

# Recovery Strategy for the Barrens Willow (*Salix jejuna* Fernald)



Photo: Joe Brazil

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## **Disclaimer:**

This document was prepared to define the recovery strategies deemed necessary to protect and recover the Barrens Willow. It does not necessarily represent the official positions or views of each and every governmental or non-governmental organization or individual involved. The realization of the goals, objectives and actions identified in this document ultimately depend upon the ongoing program priorities and budgetary constraints of the participating departments and organizations. The goals and objectives may change over time in light of new findings.

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## EXECUTIVE SUMMARY

The Barrens Willow (*Salix jejuna* Fernald) is endemic to the limestone barrens of the Strait of Belle Isle on the northwestern part of the Great Northern Peninsula of Newfoundland. It is threatened by habitat loss and degradation, from land use activities. It was assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2001 as an endangered species, and listed as such under the Newfoundland and Labrador Endangered Species Act and the federal Species at Risk Act in 2002 and 2003, respectively. The recovery goal for this species is to secure the long term persistence of the natural population throughout its range. Achievement of this goal is primarily dependant upon the removal or mitigation of anthropogenic threats.

This strategy document outlines four recovery objectives for the Barrens Willow: 1) to assess and monitor the status of the natural population; 2) to define threats and limiting factors and mitigate controllable ones; 3) to lessen to the extent possible additional habitat loss and degradation due to human activities; and, 4) to encourage stewardship by the local residents. Highest priority actions are surveys, monitoring and critical habitat protection. Some of these actions, as well as others, such as habitat stewardship, are already underway.

## PART I. BACKGROUND

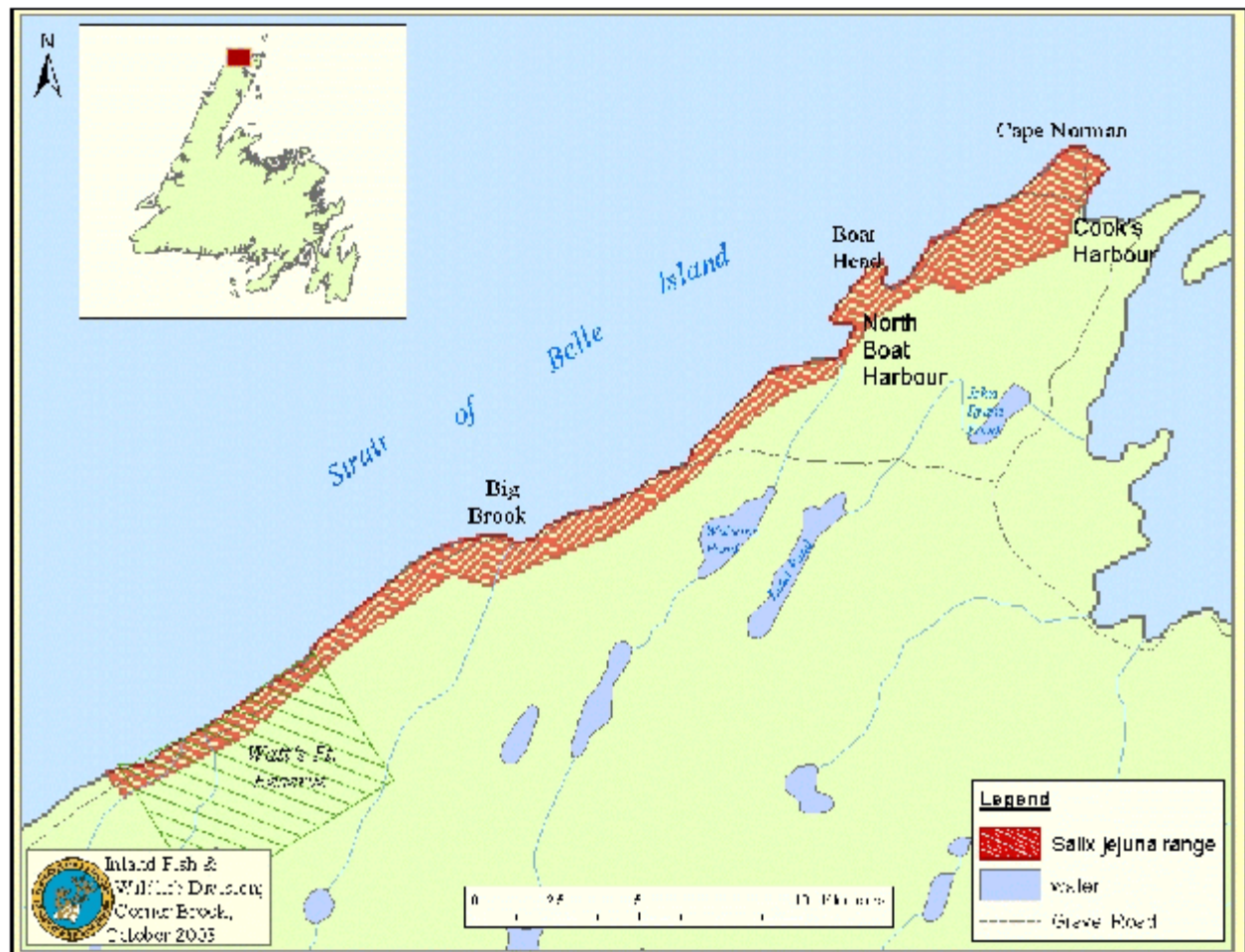
### 1. Species Information

<b>Common Name:</b>	Barrens Willow
<b>Scientific Name:</b>	<i>Salix jejuna</i> Fernald
<b>Assessment Summary:</b>	COSEWIC, May 2001 (New)
<b>Status:</b>	Endangered
<b>Reason for Designation:</b>	Highly localized limestone barrens endemic occurring at only a few sites and subject to habitat loss and degradation from land use activities.
<b>Occurrence:</b>	NL (Great Northern Peninsula of Newfoundland)
<b>Status History:</b>	Assessed as Endangered by COSEWIC in May 2001 based on a new status report (Anions 2000).
Listed as Endangered under the Newfoundland and Labrador Endangered Species Act in July 2002 and the federal Species at Risk Act in June 2003.	

## 2. Distribution

The Barrens Willow is endemic to the Strait of Belle Isle on the northwestern part of the Great Northern Peninsula of Newfoundland. Its distribution spans approximately 30 km of coast from Watts Point to Cape Norman (fig. 1). It is still present at all known historic locations. Although there is little data available, extent of distribution has probably been stable since the species was first discovered by Wiegand and Long in 1925.

Figure 1. Range of the Barrens Willow (*Salix jejuna* Fernald) in Newfoundland.



## 3. Population Size and Trend

Anions (2000) reported less than 50 known individuals. Field work conducted since indicates that the population is much larger: probably totaling more than 10,000 individuals. Available data is not sufficient to determine trends in population size.

The laying of roads through the habitat of the Barrens Willow, particularly in the latter half of the 20<sup>th</sup> century, may have adversely affected the population. Quarrying, mainly for road construction and maintenance, is another factor that possibly has had an adverse effect. On the other hand, the Barrens Willow is a pioneer species and now seems to thrive along disturbed



roadsides throughout its range. It is possible that road building and maintenance might have had a neutral or positive effect in some areas. Since the 1980s, when the Northern Peninsula Highway was built, there appears to have been only a few, localized disturbances within the range of the species.

#### **4. Biological Limiting Factors**

Habitat specificity is an important component of extinction risk (Rabinowitz 1981, as reported in Keith 1998). The Barrens Willow is endemic to a narrow band of coastal limestone barrens characterized primarily by arctic-like climatic conditions. Such harsh weather conditions, and natural processes like frost heave and abrasion by wind, typically limit plant growth. On the other hand, in more sheltered or shaded areas, competition from other plant species may limit the Barrens Willow's survival. It is unknown whether, or how, climate change might impact the amount of habitat available. Ultimately, population size and distribution are bound by the restrictive nature of the species' habitat.

Willow species generally hybridize readily. All willows, including hybrids, are vigorous pioneers that colonize disturbed habitats. In such habitats, hybrids can compete as well as pure individuals but they often display reduced viability and may die within a few years, or they may be infertile and survive only as vegetative plants (Argus 2003).

Herbivorous insects and pathogens have been observed and collected on the Barrens Willow. Their identities and impact on the willow population are unknown at this point.

#### **5. Threats**

According to Anions (2000), the main threat to this species has been loss of habitat. Further quarrying and/or road construction within the range of the species would constitute a significant threat (Argus 2003). Other known threats include habitat degradation associated with vehicular traffic, trails, and the maintenance of roads and infrastructure (Anions 2000). Off- trail vehicle use has been observed repeatedly by field biologists during recent years. Other potential threats include garbage dumping and net drying which have been observed in nearby areas. Anions (2000) also considered moose browsing and invasive plants to be potential threats. However, the risk posed by these threats is probably largely insignificant, as dwarf willows do not provide the kind of browse preferred by moose, and few introduced weeds are well adapted to the specific limestone barren habitat where the Barrens Willow occurs (Argus 2003).

## **6. Habitat Requirements**

Currently, the Barrens Willow occupies exposed coastal limestone barren habitat where vegetation cover is sparse. It is found in dry to periodically wet conditions. The substrate is generally silt and/or sand accumulated in depressions and openings between rocks, or open silt, sand and gravel, sometimes sorted by frost. Given the small population size and restricted distribution of the Barrens Willow, all natural areas of occurrences are considered critical habitat, in other words habitat that is critical to the survival of the species.

## **7. Ecological Role**

The Barrens Willow is one of three, known, endemic plant species occurring in the coastal limestone barren of the Great Northern Peninsula. The other endemic species are Long's Braya (*Braya longii* Fernald, Endangered) and Fernald's Braya (*Braya fernaldii* Abbe, Threatened). All three occupy sites where the vegetation cover is usually sparse due to regular disturbance by frost and wind. They are edge species, adapted to a marginal habitat. Many other vascular plant species that are rare in Newfoundland share this niche, disjuncts of arctic-alpine affinity found here at the southern limit of their range (e.g. *Bartsia alpina* L., *Pedicularis flammea* L., *Potentilla pulchella* R. Br. ex Ross). The presence of these species makes the Strait of Belle Ecoregion the richest in Newfoundland in terms of rare and exclusive vascular plants (Bouchard et al. 1991).

The Barrens Willow appears to be morphologically closest to *Salix ovalifolia* Trautv. and *S. stolonifera* Cov. (Argus 1997). These species are found in northwestern America, ranging from the Bering Sea and the arctic coast of Alaska and Yukon, south in the cordillera to a few isolated populations in the Rocky Mountains of British Columbia and Alberta. The evolutionary relationship between these species suggests that the Barrens Willow in Newfoundland is probably of refugial origin (Argus 2003). This hypothesis correlates with the presence of a significant number of species of arctic-alpine affinity within the same ecosystem.

Finally, the Barrens Willow is one of the dominant species at some sites. It probably plays a significant role as food source or shelter to a number of invertebrate species. It is also a pioneer species colonizing a habitat characterized by disturbance. Its presence could contribute to the establishment and survival of other plant species.

## **8. Importance to People**

Botanists and natural history enthusiasts have long been attracted to the limestone barrens of the Great Northern Peninsula. One of the main points of interest is the unique limestone barrens flora. Endemic species like the Barrens Willow are an important component of this flora, and so contribute to the ecotourism potential of the area.

Residents of the Great Northern Peninsula have generally been supportive of and interested in plant conservation efforts within the region. For example, residents of Raleigh were instrumental the creation of a Provincial Botanical Ecological Reserve at Burnt Cape. They are

now involved in the management of the reserve and development of activities around it. The Habitat Stewardship Program for the coastal limestone barrens of the Great Northern Peninsula, which is part of the recovery efforts for Long's and Fernald's Braya (Hermanutz et al. 2002), is another example. To date, the program has been very successful. Surveys of local residents have shown a strong interest in protecting the species at risk and their habitat. Three stewardship agreements have been signed in the area in 2002, including the first agreement with an elementary school in Canada.

Because of its unique features, the limestone barrens have also been, and continue to be, the subject of many scientific studies in the field of botany, zoology, ecology, and geology. Cape Norman, the type locality of the Barrens Willow, is of particular importance to science. The species itself, and its evolutionary relationships which suggest a refugial origin (see section 7 above), has the potential to provide interesting insight into the history of northern floras.

## **9. Knowledge Gaps**

Additional information is required on population size and distribution, life history, population genetics, habitat, threats and limiting factors.

### **9.1. Survey Requirements :**

Surveys to determine occurrence and population size need to be completed, in suitable habitat, within the known range of the species. Adjacent areas where similar habitat may also occur, notably Belle Isle, the southern Labrador coast, and Burnt Cape, should also be surveyed for occurrence of the species.

### **9.2. Biological/Ecological Research Requirements :**

Further information is required on species recognition, life history parameters (longevity, reproduction, growth), population genetics, and detailed habitat requirements. This information, along with information on threats and limiting factors, is necessary to carry out a population viability analysis, and important for refining the definition of critical habitat and for supporting *ex-situ* conservation efforts. Although not critical to recovery, a comparative genetic study could provide insights into the evolutionary relationships of the Barrens Willow and origin.

### **9.3. Threat Clarification Research Requirements :**

Natural and human-induced threats to the habitat are identified in the status report (Anions 2000). The importance of each of these threats and their prevalence on the landscape needs to be assessed. Pests and pathogens have been observed on the Barrens Willow. These still need to be identified and their potential impact assessed. The species may be sensitive to climate change, since its restricted habitat is apparently dependent upon narrow climatic parameters operating within a narrow coastal zone. Long term climatic data may be useful in determining trends. Surveys and research may identify other threats and limiting factors.

## PART II. RECOVERY

### 10. Recovery Goal

The fact that the Barrens Willow is naturally restricted to a relatively rare habitat affects the scope of recovery. Increased risk of extinction is inherent to high habitat specificity in space and time (Keith 1998). This species will always remain rare with a relatively small population and very restricted distribution. Recovery in this case is dependent upon the removal or mitigation of anthropogenic threats. Notwithstanding natural limiting factors that might have a significant impact on the population, threat abatement should result in the long-term survival of the species, natural population size and distribution should remain stable. **The recovery goal for the Barrens Willow is therefore to secure the long term persistence of the natural population throughout its range.**

### 11. Recovery Objectives

Recovery actions undertaken over the next five years should address the following four objectives towards the achievement of long-term recovery goals.

- I. Assess and monitor the status of the natural population.
- II. Define threats and limiting factors and mitigate controllable ones.
- III. Lessen to the extent possible additional habitat loss and degradation due to human activities.
- IV. Encourage stewardship by the local residents.

## 12. Approaches to Meet Recovery Objectives

Priority	Objectives	Actions	Specific Steps	Key Performance Indicators
Urgent	I, II & III	Biological surveys	<ul style="list-style-type: none"> <li>- Survey potential habitat within and around the species' known range, to determine complete distribution and population size, and identify threats and their impact</li> <li>- Identify and map areas where the species occurs</li> </ul>	<ul style="list-style-type: none"> <li>- Complete survey of potential habitat within the known range</li> <li>- Comprehensive estimate of population size</li> <li>- Geo-referenced data and maps available to managers, stakeholders and enforcement officers</li> <li>- List of threats and their impact as observed in the field</li> </ul>
Urgent	I, II & III	Habitat protection	<ul style="list-style-type: none"> <li>- Support the establishment by the provincial government of the proposed Cape Norman Ecological Reserve (type locality)</li> <li>- Delineate critical habitat</li> <li>- Identify and support other protection measures for occurrences outside reserves</li> <li>- Advise the appropriate property custodian (Department of Fisheries and Oceans) and the federal Minister of the Environment regarding the protection of the Barrens Willow in the Cape Norman federal property</li> </ul>	<ul style="list-style-type: none"> <li>- Establishment of Cape Norman Ecological Reserve</li> <li>- Map of critical habitat</li> <li>- List of protection measures required at each site</li> <li>- Initiation of protection process at each site</li> <li>- Drafting of necessary regulations under the Provincial Endangered Species Act and Wilderness and Ecological Reserves Act</li> <li>- Completion of protection plan</li> <li>- Drafting of the appropriate management policies for the Cape Norman federal property as required by the federal Species at Risk Act</li> </ul>

Urgent	I	Monitoring	<ul style="list-style-type: none"> <li>- Establish long term monitoring of each population</li> <li>- Determine and monitor land use patterns</li> </ul>	<ul style="list-style-type: none"> <li>- Establishment of monitoring plots</li> <li>- Establishment and maintenance of geo-referenced database on land use activities</li> </ul>
Necessary	I	Demographic research	<ul style="list-style-type: none"> <li>- Determine key demographic parameters (reproduction, growth, longevity, survivorship, persistence of seed bank and seed viability) based on monitoring data</li> </ul>	<ul style="list-style-type: none"> <li>- Continued collection and analysis of demographic data</li> </ul>
Necessary	I & III	Taxonomic research	<ul style="list-style-type: none"> <li>- Improve understanding of species definition</li> </ul>	<ul style="list-style-type: none"> <li>- Preparation of descriptions, keys, illustrations and collection of specimens that clarify identification of this and other species of willows, and their hybrids</li> </ul>
Necessary	I, II, III & IV	Ecological research	<ul style="list-style-type: none"> <li>- Determine the ecological requirements of the species</li> <li>- Define critical habitat</li> <li>- Identify limiting factors and natural threats, including climate change</li> </ul>	<ul style="list-style-type: none"> <li>- Description of ecological requirements of the species</li> <li>- List of limiting factors and natural threats and their actual and potential effect</li> <li>- Use of ecological data in critical habitat models and analysis of viability of the population</li> </ul>
Necessary	IV	Public outreach	<ul style="list-style-type: none"> <li>- Survey local communities to determine the attitudes of local populations towards conservation of the species</li> <li>- Encourage stewardship opportunities and produce education material</li> </ul>	<ul style="list-style-type: none"> <li>- Completion of initial survey</li> <li>- Involvement of residents in stewardship initiatives</li> </ul>

Necessary	I, II & III	Compliance to regulations	<ul style="list-style-type: none"> <li>- Work to ensure compliance to protection measures under the Endangered Species Act and the Wilderness and Ecological Reserves Act (e.g. training of conservation officers and public information)</li> </ul>	<ul style="list-style-type: none"> <li>- Training of local conservation officers in the recognition of the species and its habitat</li> <li>- Involvement of all relevant government departments</li> <li>- Public awareness regarding the acts and attached regulations</li> <li>- Frequent and regular of visits by compliance officers to the area</li> </ul>
Beneficial	I	Genetic research	<ul style="list-style-type: none"> <li>- Determine genetic diversity within and between populations</li> <li>- Determine breeding system</li> </ul>	<ul style="list-style-type: none"> <li>- Description of genetic variability within and between populations</li> <li>- Description of breeding system</li> </ul>
Beneficial	I & IV	<i>Ex-situ</i> conservation	<ul style="list-style-type: none"> <li>- Establish an <i>ex-situ</i> collection of living plants and a tissue bank</li> <li>- Develop techniques for cultivation and re-introduction if ever necessary</li> </ul>	<ul style="list-style-type: none"> <li>- Existence of an <i>ex-situ</i> collection of living plants and a tissue bank representative of genetic diversity observed in wild population</li> <li>- Description of techniques required for cultivation and re-introduction of the species</li> </ul>
Beneficial	III & IV	Restoration	<ul style="list-style-type: none"> <li>- Identify and restore disturbed areas within the range with the aim of improving the esthetic value of the landscape</li> </ul>	<ul style="list-style-type: none"> <li>- List of disturbed areas within the range</li> <li>- Elaboration and completion of a restoration plan</li> </ul>

### **13. Ecological and Technical Feasibility of Species Recovery**

As discussed above, the Barrens Willow will always remain rare and its recovery is dependent upon the removal or mitigation of anthropogenic threats. Commercial exploitation and other development of the limestone barrens can be limited through internal cooperation among governmental agencies responsible for resource management. On the other hand, global warming, which may prove to be a significant anthropogenic threat, would be very difficult to address at a regional scale. It is beyond the scope of this recovery strategy.

Highest priority actions for recovery of this species consist of surveys, monitoring and habitat protection. Other important steps include demographic, taxonomic and ecological research, public outreach and compliance to regulations. Surveys, ecological research and habitat protection for the limestone barrens are already under way as part of recovery efforts for Long's and Fernald's Braya (Hermanutz et al. 2002). The same is true for public outreach, under the auspices of the Limestone Barrens Habitat Stewardship Program.

In order to clarify our understanding of threats and limiting factors, to complete surveys, and to set up monitoring sites, a large initial investment of time and resources will be needed. Efforts in terms of research, monitoring and compliance to regulations, and involvement with local communities will be long-term. Because the area where the species occurs is far from major centres, any work in the area and contact with local communities involves significant investments in terms of travel time and communication costs.

The *ex-situ* collection will provide an alternate source of material for research and possibly reduce costs as well as the need for destructive sampling of the wild population. This collection will also serve as a backup to conservation in the wild.

### **14. Potential Impacts of Recovery Strategy on Other Species/Ecological Processes**

The Barrens Willow is restricted to a rare habitat type, host to a unique biological community. Protection of this habitat will ensure protection of many of the other rare species and ecological processes characteristic of this unique ecosystem. Rare species found within the range of the Barrens Willow include the threatened Fernald's Braya. Restoration aimed at improving the esthetic value of the landscape will increase its stewardship value and in the long-term possibly provide renewed natural habitat for limestone barren species.

### **15. Anticipated Conflicts or Challenges**

The general area where this species occurs has been, and will likely continue to be, exploited as a source of limestone gravel for road building and maintenance. Management of local quarry operations is starting to take into account the presence of rare plants. However, conservation efforts should continue; and appropriate tools to inform managers of the occurrence of potential habitat should be developed and communications improved.

Part of the species' range (Cape Norman) has been identified as the most important dolomite deposit on the west coast of Newfoundland. At this point in time, interest in this mineral resource, by the Newfoundland and Labrador Department of Mines and Energy, is only



at the exploratory stage. No claim has been established.

Maintenance of roads and infrastructure within the range of the species could directly threaten portions of the population and conflict with recovery efforts. Mitigation measures may need to be developed.

Finally, there are economic challenges in the area which have the potential to create additional development pressure on the species and its habitat. These challenges have recently been aggravated by the collapse of the local fishery.

## **17. Actions Completed or Underway**

This recovery strategy will be implemented as part of a multi-species recovery effort centered on the coastal limestone barren habitats of the Great Northern Peninsula of Newfoundland (Hermanutz et al. 2002). Several actions are already underway, including a habitat stewardship program, ecological research into the physical factors and processes characterizing limestone barren habitats, surveys of potential habitat, and the development of an *ex-situ* collection of live specimens. Actions completed include the creation of an Ecological Reserve for the protection of rare plants in the southern portion of the species range (Watt's Point). Potential habitat has been mapped. Finally, known areas of occurrence have been identified on the provincial Crown Lands Atlas as Sensitive Wildlife Areas, to ensure the referral of all development proposals for these areas to the Inland Fish and Wildlife Division for review.

## **18. Evaluation**

See key performance indicators in Section 12. As well, an action plan detailing the approaches to meet recovery objectives will be prepared within a year of the release of this plan.

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