



Management Plan

Mountain Fern (*Thelypteris quepaertensis*)

Prepared by the Wildlife Division

Department of Environment & Conservation

Wildlife Division



What is the *Endangered Species Act*?

The *Endangered Species Act* was enacted in 2001 to ensure that species at risk of extinction in Newfoundland and Labrador, as well as their residence and habitat critical to their survival and recovery, receive protection. Furthermore, the *Endangered Species Act* ensures that efforts to recover these species are initiated. This legislation applies to species, sub-species and populations that are native to the province, but does not include marine fish, bacteria, or viruses. It also does not apply to introduced species, except in extraordinary circumstances. The *Endangered Species Act* fulfills the province's commitments to the *Accord for the Protection of Species at Risk*. The *Species at Risk Act*, was enacted in June 2003 as the federal government's contributing piece of legislation to the Accord.

What is recovery?

For species at risk of continued population decline or extinction, such as those listed in the *Endangered Species Act* as endangered, threatened, or vulnerable, recovery is the process by which its population decline is stopped, stabilized, and reversed. This occurs when a threat to the whole population or individuals is removed or reduced. A species is not considered to be recovered, and thereby removed from the *Endangered Species Act*, until its long-term persistence in the wild is secured. It is possible that a species will always be considered rare. This typically occurs when the species is restricted to an extremely unique or uncommon habitat or habitat loss has been extensive. For each species listed as endangered or threatened a recovery team is put in place to oversee the recovery process and write a recovery plan. For each species listed as vulnerable a management plan is written to guide the recovery process.

What is a management plan?

A management plan is developed by staff of the Wildlife Division in conjunction with species experts. It sets the goals and actions deemed necessary to prevent a species from further decline and identifies threats to the species' recovery. Section 24 of the *Endangered Species Act* states that a management plan will identify measures for the conservation of a species and include information that may be prescribed in regulations made by the Minister under subsection 44(2). A management plan has to be developed within three years of a species being listed under the *Endangered Species Act*. These management plans are reviewed regularly and updated as necessary.

What's the next step?

Implementing the plan! Many people work towards implementing the actions outlined in a management plan, including people from municipal, provincial, and federal governments, aboriginal groups, industry, universities, interest groups, and local communities. Each play a significant role in the implementation of the management plan. Success in species recovery depends on the commitment and cooperation of many different people and requires all responsible jurisdictions, as well as all Newfoundlanders and Labradoreans, to work together to support and implement management plans.

Disclaimer

A species listed as vulnerable under the Newfoundland and Labrador *Endangered Species Act* requires the development of a management plan. These management plans are prepared in cooperation with jurisdictions responsible for the species. Implementation of the goals and actions identified in this document ultimately depends on the ongoing program priorities and budgetary constraints of the participating jurisdictions and organizations. The goals and actions identified in a management plan are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives. They do not necessarily represent the official positions of the governmental or non-governmental organizations, or individuals, involved.

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COVER PHOTOGRAPH

Mountain Fern in Gros Morne National Park, Newfoundland, by Michael Burzynski.

RECOMMENDED CITATION

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RESPONSIBLE JURISDICTIONS

Government of Newfoundland and Labrador
Parks Canada Agency

EXECUTIVE SUMMARY

Mountain Fern (*Thelypteris quepaertensis* (H. Christ) Ching) was listed vulnerable under the Newfoundland and Labrador *Endangered Species Act* in 2007. It is a colony- or crown-forming fern of the Marsh Fern family (Thelypteridaceae). Its elliptical, light green fronds can reach heights of 75 cm in Newfoundland.

Mountain Fern is found in Eastern Asia, particularly in Japan and the adjacent Kurile Islands, and Korea; on the northwest coast of North America, from the Aleutian Islands and southeast Alaska southward to coastal British Columbia and Washington; and on the east coast of North America, on the Island of Newfoundland. Provincially, only a single population of Mountain Fern occurs. First discovered in 1973, this population is restricted to a few closely-associated patches in an alpine valley near Heather Pond in Gros Morne National Park. Two additional plants were found in 1998 near Arm Pond in Gros Morne National Park but recent surveys have failed to relocate them. As of 2004, there were an estimated 20 000 crowns of Mountain Fern growing at Heather Pond.

The Newfoundland Mountain Fern population occurs at an altitude between 490 m and 600 m. Plants can be found growing at the base of talus slopes in moist open subalpine meadows, beside lakeshores, brooks, and springs, in till-filled valleys, and beneath conifers.

It is always the purpose of management efforts for species at risk to ensure the long-term persistence of self-sustaining, viable populations throughout their current, and, where possible, historical range. It is likely that Mountain Fern has always been rare within the province. Although its population appears to be relatively stable, and although it is legally protected within Gros Morne National Park, the species may be susceptible to stochastic events and rescue from other populations does not appear to be possible. Conserving this species in Newfoundland and Labrador will require the implementation of specific management efforts, such as preventing habitat disturbance and ensuring that viable individuals of the species are maintained in an *ex situ* conservation program, as a precaution.

The following two goals have been identified as important to the long-term persistence of Mountain Fern in Newfoundland and Labrador:

Goal 1. Undertake research to close gaps in our understanding of Mountain Fern distribution and ecology.

Goal 2. Develop mitigation strategies for threats to Mountain Fern individuals and habitat.

The only known population of Mountain Fern in Newfoundland and Labrador is found entirely within the federal lands of Gros Morne National Park. Therefore, the success of management efforts will depend upon close cooperation between federal and provincial government organizations.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	ii
SPECIES INFORMATION	1
Assessment and Legal Status	1
Description	2
Ecology	3
Habitat	3
Distribution	4
Global	4
National	4
Provincial	4
Abundance and population trends	6
Traditional and local ecological knowledge	6
Existing protection	6
MANAGEMENT GOALS, OBJECTIVES AND ACTIONS	7
Goal 1: Undertake research to close gaps in our understanding of Mountain Fern distribution and ecology.	7
Goal 2: Develop mitigation strategies for threats to individuals and habitat.	9
Management action implementation schedule	12
LITERATURE CITED	13

SPECIES INFORMATION

ASSESSMENT AND LEGAL STATUS

Common name: Mountain Fern		Scientific name: <i>Thelypteris quepaertensis</i>	
Provincial Listing (ESA): Vulnerable		Federal listing (SARA): Not assessed	
Global: G4 Apparently Secure (NatureServe)	National: N4 Secure (<i>General Status</i>) N3 Vulnerable (NatureServe)	Provincial: S2 May be At Risk (<i>General Status</i>) S1 Critically Imperilled (NatureServe)	
SSAC assessment date: 2006		COSEWIC assessment date: N/A	
SSAC assessment history: Vulnerable (2006)		COSEWIC assessment history: N/A	
Reason for designation: Mountain Fern is restricted to a few closely-associated patches on the Island of Newfoundland. This population is the only one east of the Rocky Mountains. While it is relatively stable and is legally protected because it is located within the boundaries of Gros Morne National Park, it may be susceptible to stochastic events, and no rescue effect is likely.			
Newfoundland and Labrador occurrence: Mountain Fern is known from a single population restricted to a few patches within a valley in Gros Morne National Park.			
Canadian occurrence: The coast of British Columbia and the Island of Newfoundland.			
Current legal protection: <i>Endangered Species Act (NL), National Parks Act (Federal)</i>			

DESCRIPTION

Mountain Fern (*Thelypteris quepaertensis* (H. Christ) Ching) is a colony- or crown-forming fern of the Thelypteridaceae (Marsh Fern family). It can reach heights of 75 cm in Newfoundland but the fronds die back during the winter (Burzynski 2006).

The elliptical or lanceolate, light green Mountain Fern fronds grow at the end of a 3-20 cm long and 2-5 mm wide straw-colored petiole (Smith 1993). Fronds are pinnate with each pinna deeply divided into pinnules that taper gradually along the straw-coloured rachis to a pinnatifid apex (Smith 1993) (Figure 1). Mountain Fern is similar in appearance to the closely-related *Thelypteris limbosperma* ((Allioni) H. P. Fuchs) of Europe (Smith 1993).

Mountain Fern fronds are monomorphic, meaning that both the fertile and sterile fronds look alike. The undersides of the fertile fronds, near the margin of the pinnules are dotted with sori (clusters of spore producing bodies called sporangia). Sori are round with smooth tan indusia (Smith 1993). The contained sporangia are also smooth (Smith 1993).



Figure 1. A colony of Mountain Fern (*Thelypteris quepaertensis*) at Heather Pond in Gros Morne National Park (photo by M. Burzynski).

ECOLOGY

Very little is known about the ecology of the Mountain Fern population in Newfoundland, except that it is a component of a moist open subalpine meadow plant community where other ferns, such as *Osmunda cinnamomea*, *Osmunda claytoniana*, *Dryopteris* spp., and *Phegopteris connectilis*, are present (Burzynski 2003) and that the growth and spore development appear closely related to climatic conditions.

Fronde growth or elongation in the closely related *T. limbosperma* does not begin before soil temperature has reached 7°C, after which growth is largely controlled by air temperature (Odland 1995a). It has also been shown that the fertile fronds of *T. limbosperma* need a longer period of time to mature than those of other ferns do (Odland 1995a). Research on Mountain Fern in northern Japan has found that the life span of the fronds stretches from May to mid-November and that spore dispersal occurs from mid-July to mid-September (Sato 1982).

Mountain fern can reproduce vegetatively by sending out stolons (Burzynski 2006), horizontal shoots that grow below the soil surface that have buds which can give rise to genetic clones of the original plant. This reproductive behaviour can result in large colonies of thousands of crowns of Mountain Fern (Figure 1), but Mountain Fern can also grow singly (Burzynski 2006).

A microscopic examination of fronds collected from the Newfoundland population of Mountain Fern in 2002 and 2004 revealed that most of the sporangia (75%) were incompletely developed (Burzynski 2003, 2005) and thus sexual reproduction is limited. A single plant, which has been cultivated since 2004 at sea level in Rocky Harbour, Newfoundland and Labrador, has consistently produced fertile fronds with 100% development of the sporangia (personal com., M. Burzynski), indicating that sexual reproduction by Mountain Fern in the wild is limited by site and climatic conditions. Frond fertility of *T. limbosperma* has been correlated with frond size (with the highest number of sori occurring on medium-sized fronds) and can be predicted by referencing mean July and January temperatures, humidity, and canopy cover (Odland 1995b). Mountain fern spores are wind dispersed (Burzynski 2006).

In 2002, it was noted that some colonies of Mountain Fern had been browsed, possibly by moose (Burzynski 2003).

HABITAT

In Newfoundland, Mountain Fern is typically found growing at the base of talus slopes in moist open subalpine meadows, beside lakeshores, brooks, and springs, in till-filled valleys, and beneath conifers (Burzynski 2006). Moist soil and open conditions or light shade appear to be habitat requirements of the species (Burzynski 2006; Talbot *et al.* 2010). In Newfoundland, the entire known population of Mountain Fern grows at an altitude of between 490 m and 600 m where it appears to be at its altitudinal and

latitudinal climatic limits. In other locations it has been reported growing at altitudes of 30 m to 1300 m in open, rocky woods and subalpine meadows in acidic soils (Smith 1993).

Studies of the closely related, *T. limbosperma* in Norway found that climatic factors, altitude, and slope are significant predictors of occurrence and abundance. Specifically, *T. limbosperma* favoured moderately high winter (average -1.8 °C) and summer temperatures (optimum =12.6 °C), high humidity (179.2 [de Martonne's humidity index]), medium altitude (459.5 m), a slope of 22.5°, and soils of low pH and base content (Odland *et al.* 1995). Recent work in the Aleutian Islands supports these habitat requirements and those reported by Burzynski (2003, 2005, and 2006). Talbot *et al.*

(2010) described an *Erigeron peregrinus* - *Thelypteris quelpaertensis* meadow as a statistically unique type of habitat through a vegetation analysis. Key features of this habitat were that it occurred at mean elevations of 273 m, on slopes of, on average, 27°, had acidic soils (average of pH 5.05), and had moist to very wet soils containing free flowing water (i.e. mesic to sub-hydric soils) (Talbot *et al.* 2010).



Figure 2. A colony of Mountain Fern (*Thelypteris quelpaertensis*) in its typical habitat at Heather Pond in Gros Morne National Park (photo by M. Burzynski).

DISTRIBUTION

Global

The Mountain Fern is found in Eastern Asia, particularly in Japan and the adjacent Kurile Islands, and Korea; on the northwest coast of North America, from the Aleutian Islands and southeast Alaska southward to coastal British Columbia and Washington; and on the east coast of North America, on the Island of Newfoundland.

National

The only known locations of Mountain Fern in Canada are found along the coast of British Columbia and on the Island of Newfoundland.

Provincial

Mountain Fern is known from a single population restricted to a few closely-associated patches in a sub-alpine valley near Heather Pond in Gros Morne National Park on the Island of Newfoundland (Bouchard and Hay 1976; Bouchard *et al.* 1977) (Figure 3). Two plants were found in 1998 near Arm Pond in Gros Morne National Park but recent surveys have not been successful in relocating them (Burzynski 2006).



Figure 3. Location of Mountain Fern (*Thelypteris quelpaertensis*), indicated by the black dots, in Gros Morne National Park, Newfoundland and Labrador. The boundaries of Gros Morne National Park are delineated in the darker green colour. (Map produced by the Atlantic Canada Data Center).

ABUNDANCE AND POPULATION TRENDS

Mountain Fern was first found in Newfoundland in 1973 at Heather Pond, Gros Morne National Park (Bouchard and Hay 1976; Bouchard *et al.* 1977). A second occurrence of the fern, comprising only two plants, was discovered at Arm Pond, Gros Morne National Park, 3 km away in 1998. In 1999, 26 brooks and two snowmobile routes in the Heather Pond area were checked for Mountain Fern but no further locations were discovered (Burzynski 2003). In 2002, three additional sites within the Heather Pond area, selected for having the same aspect and vegetation as the Heather Pond site, were checked for Mountain Fern but no further locations were discovered (Burzynski 2005). Recent surveys have also not been successful in relocating the two plants found in 1998 near Arm Pond (Burzynski 2006).

As of 2004 there were an estimated 20 000 crowns within a 1 km² area at Heather Pond, 18 500 of which were found in 2002 and an additional 750 which were found in 2004 (Burzynski 2003; 2005).

TRADITIONAL AND LOCAL ECOLOGICAL KNOWLEDGE

Mountain Fern in Newfoundland and Labrador is a minor component of the moist open subalpine meadow plant community. Its rarity and remote location is likely the reason for a lack of traditional or local ecological knowledge.

EXISTING PROTECTION

The entire known Newfoundland and Labrador population of Mountain Fern grows within the boundaries of Gros Morne National Park and is thus legally protected from destruction, disturbance, or removal by the Canadian *National Parks Act*.

While Mountain Fern is listed as vulnerable under the provincial *Endangered Species Act*, this *Act* has no legal standing on federal property. Nonetheless, any population of Mountain Fern that may be found on provincial land in the future will be managed under the provincial *Endangered Species Act*.

MANAGEMENT GOALS, OBJECTIVES, AND ACTIONS

It is always the purpose of management efforts for species at risk to ensure the long-term persistence of self-sustaining viable populations throughout their current, and, where possible, historical range. The following section details the goals, objectives, and actions needed to fulfill this purpose, all of which are summarized in Table 2. The following two goals have been identified as important to the long-term persistence of Mountain Fern in Newfoundland and Labrador:

Goal 1. Undertake research to close gaps in our understanding of Mountain Fern distribution and ecology.

Goal 2. Develop mitigation strategies for threats to Mountain Fern individuals and habitat.

The only known population of Mountain Fern in Newfoundland and Labrador is found entirely within the federal lands of Gros Morne National Park. Therefore, the success of management efforts will depend upon close cooperation between the federal and provincial governments.

GOAL 1. UNDERTAKE RESEARCH TO CLOSE GAPS IN OUR UNDERSTANDING OF MOUNTAIN FERN DISTRIBUTION AND ECOLOGY.

Our ability to identify and implement management actions in support of Mountain Fern conservation is limited due to our lack of knowledge of population trends, habitat requirements, and the relative impact or importance of the threats identified to date.

Objective 1. Determine trends in population size and demographic rates.

In 2002 and 2004 researchers completed a census and review of reproductive output of the known population of Mountain Fern at Heather Pond, Gros Morne National Park (Burzynski 2003; 2005). The population is spreading primarily by vegetative growth as most fronds were found to be infertile or had incompletely developed sporangia (Burzynski 2003, 2005). Each crown was regarded as representing an individual plant and single fronds arising from stolons were not counted (Burzynski 2005). When dense patches of Mountain Fern were found a test count was completed on a portion of the patch and this estimate of density was extrapolated to the entire patch. This was necessary to avoid the trampling that would occur if a more accurate count had been attempted (Burzynski 2005).

Action 1: Every 10 years, complete a census of the Mountain Fern population at Heather Pond, marking the edges of the population. Compare results to the previous census and review population trends and spatial changes.

Action 2: Establish a minimum of five permanent monitoring plots within the Mountain Fern population. Every five years count the number of individuals (crowns) and the number of reproductive fronds. Compare the results to the previous census and monitoring to determine trends.

Objective 2. Define Mountain Fern habitat requirements and determine the availability and occupancy of suitable habitat.

Mountain Fern was first found in Newfoundland in 1973 at Heather Pond, Gros Morne National Park (Bouchard and Hay 1976; Bouchard *et al.* 1977), and a second location of the fern containing only two plants was discovered in 1998, 3 km away at Arm Pond (Burzynski 2003). Since then Heather Pond (Figure 4), Arm Pond, 26 brooks in the area, two snowmobile routes, and three areas of similar slope and vegetation as Heather Pond have been surveyed but no further locations have been discovered (Burzynski 2003; 2005). To date all surveys specific to Mountain Fern have occurred within Gros Morne National Park.

Based on the current location of Mountain Fern, it is thought that a significant component of their habitat is the presence of running water since, to date, plants have been found only in association with brooks, small streams, or slope seepage (Burzynski 2003). There are areas of wet, subalpine meadow habitat at the necessary altitude (490-600m) within the Long Range Mountain of Gros Morne National Park and the Northern Peninsula that should be surveyed for Mountain Fern.

Potential areas should be determined from aerial photographs, maps, and knowledge of previous botanical surveys. Surveys should begin with potential areas closest to the Mountain Fern population at Heather Pond, such as the St. Paul's Big Pond watershed. Access to and surveying of potential habitat will likely require a combination of helicopter travel and ground travel.



Figure 4. Mountain Fern (*Thelypteris quelpaertensis*) in its typical habitat at Heather Pond in Gros Morne National Park (photo by M. Burzynski).

Action 1: Assess the habitat of the known Mountain Fern population and better define habitat requirements based on characteristics such as soil type, moisture, and acidity.

Action 2: Using maps and aerial photos identify areas of potential Mountain Fern habitat in Newfoundland based on habitat suitability.

Action 3: Survey identified areas of potential Mountain Fern habitat, beginning with the potential habitat closest to the Mountain Fern population at Heather Pond.

Objective 3. Determine the genetic diversity and success of sexual reproduction within the Heather Pond population of Mountain Fern.

This fern can reproduce sexually but also reproduces vegetatively by sending out stolons, which results in the production of large colonies of Mountain Fern. The fact that the population of Mountain Fern at Heather Pond has not spread since it was first discovered in 1973 suggests that sexual reproduction is limited and/or ineffective in colonizing nearby, presumably suitable habitat. An examination of 100 fronds collected from Heather Pond revealed that most of the sporangia (75%) were incompletely developed (Burzynski 2003).

Action 1: Determine the genetic diversity of the Mountain Fern population.

Action 2: Assess the level of sexual reproduction and spore viability in the Mountain Fern population at Heather Pond and compared it to closely Related ferns and any *ex situ* Mountain Fern population.

GOAL 2. DEVELOP MITIGATION STRATEGIES FOR THREATS TO MOUNTAIN FERN INDIVIDUALS AND HABITAT.

Although the Mountain Fern population appears relatively stable, and is legally protected within Gros Morne National Park, it may be susceptible to stochastic events, and unless additional populations are found in Newfoundland, no rescue effect for this population appears to be possible. Anthropogenic threats are minimal because there is no human settlement or highway within 15 km of Heather Pond. The area is used sporadically by recreational forest users, such as hikers and snowmobilers.

Objective 1: Assess threats to Mountain Fern and its habitat within the Province.

There is insufficient information available for a rigorous assessment of factors that threaten or limit populations of Mountain Fern; however restricted distribution, limited sexual reproduction, recreational snowmobile activity, climate change, disease, herbivory, and physical damage are listed as threats in the status report for Mountain Fern (Table 1) (Burzynski 2006). Ongoing research is required to identify threats that may be negatively affecting the survival of individuals, habitat integrity, or the long-term persistence of this species.

Evidence suggests that rare fern distribution, including that of Mountain Fern is likely more limited by their dispersal ability than by the availability of suitable habitat, and therefore protection of known populations is critical (Wild and Gagnon, 2005).

Table 1: Potential threats to Mountain Fern individuals and habitat (Burzynski 2005, 2006).

Potential Threat	Affects Individuals	Affects Habitat	Impact of threat
Snowmobile activity	Yes	No	Individuals may be destroyed if snowmobile activity occurs while snow cover is patchy or snowmobile activity results in snow compaction that reduces snow melt time.
Climate change	Yes	Yes	Alterations in current hydrology patterns could degrade habitat and reduce survival. Increased temperature could improve spore production and reproductive success.
Disease/Frost	Yes	No	Malformation of fronds is minimal and can be caused by disease or frost action. Malformed fronds may be less reproductive.
Herbivory	Yes	No	Herbivores have consumed a few fronds and can destroy fronds by trampling.
Limited sexual reproduction	Yes	No	Poor sporangia development may limit the ability for Mountain Fern to spread to nearby, suitable habitat or re-colonize areas where plants have died.
Physical damage	Yes	Yes	Overflowing streams, animal trampling, and rock falls can destroy individuals and habitat.

- Action 1: Assess the potential of recreational snowmobiling to damage Mountain Fern individuals and habitat.
- Action 2: Record the level of reproduction, herbivory, disease, and physical damage within permanent monitoring plots (see Goal 1, objective 1). Compare the results to the previous monitoring to determine trends.

Objective 2. Develop mitigation strategies for threats to Mountain Fern and its habitat.

The habitat and population of Mountain Fern are legally protected as part of Gros Morne National Park. Land managers within the Parks Canada Agency and Gros Morne National Park are aware of the conservation concern for Mountain Fern and that protection of the known population is critical. To ensure that the species' conservation needs are met, and that land use decisions benefit Mountain Fern throughout its potential habitat, it will be necessary for Parks Canada and the Government of Newfoundland and Labrador's Wildlife Division to share new information collected about the species and its threats.

To limit the impact of anthropogenic threats, education and stewardship initiatives related directly to this species should be provided to visitors to Gros Morne National Park, including local residents who use the park. Because of the Mountain Fern's rarity, remote location within the park, and low profile, visitors to Gros Morne National Park will mostly be unaware of its existence, its status, or its conservation needs. Informed and educated visitors will be in a better position to be supportive of management actions.

It will also be prudent to establish an *ex situ* Mountain Fern population to act as a failsafe in the event that an anthropogenic or natural event destroys the only known population. Mountain Fern individuals should be collected and added to the Memorial University *ex situ* conservation program. In 2004, 10 live plants were collected and brought to Rocky Harbour, Newfoundland and Labrador where they were potted and placed in the ground but most died in 2006 when the summer was unusually dry (Burzynski 2005; M. Burzynski, personal communication). Currently one plant is still in cultivation and every year since 2008 it has produced sporangia (M. Burzynski, personal communication).

- Action 1: Maintain areas occupied by Mountain Fern and nearby suitable substrate.
- Action 2: Parks Canada Agency and the Government of Newfoundland and Labrador's Wildlife Division will regularly exchange information on the species, including biological data, survey results, and management concerns.
- Action 3: Produce educational materials (e.g. posters, brochures, news articles) about the Mountain Fern that can be provided to visitors to Gros Morne National Park.
- Action 4: Maintain a live plant collection of Mountain Fern in the Memorial University Botanical Garden *ex situ* conservation program.

MANAGEMENT ACTION IMPLEMENTATION SCHEDULE

Table 2. Implementation schedule of the management actions required to meet management objectives for Mountain Fern in Newfoundland and Labrador during the next five years (2011-2015).

Management Actions	Implementation schedule				
	2011	2012	2013	2014	2015
Population monitoring and trends					
Every 10 years, complete a census of the Mountain Fern population at Heather Pond, marking the edges of the population. Compare results to the previous census and review population trends and spatial changes.	X				
Establish a minimum of five permanent monitoring plots within the Mountain Fern population. Every five years count the number of individuals (crowns) and the number of reproductive fronds. Compare the results to the previous census and monitoring to determine trends.	X				X
Habitat requirements and availability					
Assess the habitat of the known Mountain Fern population and better define habitat requirements based on characteristics such as soil type, moisture, and acidity.	X				
Using maps and aerial photos identify areas of potential Mountain Fern habitat in Newfoundland based on habitat suitability.		X	X	X	X
Survey identified areas of potential Mountain Fern habitat, beginning with the potential habitat closest to the Mountain Fern population at Heather Pond.			X	X	X
Maintain areas occupied by Mountain Fern and nearby suitable substrate.	X	X	X	X	X
Identification and mitigation of threats					
Determine the genetic diversity of the Mountain Fern population.				X	X
Assess the level of sexual reproduction and spore viability in the Mountain Fern population at Heather Pond and compared it to closely related ferns and any <i>ex situ</i> Mountain Fern population.				X	X
Assess the potential of recreational snowmobiling to damage Mountain Fern individuals and habitat.	X	X			
Record the level of reproduction, herbivory, disease, and physical damage within permanent monitoring plots (see Goal 1, objective 1). Compare the results to the previous monitoring to determine trends.	X				X
Maintain a live plant collection of Mountain Fern in the Memorial University Botanical Garden <i>ex situ</i> conservation program.	X	X	X	X	X
Education of public					
Parks Canada Agency and the Government of Newfoundland and Labrador's Wildlife Division will regularly exchange information on the species, including biological data, survey results, and management concerns.	X	X	X	X	X
Produce educational materials (e.g. posters, brochures, news articles) about the Mountain Fern that can be provided to visitors to Gros Morne National Park.		X	X		

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