

# Recovery Strategy for the Blunt-lobed Woodsia (*Woodsia obtusa*) in Canada

## Blunt-lobed Woodsia



2012

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**Cover illustration:** Matthew Wild

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## PREFACE

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

The Minister of the Environment is the competent minister for the recovery of the Blunt-lobed Woodsia and has prepared this strategy, as per section 37 of SARA. It has been prepared in cooperation with the Ontario Minister of Natural Resources and the Ministère du Développement durable, de l'Environnement et des Parcs du Québec.

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 Blunt-lobed Woodsia 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.

## **ACKNOWLEDGMENTS**

The Blunt-lobed Woodsia recovery team contributed to the preparation of this document. Matthew Wild (Environment Canada, Canadian Wildlife Service – Quebec) and Daniel Gagnon (Université du Québec à Montréal) were instrumental in the writing of the recovery strategy. Barbara Slezak and Angela Darwin (Environment Canada, Canadian Wildlife Service – Ontario), Leslie Hunt, Erin MacDonald, Shaun Thompson, Melissa Laplante, Lesley Dunn, Erica Oberndorfer, Rachel deCatanzaro, Patricia Désilets (Ministère du Développement durable, de l'Environnement et des Parcs) as well as Karine Picard, Vincent Carignan and Caroline Bureau (Environment Canada, Canadian Wildlife Service – Quebec) assisted with revisions and edits to the recovery strategy.

## EXECUTIVE SUMMARY

Blunt-lobed Woodsia (*Woodsia obtusa*) is a small to medium-sized fern with fronds measuring up to 60 cm long. It is characterized by the blunt, rounded lobes of its bright green leaves, which are retained late into the fall. In Canada, Blunt-lobed Woodsia is found growing on calcareous rocks under a relatively open canopy, on south to southwest facing slopes. The species is widespread in the Eastern United States but reaches the northern limit of its range in southern Ontario and Quebec. Canada is home to eight known populations: four in Ontario and four in Quebec. The total number of individual plants in Canada as of 2005 was approximately 1,322. Blunt-lobed Woodsia is currently listed as Threatened in Canada on Schedule 1 of the *Species at Risk Act*. In 2003, the Ontario provincial status was uplisted from Threatened to Endangered, and in 2005 the species was designated Threatened in Quebec. Therefore, the species is protected under the *Endangered Species Act, 2007* in Ontario, the *Act Respecting Threatened or Vulnerable Species* in Quebec, as well as under the federal *Species at Risk Act* (SARA).

Threats to Blunt-lobed Woodsia include invasive species and habitat disturbance by landscape alteration and recreation activities. Blunt-lobed Woodsia is also limited by its small population size and specific microhabitat requirements. Given that the species is found at the northern extent of its range and has a naturally limited distribution in Canada, it will likely always be vulnerable to anthropogenic and natural stressors. There are currently knowledge gaps concerning the species' historical population and distribution, its biological and ecological requirements, its specific microhabitat requirements, and other unknown threats to the species.

There are unknowns regarding the feasibility of recovery of Blunt-lobed Woodsia in Canada. In keeping with the precautionary principle, this recovery strategy has been prepared as per section 41(1) of SARA as would be done when recovery is determined to be feasible. This recovery strategy addresses the unknowns surrounding feasibility of recovery. The population and distribution objective for Blunt-lobed Woodsia is to maintain extant populations and their habitat in the Canadian range.

Critical habitat is identified in this recovery strategy for all known Blunt-lobed Woodsia populations in Canada. As additional information becomes available, additional critical habitat may be identified where sites meet the critical habitat criteria.

One or more action plans for Blunt-lobed Woodsia will be posted on the Species at Risk Public Registry by December 2017.

## RECOVERY FEASIBILITY SUMMARY

Based on the following four criteria outlined by the Government of Canada (2009), there are unknowns regarding the feasibility of recovery of Blunt-lobed Woodsia. In keeping with the precautionary principle, a recovery strategy has been prepared as per section 41(1) of SARA, as would be done when recovery is determined to be feasible. This recovery strategy addresses the unknowns surrounding the feasibility of recovery.

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

Yes. There are individuals in Canada and in adjacent U.S. states. The species does not appear to have biological limitations to growth, nor do ferns in general seem to be limited by dispersal (due to long distance dispersal by spores) (Tryon 1970). When grown in a greenhouse, Brown (1964) found that Blunt-lobed Woodsia “grew like a weed” suggesting population growth and distribution may be primarily limited by specific habitat requirements.

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

Yes. At a large scale, Blunt-lobed Woodsia habitat is relatively rare and specialized (i.e., sloped calcareous bedrock, relatively low canopy cover). However, where these areas exist, there appears to be a considerable amount of suitable habitat available to Blunt-lobed Woodsia, although there are no precise estimates. The fern does not occupy areas that appear identical to habitats in which it is known to occur (Consaul 1994), and results from a microhabitat study (Wild 2003; Wild and Gagnon 2005) suggest that nearby unoccupied but apparently suitable sites could become candidates for the artificial establishment of new populations. Potential habitat is therefore thought to exist within the Great Lakes-St Lawrence forest region, along the Frontenac Axis in Ontario and the Eardley Escarpment in Quebec.

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

Unknown. Threats to this species and the factors limiting its population size and distribution are poorly understood. While some of the known threats to Blunt-lobed Woodsia may be mitigated through habitat protection and stewardship, others (e.g., invasive species) may be more difficult to address.

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

Unknown. *Ex situ* propagation of Blunt-lobed Woodsia has been shown to be successful and could be used to augment the size of existing populations or to establish new ones (see Brown 1964). However, the factors that differ between apparently identical occupied and unoccupied sites are poorly understood (Wild 2003).

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## 1. COSEWIC\* SPECIES ASSESSMENT INFORMATION

**Date of Assessment:** April 2007

**Common Name (population):** Blunt-lobed Woodsia

**Scientific Name:** *Woodsia obtusa*

**COSEWIC Status:** Threatened

**Reason for Designation:** A species with a highly fragmented distribution in Canada where it is known only from southeastern Ontario and southwestern Quebec at eight small localized sites. One additional population is now considered to be extirpated. The fern occurs almost exclusively on warm and relatively dry calcareous rocky slopes. The total Canadian population consists of fewer than 1,400 mature plants. The primary threat is at the largest population due to the anticipated loss of habitat quality and decline in the fern population as a consequence of the presence and spread of an exotic invasive shrub. Most sites, however, are in protected areas or undisturbed sites where recruitment is occurring.

**Canadian Occurrence:** Ontario, Quebec

**COSEWIC Status History:** Designated Threatened in April 1994. Status re-examined and designated Endangered in May 2000. Status re-examined and designated Threatened in April 2007. Last assessment based on an update status report.

\*Committee on the Status of Endangered Wildlife in Canada

## 2. SPECIES STATUS INFORMATION

While Blunt-lobed Woodsia is Globally Secure (G5), it is ranked as Critically Imperiled in Canada (N1) and in Ontario and Quebec (S1) (NatureServe 2010). This species is considered Threatened within Canada by COSEWIC and is listed on Schedule 1 of the *Species at Risk Act* (SARA). It is listed as Threatened in Quebec under the *Act Respecting Threatened or Vulnerable Species*, and as Endangered on the Species at Risk in Ontario List under the *Endangered Species Act, 2007*. The percentage of Blunt-lobed Woodsia's global distribution found in Canada is estimated to be less than 1%.

Blunt-lobed Woodsia is ranked as Critically Imperiled (S1) to Vulnerable (S3) in most New England states and in Delaware, Michigan, and Florida (NatureServe 2010), but is abundant in several eastern states and not reported as rare in New York State (Consaul 1994).

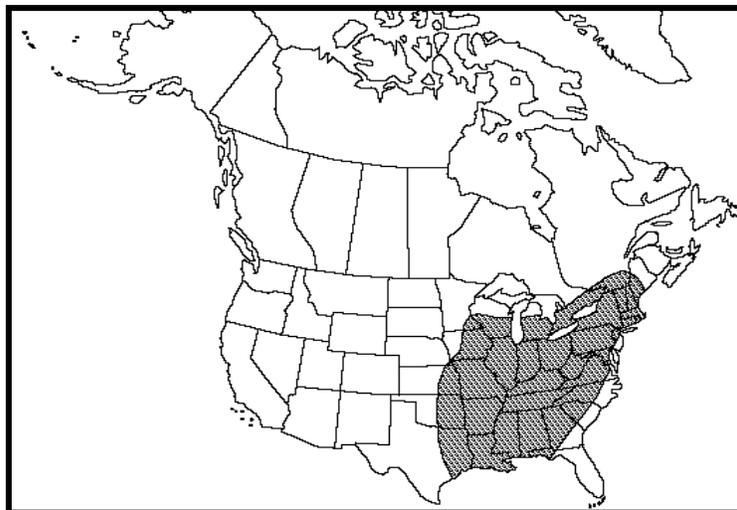


Figure 1. Global distribution of Blunt-lobed Woodsia (<http://flora.huh.harvard.edu>).

### 3. SPECIES INFORMATION

#### 3.1 Species Description

Blunt-lobed Woodsia (*Woodsia obtusa*) is a small to medium-sized fern characterized by the blunt, rounded lobes of its bright green fronds, which are retained late into the fall. Fronds grow up to 60 cm long and 15 cm wide. The leaf stalk (rachis) is straw-coloured, occasionally darker at the base and relatively brittle. The blade is coarsely cut and twice divided (2-pinnate), typically composed of 8-17 pairs of leaflets (pinnae) (COSEWIC 2007). While two subspecies of Blunt-lobed Woodsia are currently recognized, only *Woodsia obtusa* subsp. *obtusa* occurs in Canada (COSEWIC 2007). Blunt-lobed Woodsia may be confused with the Common Fragile Fern (*Cystopteris fragilis*), but is distinct in having a stiffer aspect, glands and scales on the axes and veins, as well as opaque stipes<sup>1</sup> (COSEWIC 2007).

#### 3.2 Population and Distribution

Blunt-lobed Woodsia is widespread in the eastern United States, occurring in all states east of the 100th parallel (except North Dakota and South Dakota). It extends as far north as southeastern Canada (Ontario and Quebec) and as far south as southcentral Texas and northern Florida (Brown 1964). It is not generally found on the Atlantic coastal plain (Brown 1964). It is a common species in the northeastern U.S. (Consaul 1994).

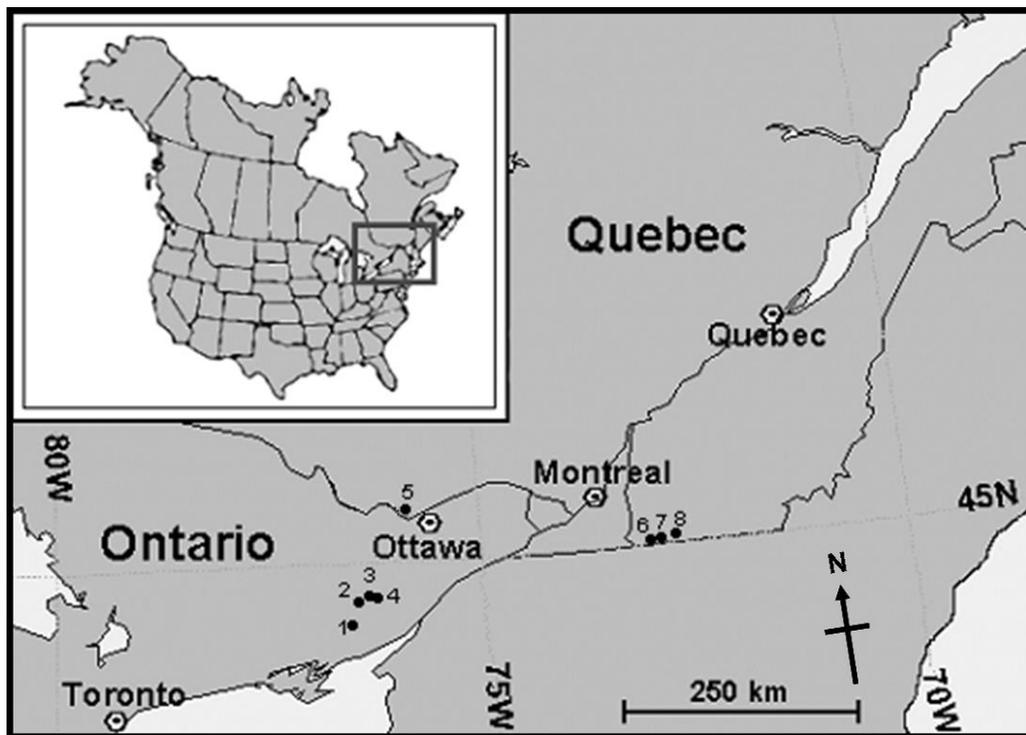
In Canada, Blunt-lobed Woodsia is found only in eastern Ontario and southern Quebec, where occurrences of the species are at the northern edge of its distribution range. Canada is home to eight known populations: four in Ontario and four in Quebec. The total number of individual plants in Canada as of 2005 is approximately 1,322. Details of the estimated national abundance can be found in Table 1.

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<sup>1</sup> supporting stalk or stem-like structure of a fern frond

In Ontario, the species is found in four locations (Figure 2): (1) Frontenac Provincial Park (Frontenac County, 35 km north of Kingston); (2) Sand Lake Area of Natural and Scientific Interest (ANSI) (Leeds County, just northwest of Westport); (3) Crown land site on Rideau Trail between two of the known Ontario sites near Westport; and (4) Foley Mountain Conservation Area (Leeds County, just northeast of Westport, on the north shore of Rideau Lake). In Quebec, there are four known populations; one of them (5) is in Gatineau Park in the Ottawa Valley (Comté de Gatineau, a few km north of Ottawa-Hull), and the other three (6, 7, 8) are located in southeastern Quebec near the border with Vermont (Comté de Missisquoi: St-Armand, Frelighsburg).

Two of the southeastern Quebec populations have been known for decades, having both been discovered in 1936 (Rouleau 1947; Scoggan 1978); the third was discovered in 2000 (COSEWIC 2007). These sites consist of outcroppings of dolomitic rock under forest shade. As the soils are impossible to cultivate, these sites have remained forested and unchanged. The species was first discovered in Gatineau Park in 1972 and in eastern Ontario in 1973 (Lafontaine 1973; Cody 1978; Cody and Britton 1989).



**Figure 2. Distribution of Blunt-lobed Woodsia in Canada (COSEWIC 2007).**

A fifth Quebec population of Blunt-lobed Woodsia was formerly known from Gatineau Park, but has not been recently relocated despite recent targeted search efforts, and is presumed extirpated. This Gatineau Park population is the only known population that has declined or been extirpated. All other populations appear stable, and increased sampling efforts have yielded increases in population estimates.

There is no evidence and insufficient historical and long-term data to support overall trends (population decline or increase) in the distribution of Blunt-lobed Woodsia in Canada. A new site was discovered in 2003; however, this is in close proximity (within 1 km) to two other populations near Westport, Ontario, and is very likely a sub-population of an existing one. The discovery of “new” populations does not necessarily reflect an expansion in range or distribution; the population may have previously existed, and had either not been surveyed or remained undetected by researchers. Similarly, the increased sampling effort has made it difficult to determine whether populations are actually increasing, since increases in population numbers are likely correlated with sampling effort.

**Table 1. Size and abundance of known Canadian populations (modified from COSEWIC 2007).**

Site Name	Population number (Figure 2)	Approx. area	Last visited	Mature individuals	Previously reported numbers
Frontenac Provincial Park (ON)	1	10 m <sup>2</sup>	2005	64	~47 (1990)
Westport – Sand Lake (ON)	2	2 x 500 m <sup>2</sup>	2005	499	~28 (1990)
Westport – Rideau Trail (ON)	3	60 m <sup>2</sup>	2009	82 <sup>1</sup>	~30 (2004)
Foley Mountain Conservation Area (ON)	4	100 m <sup>2</sup> + 150 m <sup>2</sup>	2008	212 <sup>1</sup>	~10 (1978)
Gatineau Park (Eardley) (QC)	5	500 m <sup>2</sup>	2005	300	~200 (1971)
Saint-Armand (QC)	6	2 x 25 m <sup>2</sup>	2001	40	70 (1994)
Ch. Saint-Armand (QC)	7	50 m <sup>2</sup>	2005	120	~30 (2000)
Frelighsburg (QC)	8	<5 m <sup>2</sup>	1993	5-6	5-6 (1993)
Total		~1925 m <sup>2</sup>		~1322	~420

<sup>1</sup> Reported population counts are from surveys conducted in 2005; no formal counts were conducted during more recent site visits by S. Thompson, but numbers appeared to be similar to 2005 counts.

\*The presumed extirpation of the second Gatineau Park population (Champlain – not shown here) has altered total population estimates from the original COSEWIC 2007 version of this table.

### 3.3 Needs of the Blunt-lobed Woodsia

All the Canadian populations of Blunt-lobed Woodsia are located on rocky outcrops in the Great Lakes and St. Lawrence forest regions where the average soil depth is 3.5 cm. These populations grow on south-facing slopes exposed to warm, relatively dry conditions. Blunt-lobed Woodsia is typically found in Sugar Maple (*Acer saccharum*) forests mixed with Red Oak (*Quercus rubra*), White Oak (*Quercus alba*), White Ash (*Fraxinus americana*) and Ironwood (*Ostrya virginiana*), where the trees provide significant cover (COSEWIC 2007).

In Ontario, the species appears to exist only on the Frontenac Axis, at the eastern edge of the Precambrian Shield, which contains some areas of calcareous metamorphic bedrock (Wild and Gagnon 2005; COSEWIC 2007). The Shield forms the north-western shore of Rideau Lake (where the four known Ontario populations are found), whereas the eastern shore consists of

Paleozoic limestone. Frontenac Provincial Park is located entirely on the Frontenac Axis. In Gatineau Park, which consists mostly of Precambrian bedrock, the Eardley Escarpment is a contact zone with the limestone bedrock of the Ottawa Valley. Blunt-lobed Woodsia occurs in the southeastern part of this Escarpment, where there are large areas of marble. In southeastern Quebec, the presence of dolomitic outcrops, at least under partial forest cover, appears to be directly associated with Blunt-lobed Woodsia habitat.

At the northern edge of its North American range, Blunt-lobed Woodsia seems to occur in microhabitats that have a warmer microclimate, such as south to south-west facing slopes (i.e., Westport, Gatineau Park), as well as substrates that are calcium-rich. It has been previously observed that plants that are not calciphilic near the centre of their range sometimes become restricted to calcareous soils at the northern edge of their range. Whether this is linked to nutrient availability or another microclimate effect (e.g., calcareous rocks are porous and drain more rapidly in spring, allowing soils to warm up faster) is not certain. A requirement for calcium has been identified in Blunt-lobed Woodsia, without which it cannot form archegonia or antheridia (the structures in which reproductive cells develop) (Bryan and O'Kelley 1967).

In a study conducted by Wild and Gagnon (2005), quantitative microhabitat data were recorded for six Canadian Blunt-lobed Woodsia populations, including soil chemistry for two of the populations. Table 2 summarizes specific habitat characteristics for Blunt-lobed Woodsia in Canada.

**Table 2. Results from Blunt-lobed Woodsia microhabitat studies (Wild and Gagnon 2005; COSEWIC 2007).**

Microhabitat element	Average	Range
Soil depth (cm)	3.5	0.5 - 9.5
Substrate angle (degrees)	43	26 - 88
Canopy openness (%)	18	4 - 60
Slope aspect (% south)	69	27.8 - 94.4
pH	6.60	5.94 - 7.11

A component of the same study that investigated the presence/absence in suitable habitat, showed no significant differences in characteristics measured between occupied and unoccupied habitats, thereby suggesting that unoccupied suitable habitat may be available for this species (Wild 2003; Wild and Gagnon 2005). Blunt-lobed Woodsia distribution was found to be positively correlated with a semi-open canopy. An open light environment seems to be optimal; both frond length and number of fronds per individual significantly increase when canopy openness increases. However, it is suggested that the open habitat of northernmost populations could reflect a microclimatic requirement (heat, longer growing season, etc.) rather than a light requirement (Wild 2003).

### 3.4 Biological Limiting Factors

The small size of Blunt-lobed Woodsia populations in Canada makes it vulnerable to habitat changes (alteration or loss). Population recruitment may be limited by natural factors, such as conditions occurring at the northern limit of the species' range.

Another potentially limiting attribute of Blunt-lobed Woodsia in Canada might be its specialized habitat requirements at the landscape scale. Given that spores of many fern species are dispersed through the air over great distances (Wagner and Rouleau 1984) and the fact that not all habitats suitable to a fern species are occupied, suggests that local ecological factors may be limiting their establishment. In the case of Blunt-lobed Woodsia, large quantities of spores have been found at relatively large distances (>50 m) from the source plants, indicating that dispersal is likely not a limiting factor (COSEWIC 2007). Microhabitat requirements must therefore be sufficiently narrow that significant changes (sufficient to prevent establishment) can occur over very small distances (a few cm). It is possible that the microhabitat requirements of Blunt-lobed Woodsia are much narrower (or strict) at the edge of its distribution range (i.e., in Canada).

Other specific characteristics of the species' life history or ecology that make it particularly sensitive to disturbance and/or can influence its recovery potential have yet to be discovered.

## 4. THREATS

### 4.1 Threat Assessment

Threats to the Canadian populations of Blunt-lobed Woodsia are presented in Table 3 in decreasing order of concern.

**Table 3. Threat Assessment Table**

Threat	Level of Concern <sup>1</sup>	Extent	Occurrence	Frequency	Severity <sup>2</sup>	Causal Certainty <sup>3</sup>
<b>Exotic, invasive or introduced species</b>						
<b>Invasive species (<i>Rhamnus cathartica</i>)</b>	High	Localized	Current	Continuous	Medium	Medium
<b>Habitat loss and degradation</b>						
<b>Residential construction or landscaping</b>	Low	Localized	Historic/current	Recurrent	High	High
<b>Recreation (e.g., hiking, climbing)</b>	Low	Unknown	Current	Recurrent	Unknown	Low

<sup>1</sup> *Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the recovery of the species, consistent with the population and distribution objectives. This criterion considers the assessment of all the information in the table).*

<sup>2</sup> *Severity: reflects the population-level effect (High: very large population-level effect, Moderate, Low, Unknown).*

<sup>3</sup> *Causal certainty: reflects the degree of evidence that is known for the threat (High: available evidence strongly links the threat to stresses on population viability; Medium: there is a correlation between the threat and population viability e.g. expert opinion; Low: the threat is assumed or plausible).*

## 4.2 Description of Threats

### Exotic, Invasive, or Introduced Species

At the Westport Sand Lake site, brush clearing and tree removal have opened the canopy, promoting establishment and spread of the Common Buckthorn (*Rhamnus cathartica*). This invasive alien shrub has the ability to alter the fern's natural habitat and have a negative impact on survival. Specifically, the Common Buckthorn decreases light penetration to the understory, and may also have an impact on native species through below-ground competition or allelopathy (Knight et al. 2007). Increased bird activity around bird feeders in the area may also be contributing to the spread of Common Buckthorn, as seeds may be deposited at the site in bird droppings (COSEWIC 2007).

### Habitat Loss and Degradation

While the habitat of Blunt-lobed Woodsia has shown signs of minimal physical disturbance over the past several years, no sites have been dramatically altered (COSEWIC 2007). Many known sites are in protected areas, and most are accessed infrequently and are not likely to suffer from direct human disturbance. The major threat on privately owned land would likely be development (e.g., building, landscaping, agriculture). However, because Blunt-lobed Woodsia generally occurs on steep rock faces, many of the sites lie on land that is unsuitable for development. One exception is the largest population at the Westport Sand Lake site, which is on privately owned land and has experienced the removal/felling of trees and garbage dumping in past years (Thompson pers. comm., 2005; COSEWIC 2007). Similarly, there is very little threat of damage from climbers or hikers at the sites because the slopes are too steep for hiking and not steep enough for rock climbing.

The selective removal of trees has not been shown to be deleterious to Blunt-lobed Woodsia. In fact, it may be beneficial, as the fern naturally occurs in semi-open and dry wooded areas. However, opening of the canopy may have a negative effect on Blunt-lobed Woodsia if it leads to the establishment and spread of invasive species such as the Common Buckthorn.

## 5. POPULATION AND DISTRIBUTION OBJECTIVES

The population and distribution objective for Blunt-lobed Woodsia is to maintain extant populations and their habitat in the Canadian range.

Given the naturally small distribution and population of Blunt-lobed Woodsia in Canada and the apparent recent loss of one population for unknown reasons, further studies are required to support meeting the population and distribution objectives for this species. Areas for further study include: improving understanding of the species' ecology; the nature of threats to Blunt-lobed Woodsia; whether additional populations exist; and reintroduction and augmentation techniques (should they be required to maintain populations in the Canadian range).

## **6. BROAD STRATEGIES AND GENERAL APPROACHES TO MEET OBJECTIVES**

### **6.1 Actions Already Completed or Currently Underway**

#### **Monitoring**

Extant population monitoring was conducted annually at all sites between 2000 and 2005 (for details see COSEWIC 2007). Since 2000, historical occurrences of Blunt-lobed Woodsia have been surveyed to update occurrence information. Searches for new populations have occurred, and a new site, containing approximately 30 plants, was discovered in July 2003 between two of the known Ontario sites near Westport.

#### **Stewardship and Protection**

Public outreach and awareness programs are underway. All landowners with Blunt-lobed Woodsia on their land have been contacted and are aware of the species' presence (COSEWIC 2007). In some cases, stewardship discussions have been initiated. Efforts to encourage and aid municipalities to participate in the protection of Blunt-lobed Woodsia and other endangered plants are ongoing. In addition, the creation of mapping guidelines for eligibility under the Ontario Conservation Land Tax Incentive Program (CLTIP) was initiated in 2003.

#### **Research**

Through funding secured from World Wildlife Fund Canada and Environment Canada (Endangered Species Recovery Fund), the Ontario Ministry of Natural Resources and the Quebec Ministère du Développement durable, de l'Environnement et des Parcs, as well as a partnership with Gatineau Park (National Capital Commission), a number of recovery actions for Blunt-lobed Woodsia were initiated in 2001. These recovery actions include an investigation of the ecology of the species, extant population surveying and mapping and investigation of precise habitat and microhabitat characteristics. Extensive searches of potential habitat for new populations and of potential sites for establishing new populations were also initiated. Habitat suitability modeling for Blunt-lobed Woodsia has been undertaken by the Eastern Ontario Model Forest (EOMF), as well as the St. Lawrence Islands National Park (for the Frontenac Axis).

## 6.2 Strategic Direction for Recovery

**Table 4. Recovery Planning Table**

<b>Threat or Limitation</b>	<b>Priority</b>	<b>Broad Strategy to Recovery</b>	<b>General Description of Research and Management Approaches</b>
Small population size; Residential construction or landscaping; Recreation	High	Extant population survey, mapping and monitoring	<ul style="list-style-type: none"> <li>• Surveys, detailed mapping and monitoring of known populations.</li> </ul>
Knowledge gaps; Small population size	High	Search for new populations	<ul style="list-style-type: none"> <li>• Focus search for new populations on areas with suitable habitat characteristics;</li> <li>• Develop a habitat model.</li> </ul>
Invasive species; Residential construction or landscaping	High	Protection of extant and newly discovered populations on private (non-federal) land	<ul style="list-style-type: none"> <li>• Encourage landowner stewardship (e.g., conservation easements), and develop conservation/ management plans that include measures to control the spread of invasive species (e.g., Common Buckthorn);</li> <li>• Encourage private landowners to participate in the Conservation Land Tax Incentive Program in Ontario.</li> </ul>
Residential construction or landscaping; Invasive species	Medium	Protection of extant and newly discovered populations on public land	<ul style="list-style-type: none"> <li>• Develop provincial habitat mapping guidelines;</li> <li>• Incorporation of Blunt-lobed Woodsia and its habitat (including invasive species control) into management plans and official plans.</li> </ul>
Knowledge gaps; Specific microhabitat requirements	Medium	Develop better understanding of biological limiting factors	<ul style="list-style-type: none"> <li>• Improve knowledge of the species' ecology (e.g., dispersal), potential limiting factors and/or threats to direct future recovery efforts and determine the minimum viable population size for this species;</li> <li>• Investigate the impacts of changes in canopy cover on Blunt-lobed Woodsia.</li> </ul>
Residential construction or landscaping	Low	Encourage municipalities to participate in protection of Blunt-lobed Woodsia	<ul style="list-style-type: none"> <li>• Inform municipalities of the locations of Blunt-lobed Woodsia, and provide information on legislative and policy tools for protection.</li> </ul>

Recreation; Residential construction or landscaping	Low	Public outreach and awareness	<ul style="list-style-type: none"> <li>• Produce information for recreational users of Blunt-lobed Woodsia habitat and work in collaboration with parks to develop visitor education programs;</li> <li>• Produce information for the general public and landowners and give talks to landowners re: regulation and ESA 2007.</li> </ul>
Knowledge gaps; Small population size	Low	Conduct demographic and genetic studies	<ul style="list-style-type: none"> <li>• Genetic analysis of Canadian populations and U.S. populations as a reference.</li> </ul>
Small population size	Low	Augment populations	<ul style="list-style-type: none"> <li>• If determined to be necessary and feasible, investigate techniques to augment populations (collect and store spores, develop methods for propagation).</li> </ul>

### **6.3 Narrative to Support the Recovery Planning Table**

#### **Extant population survey, mapping and monitoring**

Compiling complete records of extant populations will require periodic visits and counts of Blunt-lobed Woodsia individuals, along with detailed habitat mapping of each site. Baseline monitoring is essential in order to assess any future changes to population size and habitat quality. Survey and monitoring results should be submitted to provincial data centres (i.e., Ontario Natural Heritage Information Centre and Centre de données sur le patrimoine naturel du Québec) to ensure up-to-date information is available to individuals and organizations implementing recovery activities.

#### **Protection of populations (private land stewardship, protection on public lands, working with municipalities)**

Private land stewardship is important for the recovery of this species, especially given that 25% of the known individuals for this species in Canada occur on a single private property. Landowners will be encouraged to participate in stewardship programs and to implement management plans that address the threats to Blunt-lobed Woodsia and its habitat, including control of invasive species. Environment Canada's Habitat Stewardship Program (HSP) has supported several projects targeted toward the conservation and protection of Blunt-lobed Woodsia and its habitat.

Working in collaboration with municipal and regional planning offices and protected area managers will guide land use planning, permitted activity policies and visitor education programs, and in informing both legislative and policy tools towards the protection of this species.

#### **Searches for new populations**

In the past, potential habitat for Blunt-lobed Woodsia populations was likely overlooked since basic habitat information for known occurrences was incomplete. Based on what is currently known of habitat requirements, priority areas to be searched include the rocky slopes on the shores of Rideau Lake, north and southwest of the Westport population, as well as suitable slopes (south facing, on marble bedrock) on the Eardley Escarpment of Gatineau Park. Further research and the development of a habitat model will likely reveal additional suitable areas to be searched.

#### **Research on threats and limiting factors**

Further studies may be required to identify and clarify threats facing Blunt-lobed Woodsia, so that extant populations can be managed to ensure their persistence.

A clear understanding of the beneficial or negative effects of canopy openings is lacking. Studies on light will improve understanding of the role of the canopy, and determine whether the canopy is closing or opening at extant sites. The extent to which Common Buckthorn is having an impact on Blunt-lobed Woodsia (e.g., via shading) also needs to be investigated.

Research is underway to identify habitat and microhabitat characteristics of Blunt-lobed Woodsia. Such information could be used to determine if unoccupied sites are suitable for the

species, and to select sites for potential artificial establishment of new populations, if feasible. Intensive survey efforts and microhabitat analyses may reveal previously unsuspected threats.

**Perform demographic and genetic studies, and augment the extant population *ex situ***

Knowledge of the techniques and methods for artificial propagation, as well as a clear understanding of the biology, ecology, and genetics of Blunt-lobed Woodsia, will be essential should reintroduction be determined to be necessary and feasible. Greenhouse propagation techniques of the species have been shown to be relatively straight forward but more information is required.

## 7. CRITICAL HABITAT

### 7.1 Identification of the Species' Critical Habitat

Critical habitat is identified in this recovery strategy for all known Blunt-lobed Woodsia populations in Canada. Critical habitat includes the current area that the populations occupy plus the surrounding suitable habitat. Additional critical habitat may be identified across the range of the species as more information becomes available.

#### 7.1.1 Suitable Habitat

As an obligate calcicole (i.e., plant that does not tolerate acidic soil) occurring on marble, dolomite and limestone, the first consideration in describing suitable habitat for Blunt-lobed Woodsia is the bedrock on which it occurs. For the Ontario occurrences, the bedrock is Precambrian but not acidic (pHs of 6.2-6.7 are reported by Consaul (1994) for the Westport site). In Gatineau Park, the largest population occurs over marble bedrock. Dolomite ( $\text{CaCO}_3$  and  $\text{MgCO}_3$ ) is the bedrock at Frelighsburg and St-Armand. This calcareous nature of the substrate (or at least the presence of some rocks with significant amount of calcium) is reflected by the presence of several well known calciphilic plants in the same habitat as Blunt-lobed Woodsia, such as Eastern Red Cedar (*Juniperus virginiana*), Common Snowberry (*Symphoricarpos albus*) and Fragrant Sumac (*Rhus aromatica*). Other species of fern such as Common Fragile Fern share the same habitat as Blunt-lobed Woodsia (Cody and Britton 1989).

A second common feature of Canadian populations is the slope and aspect: all populations are found on slopes between 20° and 60° with a southern-facing aspect between 110°N and 250°N (Wild 2003). In addition, these sites also have thin surficial soils (< 15 cm) (Wild 2003).

Biotic conditions include vegetation communities such as Sugar Maple forest with Red Oak, White Oak, White Ash, and/or Ironwood (Consaul 1994), with canopy opening varying from 10% to 40% (Wild and Gagnon 2005) and numerous rock outcroppings. These conditions are based on those found in extant populations in Canada. They have previously been described in Consaul (1994), Wild (2003) and Wild and Gagnon (2005).

**Habitat Suitability Criteria:** Suitable habitat for Blunt-lobed Woodsia is identified as locations where the following biotic and abiotic conditions are present:

- Bedrock containing calcium (e.g., marble, dolomite, limestone)

- Slopes with a southern-facing aspect between 110°N and 250°N
- Slopes between 20° and 60°
- Thin surficial soils (< 15 cm)
- Canopy opening varying from 10% to 40%

### 7.1.2 Application of Blunt-lobed Woodsia Critical Habitat Criteria

Critical habitat is identified as sites currently known to be occupied by Blunt-lobed Woodsia that meet the Habitat Suitability Criteria (see Section 7.1.1). Critical habitat extends laterally on either side of extant populations for as far as both abiotic and biotic conditions (as described in Section 7.1.1) exist. Although Blunt-lobed Woodsia often only occupies a small portion of the slope, the entire slope (between 20° and 60°) will be considered critical habitat in areas where there are known populations of the species. The rationale for the vertical dimension of the slope (height) is that any disturbance upslope is likely to have a direct effect on populations below, and areas downslope are more likely to be colonised by new individuals. As for the horizontal dimension (breadth, lateral), because colonisation is also possible along the full extent of the slope (as long as aspect and bedrock remain the same) it is also included as critical habitat. To be included as critical habitat, the suitable habitat must be contiguous (at the landscape scale) with the extant population except in the case of the Frontenac Park population. Breaks in suitable habitat attributes, such as roads or clearings, signify the end of contiguous habitat.

The critical habitat attributes for the Frontenac Park population occur on an extremely small slope (height < 5 m, breadth < 10 m). The site is very heterogeneous with very small patches of “suitable” habitat contained within a large matrix of “non-suitable” habitat. Empirical evidence indicates that Blunt-lobed Woodsia spores disperse at least 50 m and the number of spores in the soil at that distance strongly suggests that spores can disperse much further (M. Wild, unpubl. data). Given the heterogeneous nature of the site, a 50 m radius would not likely contain any other “suitable” patches yet similar slopes in the vicinity need to be included to allow for colonisation and survival of this species. In this case, critical habitat for the Frontenac Park population is the suitable habitat (as described in Section 7.1.1) occurring within 250 m in any direction of the extant population.

Application of the critical habitat criteria to available information identifies 8 sites containing critical habitat in Canada (Table 5). It is important to note that the centroids represent the site polygon that contains the critical habitat, and not the extent or boundaries of the critical habitat itself.

The description and centroid of critical habitat of the Frontenac Park site (Appendix B) have been removed from the public document. As this population is small in size and is relatively accessible to members of the public, making its location known could leave it vulnerable to destruction by inadvertent trampling by visitors wishing to view the rare plant, and may also increase the potential for collection.

**Table 5: Sites in Canada Identified as Containing Critical Habitat for Blunt-lobed Woodsia**

Site Name	Province	Description	Site Centroid			Land Tenure
			UTM Zone	Easting	Northing	
Frontenac Park	ON	----	----	----	----	Non-federal
Westport – Sand Lake	ON	North shore of Westport (Sand) Lake	18	387906	4949163	Non-federal
Westport – Rideau Trail	ON	North shore of Westport Pond	18	388940	4948855	Non-federal
Foley Mountain Conservation Area	ON	North shore of Upper Rideau Lake	18	390470	4948697	Non-federal
Gatineau Park	QC	Eardley Escarpment	18	433750	5035445	Federal (NCC <sup>1</sup> )
Saint-Armand	QC	The south-facing dolomite outcroppings	18	652485	4986559	Non-federal
Ch. Saint-Armand	QC	The south-facing dolomite outcroppings	18	655784	4988933	Non-federal
Frelighsburg	QC	The south-facing dolomite outcroppings	18	667451	4991353	Non-federal

<sup>1</sup>National Capital Commission

## 7.2 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 were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single or multiple activities at one point in time or from the cumulative effects of one or more activities over time (Government of Canada 2009).

Activities that are likely to result in the destruction of Blunt-lobed Woodsia critical habitat include (but are not limited to):

- Activities (e.g., clearcutting, extraction) resulting in large open areas that promote establishment of other species (e.g., Common Buckthorn) that compete with Blunt-lobed Woodsia for light or below-ground resources, thereby decreasing survival of Blunt-lobed Woodsia;
- Development (e.g., building, landscaping, agriculture, garbage dumping) that physically covers the critical habitat for Blunt-lobed Woodsia and prevents germination and growth of individuals;
- Any activities (e.g., excessive pedestrian traffic) that might destabilize the slope, leading to a loss of substrate required for the establishment and growth of Blunt-lobed Woodsia.

## **8. MEASURING PROGRESS**

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives. Specific progress towards implementing the recovery strategy will be measured against indicators outlined in subsequent action plans.

Every five years, success of recovery strategy implementation will be measured against the following performance indicators:

- Continued persistence of extant populations, including any newly discovered populations;
- Maintain the number of individuals in extant populations;
- Maintain the extent of suitable habitat at extant sites.

## **9. STATEMENT ON ACTION PLANS**

One or more Action Plans will be completed for Blunt-lobed Woodsia by December 2017.

## 10. REFERENCES

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## **APPENDIX A: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES**

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

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

The strategies and approaches identified in the Recovery Strategy for Blunt-lobed Woodsia are expected to positively affect or have no significant adverse impacts on the environment and other native species. The broad strategies call for searches for new populations, monitoring and protection of existing populations, and raising awareness of the species.

## **APPENDIX B: CENTROID OF THE CRITICAL HABITAT FOR THE FRONTENAC PARK POPULATION**

*This appendix has been removed from the document posted on the Public Registry.*