. Since the plant is an annual the population of mature individuals likely fluctuates from year to year, and long-term survival of the species depends on dormant seeds stored in the substrate. Little is known about the longevity of the seeds or the size of the seed bank.

The main threat to the species is degradation of habitat as a result of invasion by the introduced and invasive variety of Common Reed (*Phragmites australis*), commonly referred to as *Phragmites*. This plant is actively invading many wetlands in southern Ontario and is present at both populations of Bent Spike-rush. Populations of *Phragmites* on Long Point increased from 18 ha to almost 140 ha between 1995 and 1999, and have increased about five-fold since then. Since Bent Spike-rush requires open strand lines to grow, competition from *Phragmites* and changes in shoreline dynamics are considered threats, especially where physical changes in the shoreline have been affected by the presence of *Phragmites*. At Cedar Springs, the population is in a habitat that is at least partly created by humans. The habitat of Bent Spike-rush is currently protected under the ESA 2007.

The recovery goal for Bent Spike-rush is to prevent further loss of habitat within the area of occupancy at both sites where it occurs so that populations are maintained.

The objectives of this recovery strategy are:

1. Inventory and map all known Bent Spike-rush locations, populations and habitats by 2015 to provide a quantitative baseline for future monitoring and initiate a monitoring program.
2. Monitor populations and extent of *Phragmites* at Bent Spike-rush sites at regular intervals (at least every 2-3 years) on an on-going basis to provide data on the extent and rate of habitat change.
3. Investigate options for removal and/or control of *Phragmites* at Bent Spike-rush sites that are most vulnerable to this threat. Prepare plans for *Phragmites* management and begin management by 2012.
4. Research the habitat requirements (including hydrologic regime), population biology, dispersal and seed bank dynamics of Bent Spike-rush to determine feasibility of survival, relocation and recovery in protected habitat.
5. Provide communication and outreach to landowners, municipalities and planners to restrict habitat destruction by development at the Cedar Springs

site. Incorporate specific protection into the next draft of relevant municipal Official Plans.

Approaches to protection and recovery include detailed inventory and mapping of populations and habitats, including the extent of the threat of *Phragmites*. This will provide baseline data from which the success of recovery actions can be measured. Habitat recovery, restoration and rehabilitation may be achieved through management or removal of *Phragmites*. Opportunities for *Phragmites* control need to be investigated and experimental treatments carried out that can be the basis for adaptive management.

It is recommended that the habitat at Long Point be prescribed as habitat for Bent Spike-rush in a habitat regulation. This habitat includes those areas of the North Beach and the shorelines of interdunal ponds and wet meadows between Gravelly Bay and the tip of Long Point that are occasionally or seasonally inundated and that remain moist for most of the growing season, and where the native vegetation that competes with Bent Spike-rush is naturally sparse to open. At Cedar Springs, it is recommended that the graded shoreline of the sand pit be prescribed as habitat for Bent Spike-rush in a habitat regulation.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 BACKGROUND INFORMATION

1.1 Species Assessment and Classification

COMMON NAME: Bent Spike-rush

SCIENTIFIC NAME: *Eleocharis geniculata*

SARO List Classification: Endangered

SARO List History: Endangered (2009)

COSEWIC Assessment History: Great Lakes Plains population – Endangered (2009)

SARA Schedule: N/A

CONSERVATION STATUS RANKINGS:
GRANK: G5 NRANK: NNR SRANK: S1

The glossary provides definitions for the abbreviations above.

1.2 Species Description and Biology

Species Description

Bent Spike-rush is a small plant with densely tufted, green and slightly waxy-looking, threadlike stems 2-20 centimetres long and 0.2-0.5 millimetres in diameter. There are no underground stems (rhizomes). The base of the stem has two pale green sheaths that are often tinged reddish brown in lower part. A single, many-flowered spikelet about 3-7 millimetres long, 3-4 millimetres wide and rounded or slightly pointed is borne at the summit of the flowering stem. The scales of the spikelet are rusty or pale brown, broadly egg-shaped or elliptical, obtuse and about 1.5-2 millimetres long. Flowers are bisexual with both male and female parts. The fruit is a smooth black, glossy, achene about 1 millimetres long and broadly obovoid (egg-shaped, but widest at the top). The achene is surrounded by 6-7 soft, rust-coloured bristles with small barbs on them. The top of each achene is adorned with a wide, flattish, pale green structure known as a tubercle (Menapace 2002) (Figure 1).

Figure 1: Achenes of Bent Spike-rush. CalPhotos Photo Database © 2003 Steve Matson [http://calphotos.berkeley.edu/cgi/]. Used with permission.

Species Biology

Bent Spike-rush is a pan-tropical wetland species that extends into temperate regions at the edge of its range and typically grows in sand or mud along the shoreline at the edge of lakes, ponds and rivers. It is also found in seeps, salt-marshes, rice paddies and taro fields in the tropics (Menapace 2002). In Ontario it is found on muddy or silty soils at the edge of ephemeral ponds, beaches and wet meadows that are flooded early in the year but later dry out. It appears in places where other vegetation is sparse or absent so that competition from other species is low. Plants mature and set seed in late summer and early autumn, usually around the first week of September in Ontario (COSEWIC 2009).

Plants grow each year from seed deposited the previous year or that are dormant in the seed bank. For annual species, such as Bent Spike-rush, long term persistence depends on seeds stored in the seed bank, with plants growing and setting seed only in years when the conditions are favourable. Dormancy may last for several to many years (COSEWIC 2009). Annual changes in water levels can have a large effect on the area of suitable habitat available from year to year (personal observation), and population sizes may fluctuate considerably (COSEWIC 2009). Population trends can only be established from regular monitoring over several years, but trends may be inferred from the extent of suitable habitat.

Bent Spike-rush has no obvious means of long distance dispersal. Seeds probably fall close to the parent plants or are washed off during rising water levels. Seeds float for a few hours when first released and may get washed along the shoreline. Movement of seeds in mud stuck to the feet of waterfowl was proposed as a mechanism of dispersal by Darwin (1859) and has been demonstrated for other species of *Eleocharis* (Bell 2000). The scattered distribution of Bent Spike-rush in Ontario, and its absence from some locations with apparently suitable habitat, suggests that dispersal is quite limited.

1.3 Distribution, Abundance and Population Trends

There are two known extant populations and one known historical population of Bent Spike-rush in Ontario. The first report of Bent Spike-rush in Canada was from Rondeau Provincial Park in 1934 (Taylor, 1935), but the plant has not been found there since despite several searches (COSEWIC 2009). At Long Point it was first observed in 1979

and was reported by Reznicek and Catling (1989) as being “occasional but widespread on beach strands and sandy pond shores between Gravelly Bay and the tip of the Point”. Most stands are within the Long Point National Wildlife Area. The Cedar Springs site was discovered in 1996 by M.J. Oldham and A.W. Cusick (COSEWIC 2009). The Rondeau Provincial Park and Long Point sites are along the Lake Erie shoreline while the Cedar Springs location is about 2 kilometres inland on the shoreline of Glacial Lake Warren.

Targeted searches for Bent Spike-rush were conducted at all known Ontario sites in 2007 by T. McIntosh, M.J. Oldham, S. Brinker and A. Reznicek during field work for the COSEWIC Status Report (COSEWIC 2009). The number of mature, fruiting individuals was 300-500 plants at Cedar Springs and 1,000-2,000 at Long Point. At Long Point, stands of Bent Spike-rush were found scattered over an area about 4.4 kilometres long. Not all suitable habitat in the area was searched; abundance estimates were made visually on transects into previously known sites. Estimates of plant numbers were made at locations where GPS waypoints were recorded and inferred from the extent of suitable habitat.

The population at Cedar Springs was not surveyed quantitatively before 2007, but no obvious changes in density or abundance have been noted since it was discovered in 1996 (COSEWIC 2009).

Similarly, no earlier counts of Bent Spike-rush have been made at Long Point. In 2007 the species was absent from several places where it had been present in 1988 or earlier (M. J. Oldham pers. comm. 2009). In some places it was still present, but there seemed to be fewer plants than in previous years. Some sites with suitable habitat in 1988 had grown in with the invasive variety of Common Reed (*Phragmites australis*), commonly known as *Phragmites.*

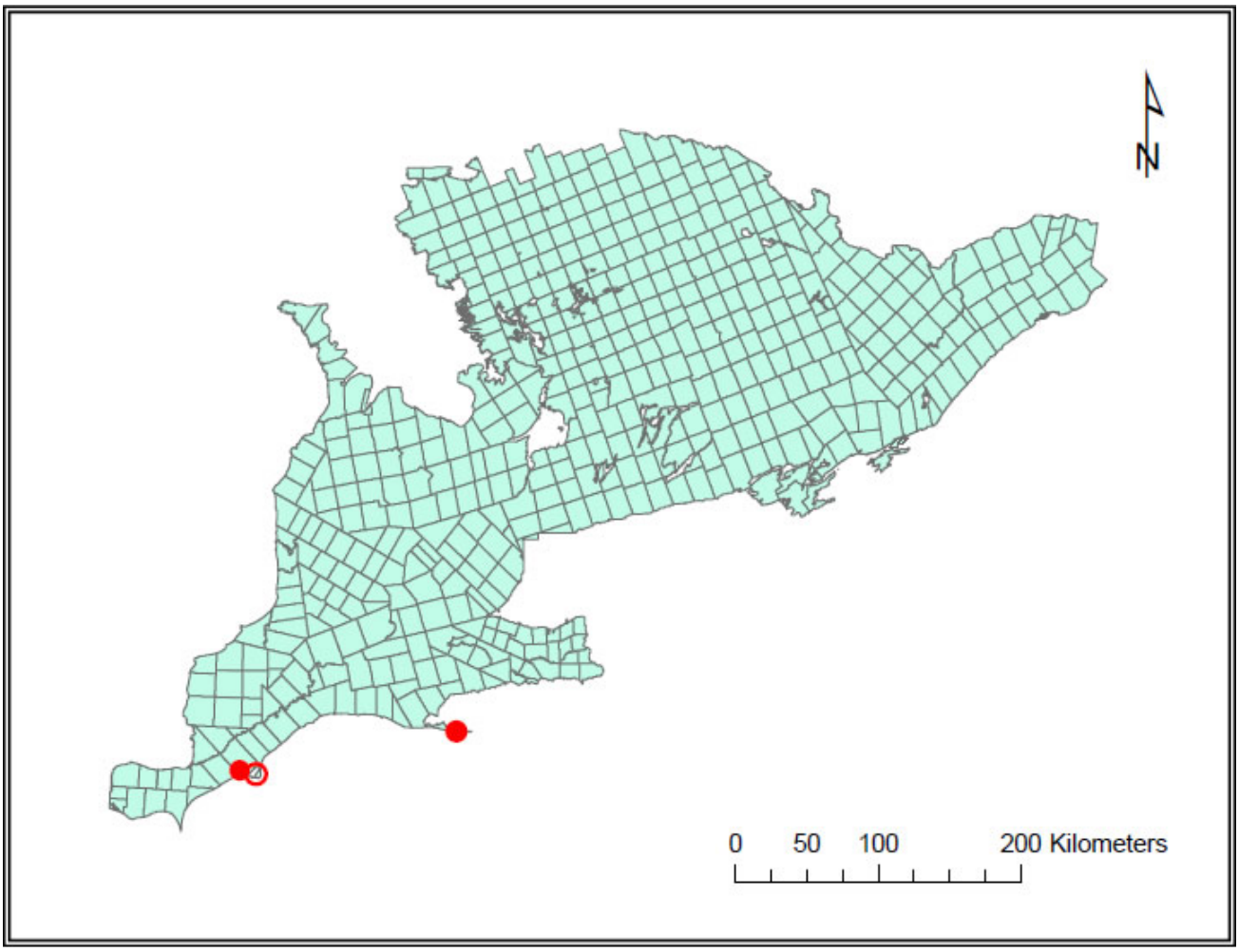

Figure 2. Historical (open circle) and current distribution (closed circle) of Bent Spike-rush in Ontario

1.4 Habitat Needs

Bent Spike-rush is limited in Ontario close to the shore of Lake Erie. The specific habitats for Bent Spike-rush are the sheltered shorelines of lakes and ponds on the strand lines at the water and on flat beaches where the water table is close to the surface. Bent Spike-rush usually grows in open areas where other shoreline species are present, but it cannot compete with tall or permanent vegetation such as *Phragmites*. On a local scale the habitat is usually quite ephemeral, moving back and forth across the shoreline in response to changes in water levels.

There are only two known extant locations for the species in Ontario. At the Cedar Springs location, Bent Spike-rush is found within the boundaries of the hamlet of Cedar Springs. It grows on a sloping shoreline at the edge of an old sand pit on an ancient beach ridge of a glacial lake, and is about 1.7 kilometres inland from the current lakeshore. Associated species include Elliptic Spike-rush (*Eleocharis elliptica*),

Kilometers

Northern Bugleweed (*Lycopus uniflorus*), Green Sedge (*Carex viridula*), Greater Canadian St. John's-wort (*Hypericum majus*), *Phragmites*, Small-flowered Agalinis (*Agalinis paupercula*), Narrowleaf Paleseed (*Leucospora multifida*), Northern Green-rush (*Juncus alpinoarticulatus* ssp. *nodulosus*), Brook Flatsedge (*Cyperus bipartitus*) and Annual Witchgrass (*Panicum capillare*) (McIntosh 2007).

At Long Point, Bent Spike-rush grows along the sandy or silty shorelines of ponds in interdunal swales within 5 kilometres of the tip of the point. The area and depth of water in these ponds, and the width of the strand areas, are dependent on the water levels in the ponds. These in turn are related, at least partially, to the water level of Lake Erie, which typically fluctuates about 0.5 metres annually and up to 2 metres on longer-term cycles (NOAA 2009). Typical associated species in the habitat include Elliptic Spike-rush, Low Nutrush (*Scleria verticillata*), Green Sedge, Horned Beakrush (*Rhynchospora capillacea*) and Philadelphia Panic Grass (*Panicum philadelphicum*) in places where there is more than 99 percent bare substrate of silt and organic matter on sand.

Bent Spike-rush is also sometimes found on the open bottom of drying ponds with associates including Annual Witchgrass, Smooth Sawgrass (*Cladium mariscoides*), Marsh Arrowgrass (*Triglochin palustre*), Squarestem Spike-rush (*Eleocharis quadrangulata*), Green Sedge and Horned Bladderwort (*Utricularia cornuta*). It also occurs in a long, shallow interdunal depression near the south shore of Long Point, south of Gravelly Bay, often with Bright Green Spike-rush (*Eleocharis olivacea*), which stands out as being less common and larger; Slender Fimbry (*Fimbristylis autumnalis*), Green Sedge, Horned Beakrush, Smooth Sawgrass and Water Milfoil (*Myriophyllum* sp.) may also be present. This habitat has large patches of *Phragmites* invading the site (McIntosh 2007).

1.5 Limiting Factors

The main limiting factor for Bent Spike-rush in Canada is the very specific habitat, with limited geographic distribution, in which it grows. Sheltered shoreline sites have limited distribution in Ontario and are subject to changes in water levels. In years of high water levels, beaches, strands and the shorelines of ponds may be very narrow because part, or even most, of the habitat is under water. There are clearly other (unknown) factors limiting the species because it has very limited occurrence even in habitats that are apparently suitable.

1.6 Threats to Survival and Recovery

The main threat to Bent Spike-rush in Ontario is invasion of the known sites and areas of suitable habitat by the invasive variety of *Phragmites* at both Long Point and Cedar Springs (COSEWIC 2009).

The amount of *Phragmites* is expanding rapidly into the shorelines of ponds where Bent Spike-rush grows. Wilcox et. al. (2003) showed that the area of *Phragmites* stands on Long Point expanded from 18 hectares in 1995 to 137 hectares in 1999. This exponential expansion is continuing. Data from *Phragmites* cover estimated in permanent vegetation monitoring plots show that in 2009 the amount of *Phragmites* was about 5 times greater than in 1999 (Bowles and Bradstreet unpublished data). Growth of *Phragmites* is known to respond to increased nitrogen in shoreline systems (Silliman and Bertness 2004). Increased nitrogen inputs at Bent Spike-rush habitats may come from agricultural runoff into rivers, and thus the lake, and from atmospheric deposition.

Because the shoreline habitat of Bent Spike-rush is dynamic in nature, changes in lake levels and shoreline dynamics may alter some sites (for example by sand accretion, erosion, flooding) so that they no longer provide suitable habitat. This is a natural and continuing process on Long Point (Reznicek and Catling 1989), but it may be exacerbated by changes in vegetation such as an increase in the population of *Phragmites*.

At Cedar Springs, there is an additional threat of possible residential development at the site. The site lies within the boundaries of the Hamlet of Cedar Springs in Raleigh Township. The Chatham-Kent Official Plan (2009) allows for residential development and growth within hamlet boundaries, but provides for the protection of significant habitat for endangered and threatened species and adjacent areas.

1.7 Knowledge Gaps

The most important knowledge gaps for the recovery and protection of Bent Spike-rush in Ontario relate to the extent, size and precise locations of the Long Point population. Observations have been made over the last few decades by knowledgeable individuals familiar with the species, but information from a detailed survey is lacking. The extent of the species in apparently suitable habitats is not known. Some previous locations have been altered by changes in lake level and beach dynamics, and the species may have disappeared from some sites. Invasion by *Phragmites* is altering the structure and composition of plant communities, including some globally imperilled vegetation types such as the Great Lakes Coastal Meadow Marsh, as well as altering physical and chemical properties of the habitats (Rudrappa et al. 2007). Changes in the population levels and in the extent and quality of habitat for Bent Spike-rush can only be monitored and tracked effectively if baseline levels are known for all known sites. The long-term fate of the habitat (and presumably the species) can only be projected and predicted if the habitats and their dynamics are understood. Another important gap is the response of the species to management of the habitat through control of *Phragmites*, and whether this is even feasible.

Little is known about the year-to-year fluctuations in the populations of Bent Spike-rush and how, and what, environmental factors affect germination, population numbers and fruiting success. Almost nothing is known about seed dispersal or seed dormancy and

seed bank characteristics such as size, longevity and turnover. As an annual species, continued existence of the plant from one year to the next relies entirely on seeds.

1.8 Recovery Actions Completed or Underway

To date there have been no recovery actions specific to Bent Spike-rush in Ontario. Surveys by McIntosh, Oldham, Reznicek and Brinker (COSEWIC 2009) have begun to document threats and the decline of Bent Spike-rush in Ontario. The studies showing the increasing threat of *Phragmites* (Wilcox et al 2003, Bowles and Bradstreet unpublished data) are not specific to Bent Spike-rush habitat.

2.0 RECOVERY

2.1 Recovery Goal

The recovery goal for Bent Spike-rush is to prevent further loss of habitat within the area of occupancy at both populations where it occurs so that populations are maintained.

2.2 Protection and Recovery Objectives

The protection and recovery objectives are listed in order of priority in Table 1 below.

Table 1. Protection and recovery objectives

No.	Protection or Recovery Objective
1	Inventory and map all known Bent Spike-rush locations, populations and habitats by 2015 to provide a quantitative baseline for future monitoring and initiate a monitoring program.
2	Monitor populations and extent of *Phragmites* at Bent Spike-rush sites at regular intervals (at least every 2-3 years) on an on-going basis to provide data on the extent and rate of habitat change.
3	Investigate options for removal and/or control of *Phragmites* at Bent Spike-rush sites that are most vulnerable to this threat. Prepare plans for *Phragmites* management and begin management by 2012.
4	Research the habitat requirements (including hydrologic regime), population biology, dispersal and seed bank dynamics of Bent Spike-rush to determine feasibility of survival, relocation and recovery in protected habitat.
5	Provide communication and outreach to landowners, municipalities and planners to restrict habitat destruction by development at Cedar Springs site. Incorporate specific protection into the next draft of relevant municipal Official Plans.

2.3 Approaches to Recovery

The recommended approaches to recovery are listed in Table 2. Short-term and immediate critical actions are inventory and accurate mapping of the populations of the Bent Spike-rush, their habitat, and the populations of *Phragmites* that threaten the habitat. Controlling *Phragmites* using an adaptive approach that responds to current wisdom and monitoring the results of on-going trials are necessary long-term actions.

Table 2. Approaches to recovery of the Bent Spike-rush in Ontario

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
1. Inventory and map all known Bent Spike-rush locations, populations and habitats by 2015 to provide a quantitative baseline for future monitoring and initiate a monitoring program.				
Critical	Short-term	Inventory, Monitoring and Assessment	**1.1** Conduct detailed mapping and census of known populations – GPS based mapping and census at all known sites – Detailed inventory of associated species – Measurement of water levels and moisture	• Lack of detailed census and site mapping. • Lack of information on suitable habitat • Lack of information about extent of suitable habitat
Critical	On-going	Inventory, Monitoring and Assessment	**1.2** Repeat mapping, census and measurements of all known populations (as above) to assess species dynamics over an extended period (10 years)	• Lack of information about annual fluctuations in the population • Lack of information on extent of habitat under year to year changes in water levels
2. Monitor populations and extent of *Phragmites* at Bent Spike-rush sites at regular intervals (at least every 2-3 years) on an on-going basis to provide data on the extent and rate of habitat change.				
Critical	Short-term	Monitoring and Assessment; Research	**2.1** Create detailed maps of extent of *Phragmites* stands at Bent Spike-rush locations – GPS based mapping of stands – Airphoto interpretation of stand expansion	• Lack of information about the rates of *Phragmites* invasion • Lack of information about habitat loss due to *Phragmites*

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
3. Investigate options for removal and/or control of *Phragmites* at Bent Spike-rush sites that are most vulnerable to this threat. Prepare plans for *Phragmites* management and begin management by 2012.				
Critical	Ongoing	Management	**3.1** Investigate *Phragmites* management options from literature, current practices and knowledgeable individuals. – Compile a list of management and control options – Engage with landowners (CWS, Ontario Parks, Transport Canada and private landowners) to discuss options and alternatives – Co-ordinate efforts with recovery actions for other species at risk (e.g. Fowler's Toad, turtles)	• Degraded habitat • Habitat loss
Critical	Long-term	Management	**3.2** Design and execute experimental management of *Phragmites* in selected plots – Establish experimental plots for removal/ control/ prevention of *Phragmites* invasion – Monitor *Phragmites* and Bent Spike-rush in experimental plots before and after treatment – Provide feedback to landowners and stakeholders	• Habitat loss • Competition • Degraded habitat • Population structure
4. Research the habitat requirements (including hydrologic regime), population biology, dispersal and seed bank dynamics of Bent Spike-rush to determine feasibility of survival, relocation and recovery in protected habitat.				
Urgent	Ongoing and long-term	Research	**4.1** Establish research protocols to investigate reproductive and habitat biology of Bent Spike-rush. – Establish partnerships between landowners, universities and species at risk units. – Set up field research plots and protocols	• Population structure

Relative Priority	Relative Timeframe	Recovery Theme	Approach to Recovery	Threats or Knowledge Gaps Addressed
5. Provide communication and outreach to landowners, municipalities and planners to restrict habitat destruction by development at Cedar Springs site. Incorporate specific protection into the next draft of relevant municipal Official Plans.				
Urgent	Short-term	Communications and Stewardship	**5.1** Communicate with decision makers at Cedar Springs population. – Establish land ownership and plans – Provide relevant recovery and protection information – Discuss management and recovery options	• Habitat loss

2.4 Performance Measures

Table 3. Performance measures

Protection or Recovery Objective	Performance Measures
Objective 1: Inventory and map all known Bent Spike-rush locations, populations and habitats by 2015 to provide a quantitative baseline for future monitoring and initiate a monitoring program.	• State of detailed knowledge about Bent Spike-rush populations on Long Point • Detailed mapping and repeated population census data available for all sites
Objective 2: Monitor populations and extent of *Phragmites* at Bent Spike-rush sites at regular intervals (at least every 2-3 years) on an on-going basis to provide data on the extent and rate of habitat change.	• Success of *Phragmites* control and Bent Spike-rush response in experimental plots • Improvement in the habitat quality for Bent Spike-rush
Objective 3: Investigate options for removal and/or control of *Phragmites* at Bent Spike-rush sites that are most vulnerable to this threat. Prepare plans for *Phragmites* management and begin management by 2012.	
Objective 4: Research the habitat requirements (including hydrologic regime), population biology, dispersal and seed bank dynamics of Bent Spike-rush to determine feasibility of survival, relocation and recovery in protected habitat.	• Availability of good data on population biology, dispersal, and seed bank dynamics of Bent Spike-rush collected using repeatable methods.
Objective 5: Provide communication and outreach to landowners, municipalities and planners to restrict habitat destruction by development at Cedar Springs site. Incorporate specific protection into the next draft of relevant municipal Official Plans.	• Protection of Bent Spike-rush is specifically written into municipal plans. • Landowners are informed and are supportive of the recovery efforts.

2.5 Area for Consideration in Developing a Habitat Regulation

Under the ESA 2007, a recovery strategy must include a recommendation to the Minister of Natural Resources on the area that should be considered in developing a habitat regulation. A habitat regulation is a legal instrument that prescribes an area that will be protected as the habitat of the species. The recommendation provided below by the author will be one of many sources considered by the Minister when developing the habitat regulation for this species.

Bent Spike-rush is an annual species with, presumably, fluctuating populations of mature plants. It grows in a narrow range of specific habitat that may move from year to year in response to fluctuating water levels. The extent of the specific habitat may vary depending on year-to-year changes in water level, the physical properties of the systems such as slope of the land, deposition of sand during storm events and the amount of competition from other plants.

It is recommended that at Long Point, the areas of the North Beach and the shorelines of interdunal ponds and wet meadows between Gravelly Bay and the tip of Long Point

be prescribed as habitat for Bent Spike-rush in a habitat regulation. This should only include those areas that are inundated seasonally or by fluctuating lake levels and that remain moist for most of the growing season, and where the native vegetation that competes with Bent Spike-rush is naturally sparse to open. Specific sites may expand, contract and move according to lake levels and changes in dune dynamics. There is a high probability that additional stands of Bent Spike-rush may be found through this area since populations of Bent Spike-rush fluctuate, the species is relatively inconspicuous, and detailed botanical surveys have not been done in all locations. It is also recommended that accurate inventory and mapping of these habitats on Long Point be conducted to support the habitat regulation.

At Cedar Springs, Bent Spike-rush grows in a habitat that is formed by human activity. The species is found on the graded shoreline of a pond formed in a dug sand pit. It is recommended that the graded shoreline of the sand pit be prescribed as habitat for Bent Spike-rush in a habitat regulation.

GLOSSARY

Achene: A small dry (non-fleshy) fruit containing a single seed.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The committee responsible for assessing and classifying species at risk in Canada.

Committee on the Status of Species at Risk in Ontario (COSSARO): The committee established under section 3 of the *Endangered Species Act, 2007* that is responsible for assessing and classifying species at risk in Ontario.

Conservation status rank: A rank assigned to a species or ecological community that primarily conveys the degree of rarity of the species or community at the global (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank and S-rank, are not legal designations. The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate geographic scale of the assessment. The numbers mean the following:

1 = critically imperilled
2 = imperilled
3 = vulnerable
4 = apparently secure
5 = secure
NR = the conservation status is "not ranked" or assessed yet in that jurisdiction

Endangered Species Act, 2007 (ESA 2007): The provincial legislation that provides protection to species at risk in Ontario.

GPS (Global Positioning System): A navigational or locating system that involves satellites and that can determine the exact location (latitude and longitude) of a receiver on the ground by calculating the time difference of signals that reach the receiver from different satellites.

Species at Risk Act (SARA): The federal legislation that provides protection to species at risk in Canada. This act establishes Schedule 1 as the legal list of wildlife species at risk to which the SARA provisions apply. Schedules 2 and 3 contain lists of species that at the time the act came into force needed to be reassessed. After species on Schedule 2 and 3 are reassessed and found to be at risk, they undergo the SARA listing process to be included in Schedule 1.

Species at Risk in Ontario (SARO) List: The regulation made under section 7 of the *Endangered Species Act, 2007* that provides the official status classification of species at risk in Ontario. This list was first published in 2004 as a policy and became a regulation in 2008.

Strand line: The zone at the top of a beach or shoreline that marks the high water level. Stranded debris and litter often accumulate along the strand line.

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PART 3 – *Bent Spikerush: Ontario Government Response Statement*, prepared by the Ontario Ministry of Natural Resources

Ministry of Natural Resources

Natural. Valued. Protected.

Bent Spike-Rush

Ontario Government Response Statement

PROTECTING AND RECOVERING SPECIES AT RISK IN ONTARIO

Species at risk recovery is a key part of protecting Ontario's biodiversity. Biodiversity – the variety of life on Earth – provides us with clean air and water, food, fibre, medicine and other resources that we need to survive.

The Endangered Species Act, 2007 (ESA) is the Government of Ontario's legislative commitment to protecting and recovering species at risk and their habitats. As soon as a species is listed as extirpated, endangered or threatened under the ESA, it is automatically protected from harm or harassment. Also, immediately upon listing, the habitats of endangered and threatened species are protected from damage or destruction.

Under the ESA, the Ministry of Natural Resources (the Ministry) must ensure that a recovery strategy is prepared for each species that is listed as endangered or threatened. A recovery strategy provides science-based advice to government on what is required to achieve recovery of a species.

GOVERNMENT RESPONSE STATEMENTS

Within nine months after a recovery strategy is prepared, the ESA requires the Ministry to publish a statement summarizing the government's intended actions and priorities in response to the recovery strategy. The recovery strategy for Bent Spike-rush was completed on September 10, 2010 (http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/STDPROD_066835.html).

The response statement is the government's policy response to the scientific advice provided in the recovery strategy. In addition to the strategy, the response statement is based on input from stakeholders, other jurisdictions, Aboriginal communities and members of the public. It reflects the best available traditional, local and scientific knowledge at this time and may be modified if new information becomes available. In implementing the actions in the response statement, the ESA allows the Ministry to determine what is feasible, taking into account social and economic factors.

Bent Spike-rush is a small, green to greenish yellow, annual tufted plant that grows in open areas on the sheltered shorelines of ponds and lakes.

Ontario

MOVING FORWARD TO PROTECT AND RECOVER BENT SPIKE-RUSH

Bent Spike-rush is listed as an endangered species under the ESA, which protects both the plant and its habitat. The ESA prohibits harm to or harassment of the species and damage to or destruction of its habitat without authorization. Such authorization would require that conditions established by the Ministry be met.

There are two populations of Bent Spike-rush in Ontario, both within two kilometres of Lake Erie. The greatest threat to the plant is habitat degradation caused by the spread of an invasive species called Common Reed (*Phragmites australis* subsp. *australis*). Common Reed is actively invading many wetlands in southern Ontario and is present at both locations of Bent Spike-rush.

The government's goal for the recovery of Bent Spike-rush is to prevent further loss and degradation of habitat at both locations where it occurs so that populations are maintained.

Protecting and recovering species at risk is a shared responsibility. No single agency or organization has the knowledge, authority or financial resources to protect and recover all of Ontario's species at risk. Successful recovery requires intergovernmental co-operation and the involvement of many individuals, organizations and communities.

In developing the government response statement, the Ministry considered what actions are feasible for the government to lead directly and what actions are feasible for the government's conservation partners to undertake with government support.

GOVERNMENT-LED ACTIONS

To help protect and recover Bent Spike-rush, the government will directly undertake the following actions:

- Finalize the best management practices for the control of Common Reed within sensitive habitats and update them as new control techniques become available.
- Educate other agencies and authorities involved in planning and environmental assessment processes on the protection requirements under the ESA.
- Encourage the submission of Bent Spike-rush data to the Ministry's central repository at the Natural Heritage Information Centre.
- Undertake communications and outreach to increase public awareness of species at risk in Ontario.
- Protect Bent Spike-rush and its habitat through the ESA. Develop and enforce a regulation prescribing the habitat of the species.

- Support conservation, agency, municipal and industry partners in undertaking activities to protect and recover Bent Spike-rush. Support will be provided through funding, agreements, permits (including conditions) and advisory services.
- Establish and communicate annual priority actions for government support in order to encourage collaboration and reduce duplication of effort.

GOVERNMENT-SUPPORTED ACTIONS

The government endorses the following actions for the protection and recovery of Bent Spike-rush. Actions identified as "high" will be given priority consideration for funding or for authorizations under the ESA. The government will focus its support on these high-priority actions over the next five years.

Focus Area: **Threat Management**
Objective: Investigate and implement options for removing and/or controlling Common Reed at Bent Spike-rush sites that are most vulnerable to this threat.

Actions:

1. **(HIGH)** Implement the best management practices for Common Reed through an adaptive management approach that assesses their impact on Bent Spike-rush in test plots prior to broader implementation.

Focus Area: **Inventory and Monitoring**
Objective: Inventory and map all known Bent Spike-rush populations and habitats at regular intervals to provide data on the extent and rate of change.

Actions:

2. Conduct detailed mapping and surveys of known populations to provide a quantitative baseline for future monitoring. This inventory should include:
   - an estimate of the population abundance, including the seed bank;
   - GPS-based mapping of the population extent of Bent Spike-rush and Common Reed;
   - a detailed inventory of the species present in the vegetation community; and
   - measurements of water and moisture levels.
3. Repeat the inventory and mapping of all known populations to assess species dynamics over an extended period and response to threat-mitigation actions.

Focus Area: **Research**
Objective: Improve knowledge of the species' biology to help inform future recovery efforts.

Actions:

4. Conduct research to assess the reproductive and habitat needs of Bent Spike-rush and the magnitude of impacts on these factors by Common Reed.

IMPLEMENTING ACTIONS

Financial support for the implementation of actions may be available through the Species at Risk Stewardship Fund, Species at Risk Farm Incentive Program or Community Fisheries and Wildlife Involvement Program. Conservation partners are encouraged to discuss project proposals related to the actions in this response statement with the Ministry. The Ministry can also advise if any authorizations under the ESA may be required to undertake the project.

Implementation of the actions may be subject to changes in priorities across the multitude of species at risk, availability of resources and the capacity of partners to undertake recovery activities. Where appropriate, the implementation of actions for multiple species will be co-ordinated across government response statements.

REVIEWING PROGRESS

The ESA requires the Ministry to conduct a review of progress toward protecting and recovering a species not later than five years from the publication of this response statement. The review will help determine whether adjustments are needed to achieve the protection and recovery of Bent Spike-rush.

ACKNOWLEDGEMENT

We would like to thank all those who participated in the development of the "Recovery Strategy for the Bent Spike-rush in Ontario" for their dedication to protecting and recovering species at risk.

For additional information:
Visit the species at risk website at
ontario.ca/speciesatrisk
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Contact the Natural Resources Information Centre
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