

The Status of
Mountain Bladder Fern
Cystopteris montana

in Newfoundland and Labrador



Photo: Michael Burzynski

**THE SPECIES STATUS ADVISORY COMMITTEE
REPORT NO. 29**

APRIL 15, 2013

TECHNICAL SUMMARY #1

NEWFOUNDLAND POPULATION

Cystopteris montana
Mountain Bladder Fern

Cystoptéride des montagnes

Range of occurrence in Canada: British Columbia, Alberta, Yukon, Northwest Territories, Saskatchewan, Ontario, Québec, Nova Scotia, Newfoundland and Labrador.

Demographic Information

Generation time	Unknown
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Insufficient data
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Insufficient data
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Insufficient data
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Insufficient data
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Insufficient data
Are the causes of the decline clearly reversible and understood and ceased?	N/A
Are there extreme fluctuations in number of mature individuals?	Insufficient data

Extent and Occupancy Information

Estimated extent of occurrence *	0.01 km ²
Index of area of occupancy (IAO)*	4 km ²
Is the total population* severely fragmented?	No
Number of locations*	1
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	Unknown.
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	Unknown.
Is there an [observed, inferred, or projected] continuing decline in number of populations?	Only one population is known for Newfoundland
Is there an [observed, inferred, or projected] continuing decline in number of locations*?	Only one location is known for Newfoundland
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Yes
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations?	No
Are there extreme fluctuations in extent of occurrence?	Unknown
Are there extreme fluctuations in index of area of occupancy?	Unknown

[*] See “Definitions and Abbreviations”, on [COSEWIC website](#) and [IUCN 2010](#) for more information on this term.

Number of Mature Individuals (in each population)

Population	No. of Mature Individuals
[*] In 2009, Squires counted 44 <i>fronds</i> , and in 2011 Goltz counted 74 <i>fronds</i> . It is not clear how many individual plants they represent, or how many of the fronds were fruiting. The difference in the two counts may reflect different areas covered by the surveyors, varying herbivory, or actual changes in the sub-population. Additional fieldwork may help to clarify this.	44-74 fronds located*

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Insufficient data
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Threats (actual or imminent, to populations or habitats)

Habitat loss due to quarrying, industrial disturbance, home construction and general urban expansion, tree cutting, and garbage dumping. Habitat shifting and alteration due to climate change.

Rescue Effect (immigration from outside of Newfoundland and Labrador)

Status of outside population(s)? (Status in Greenland is unknown. Critically imperiled in Colorado, Presumed Extirpated in Montana, and Vulnerable in Alaska. In Canada: Vulnerable in Québec)	
Is immigration known or possible?	Highly unlikely, via long-distance spore dispersal from Québec
Would immigrants be adapted to survive in Newfoundland?	Probably.
Is there sufficient habitat for immigrants in Newfoundland?	Probably; but the specific habitat requirements of this fern are unknown.
Is rescue from outside populations likely?	Newfoundland: possibly?

Current Status

COSEWIC: Not assessed
SSAC: Not assessed

TECHNICAL SUMMARY #2

LABRADOR POPULATIONS

Cystopteris montana
Mountain Bladder Fern

Cystoptéride des montagnes

Range of occurrence in Canada: British Columbia, Alberta, Yukon, Northwest Territories, Saskatchewan, Ontario, Québec, Nova Scotia, Newfoundland and Labrador.

Demographic Information

Generation time	Unknown
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Insufficient data
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Insufficient data
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Insufficient data
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Insufficient data
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Insufficient data
Are the causes of the decline clearly reversible and understood and ceased?	N/A
Are there extreme fluctuations in number of mature individuals?	Insufficient data

Extent and Occupancy Information

Estimated extent of occurrence*	~ 300,000 km ² (historical + recent data)
Index of area of occupancy (IAO)* [**] There is little information about the areal extent of occurrence of this species in Labrador, so a reasonable assumption has been made that each of the 12 local populations/subpopulations fits within a 2 km by 2 km area.	48 km ² ** (historical + recent data) [approximation]
Is the total population* severely fragmented?	Yes (historical + recent data)
Number of locations* [***] The historical L'Anse-Amour, and Forteau populations, along with the recent L'Anse-au-Loup to L'Anse-au-Diable (Battery Trail) population, are considered together to be a single location. In addition, the 3 historical and 1 recent "Schefferville area" populations/subpopulations (all 4 sites located just over the Quebec/Labrador border, IN LABRADOR) are considered to be a single location.	7 (historical + recent data)***
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	Unknown.
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	Unknown.
Is there an [observed, inferred, or projected] continuing decline in number of populations?	The status of the historical Labrador populations is unknown.
Is there an [observed, inferred, or projected] continuing decline in number of locations?	The status of the historical Labrador locations is unknown
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Unknown
Are there extreme fluctuations in number of populations?	Unknown
Are there extreme fluctuations in number of locations?	Unknown

Are there extreme fluctuations in extent of occurrence?	Unknown
Are there extreme fluctuations in index of area of occupancy?	Unknown

[*] See “Definitions and Abbreviations”, on COSEWIC website and IUCN 2010 for more information on this term.

Number of Mature Individuals (in each population)

Population	No. of Mature Individuals
[*] There are no estimates of numbers of plants from the historical Labrador populations. The recent L’Anse-au-Loup to L’Anse-au-Diable (Battery Trail) population contains at least ~ 400 plants	Insufficient data*

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Insufficient data
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Threats (actual or imminent, to populations or habitats)

Habitat shifting due to climate change. General human disturbance; all of the historical Labrador localities are situated near human habitation.
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Rescue Effect (immigration from outside of Newfoundland and Labrador)

Status of outside population(s)? (Status in Greenland is unknown. Critically imperiled in Colorado, Presumed Extirpated in Montana, Vulnerable in Alaska. In Canada: Vulnerable in Québec)	
Is immigration known or possible?	Possible. Northern and central Quebec populations occur quite close to the Labrador border.
Would immigrants be adapted to survive in Labrador?	Probably.

Is there sufficient habitat for immigrants in Labrador?	Probably; but the specific habitat requirements of this fern are unknown.
Is rescue from outside populations likely?	Probably, in the north and west

Current Status

COSEWIC: Not ranked
SSAC: Not ranked

Author of the original draft report and technical summary: Michael Burzynski

SSAC Botany Report Editor: John E. Maunder.

Supplementary Labrador information, from 2012 and 2013, assembled by Diane Allen and Paul Hines, was added to the original report, in September 2013, by the SSAC Botany Report Editor.

Additional contributions: James Goltz (New Brunswick), Kim Damboise (Herbier Louis-Marie, Université Laval, Québec City).

**Recommended Status and Reasons for Designation - #1 Newfoundland
Population**

Recommended Status: ENDANGERED	Alpha-numeric code: B 2 a) and b) iii) ; D1
Reasons for designation: <ol style="list-style-type: none">1. IOA = 4 km²2. locations = 13. projected, continuing, decline in the area and quality of habitat, owing to quarrying, industrial disturbance, home construction, general urban expansion, tree cutting, garbage dumping, and climate change4. only 44-77 fronds have been located	

Applicability of Criteria

<p>B2 a, b(iii) - IAO is known to be less than 500 km², there are fewer than 5 locations, and there is a projected, continuing, decline in the area and quality of habitat.</p> <p>D1 - fewer than 250 mature individuals.</p>

Recommended Status and Reasons for Designation – #2 Labrador Populations

Recommended Status: DATA DEFICIENT	Alpha-numeric code: N/A
Reasons for designation: <ol style="list-style-type: none">1. recent search effort has been insufficient to allow for the determination of the Labrador status of this scattered and hard-to-find species2. 5 of the 7 recorded locations are historical	

Applicability of Criteria

Not applicable owing to data deficiency

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STATUS REPORT

Cystopteris montana (Lam.) Bernh. ex Desv.

Mountain Bladder Fern; Cystoptéride des montagnes.

Synonyms: *Polypodium montanum* Lamarck
Rhizomatopteris montana (Lamarck) A. P. Khokhrjakov

(ref.: www.data.canadensys.net/vascan/name/Cystopteris%20montana)

Family: Cystopteridaceae (Fragile Fern Family)

Life Form: Terrestrial, herbaceous, calcicolous, perennial pteridophyte.

Systematic/Taxonomic Clarifications

There are four species of *Cystopteris* in Newfoundland and Labrador, *Cystopteris bulbifera* (Bulblet Bladder Fern), *Cystopteris fragilis* (Fragile Bladder Fern), *Cystopteris laurentiana* (Laurentian Bladder Fern), and *Cystopteris montana* (Mountain Bladder Fern) (Meades *et al.* 2000). *Cystopteris montana* does not resemble the other three species, and does not hybridize with them.

Distribution

Global:



Figure 1. World distribution of *Cystopteris montana* (From: Encyclopedia of Life <http://eol.org/pages/600380/maps>, using Google Earth image, and Global Biodiversity Information Facility (GBIF) data <http://data.gbif.org/species/2650808/>, all last accessed April 28, 2013.)

Cystopteris montana has a rather sparse and patchy distribution across the northern hemisphere; through North America, Europe (particularly Scandinavia), and some southern parts of the Far East.

It has been reported from the following countries: United States (Alaska, Colorado, Montana), Canada, Greenland, United Kingdom, Portugal, Spain, Andorra, France, Italy, Germany, Liechtenstein, Switzerland, Austria, Hungary, Poland, Slovakia, Norway, Sweden, Finland, Russia, Bhutan, Nepal, China, Myanmar, India (<http://www.gwannon.com/species/Cystopteris-montana>).

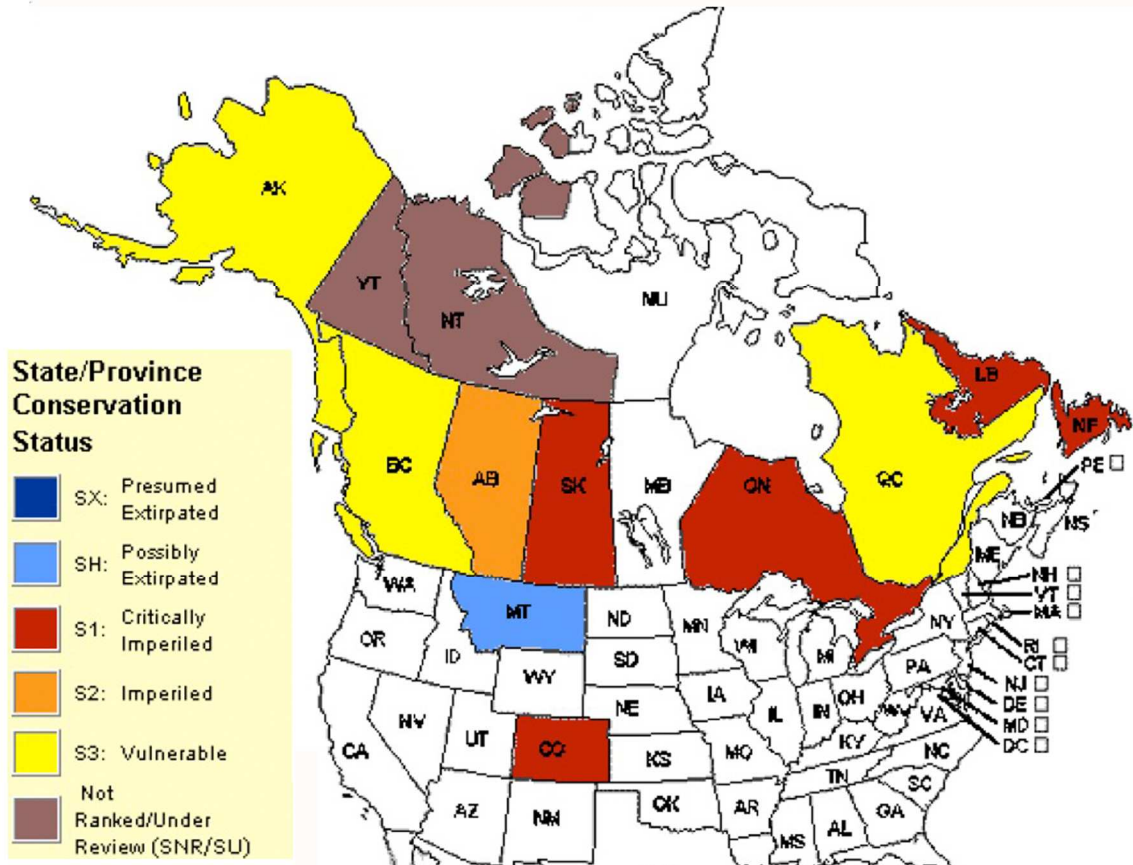


Figure 2. Distribution of *Cystopteris montana* in Canada and USA (by province and state. Map: adapted from the NatureServe, *Cystopteris montana* page, accessible via: <http://www.natureserve.org/explorer>. (Last accessed: April 28, 2013).

In Canada, the species occurs in British Columbia (Douglas *et al.* 1998), western Alberta (Argus and White 1978), Yukon (southwestern Mackenzie District - Cody 2000), Northwest Territories (Porsild and Cody 1980), Saskatchewan (Harms 2006), Ontario (Lake Superior north shore - Newmaster *et al.* 1998), Québec (north and Gaspé), Nova Scotia (Zinck 1998), and Newfoundland and Labrador (both land units - Meades *et al.* 2000). (VASCAN database; accessed January 16, 2013)

Provincial:



Figure 3. Known historic and recent locations of *Cystopteris montana* in Newfoundland and Labrador, and nearby Québec (N of 54 degrees only, except for the Blanc Sablon, Mingan Islands, Anticosti Island, and Gaspé records). White dots mark sites in Newfoundland and Labrador; black dots mark those in nearby Québec (note: black dot for Schefferville, Québec, has been obscured by a white dot for Labrador records from the same general vicinity). Historical sites (> 25 years old) are marked with an “H” (the historical vs. recent status of the 3 Gulf of St. Lawrence locations is undetermined, at this writing). Base map: Google Earth.

Original Reports of the Species in the Newfoundland and Labrador vicinity:

Newfoundland

Yankee Point M. L. Fernald, 1926

Labrador

Mt. Eloit, N. of Nachvak Fjord A. Dutilly, H. T. O'Neill,
and M. G. Duman,
1939 *

Ramah A. Stecker, 1899 *

Marble Lake, North of Esker Yrjö Mäkinen, 1967 *

W. of Lake Wishart, S.W. of Schefferville,
Québec - in Labrador I. Hustich, 1948 *

N. of Dyke Lake, ~ 20 km S.E. of
Schefferville, Québec - in Labrador
(2 sites) [1] M. J. Waterway and
M. J. Lechowicz,
1978*

[2] Mark Vellend, 1995 *

Just W. of Schefferville, Québec - in
Labrador Yrjö Mäkinen, 1967 *

Smoky Mountain, Labrador City I. Hustich, 1967 *

Cartwright area Map 14 in Porsild & Cody
(1980)

Forteau M. L. Fernald 1926

L'Anse-Amour W. A. Stearns 1883

L'Anse-au-Loup-L'Anse-au-Diable
(Battery Trail) Diane Allen and Paul
Hines, 2012/2013

Nearby Québec (close enough that plants MAY be present on both sides of the border).

Fjord Adloylik (E. coast of Ungava Bay)	L. Rousseau, 1951 *
Dignard 1 (Parc Kuururjuaq)	N. Dignard <i>et al.</i> (2011)
Dignard 2 (Parc Kuururjuaq)	N. Dignard <i>et al.</i> (2011)
Schefferville area and north (9 sites)	Ref. database of the Herbarium Louis-Marie *
Blanc Sablon	M. L. Fernald, 1911

Other Québec Records

There is a long swath of ~18 *Québec* collections sites trending generally NNW from the Schefferville area towards the west side of Ungava Bay * (whether or not this shows a distribution biased by collecting effort is unknown). There are also *Québec* collections sites on the *Québec* mainland SE of the Belcher Islands, and from the Mingan Islands, Anticosti Island, and the Gaspé. *

[*] Records marked with an asterisk are from the database of the Herbarium Louis-Marie, Université Laval, Québec City (provided through the courtesy of Kim Damboise, Technicienne en travaux d'enseignement et de recherche)

Description

Cystopteris montana is a low-growing terrestrial fern, in Newfoundland it reaches a height of about 30 cm. It has long thin stems that grow below the soil surface sending up leaves at intervals of 1 to 4 cm. The stems are hairless with light brown ovate to lanceolate scales. Leaves live for only one growing season and are loosely clustered near the growing apices of the underground stems. Sori can be produced on all leaves. Sporulation takes place from late summer to autumn. Indusia are cup shaped with glandular hairs around the edges; spores are spiny, between 37 and 42 µm in diameter, 2n=168. Petioles are dark brown or black at the base becoming green or straw-coloured towards the top. Petioles are sparsely scaly, and are 1 to 3 times the length of the leaf blades, old petiole bases are not persistent. Leaf blade is elongate triangular to pentagonal, 3 or 4 times pinnate-pinnatifid. No bulblets, gland-tipped hairs only in axils. Margins of pinnae are serrate. Veins in notches.

(http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=200003874 and <http://eol.org/pages/600380/details>)

Habitat





Figures 4-6. *Cystopteris montana* habitat at Yankee Point, showing the dense spruce-fir stand surrounded by fen. The ferns grow in the shade beneath the dwarfed trees. Photos: Michael Burzynski.

Cystopteris montana is a ground-dwelling fern found across Eurasia, North America, and southern Greenland at altitudes between 0 and 3,500 m in wet woodland and along watercourses. It is usually found on a calcium-rich substrate, and is most common at high latitude and high altitude.

In Newfoundland, the species is known from only one site, at Yankee Point (between the communities of Mistaken Cove and Savage Cove). The bedrock at Yankee Point is Ordovician limestone, and most of the plants are growing in a small grove of stocky *Picea glauca* and *Abies balsamea* in a fen at the edge of a limestone gravel quarry. Typical habitat in Newfoundland (ie. at Yankee Point) is “mossy glades in spruce thickets on limestone” (Bouchard *et al.* 1991). Despite all of the botanical attention paid to the rare plants and communities of the limestone barrens along the Island’s west coast in the last two decades, no other Newfoundland sites have been found.

Associated species at Yankee Point include: *Circaea alpina*, *Cornus canadensis*, *Cystopteris fragilis*, *Equisetum scirpoides*, *Fragaria virginiana*, *Geum rivale*,

Heracleum maximum, *Mitella nuda*, *Ranunculus acris*, *Ribes lacustre*, *Ribes triste*, *Rubus pubescens*, *Sanguisorba canadensis*, *Solidago macrophylla*, *Symphotrichum puniceum*, *Taraxacum officinale*, and *Viburnum edule*, (J. Goltz, pers. comm., and M. Burzynski, personal observation).

In Labrador this species is often found on limestone or dolomite (ref. the “Flore du Québec-Labrador nordique” project database for northern Québec/Labrador, N of 54 degrees).

The “Flore du Québec-Labrador nordique” project database further records the species as growing in often mature, spruce - fir woods, often in sheltered, damp gullies, often under alders and near water; but also, occasionally, in muskeg or alpine areas. Associated species include: *Abies balsamea*, *Actaea rubra*, *Alnus viridis subsp. crispa*, *Calamagrostis canadensis*, *Carex vaginata*, *Circaea alpina*, *Cornus canadensis*, *Dryopteris expansa*, *Heracleum maximum*, *Linnaea borealis*, *Lycopodium annotium*, *Mitella nuda*, *Moehringia macrophylla*, *Phegopteris connectilis*, *Picea glauca*, *Picea mariana*, *Rhododendron groenlandicum*, *Ribes sp.*, *Salix vestita*, *Solidago macrophylla*, *Streptopus amplexifolius*, *Viburnum edule*, and “feather moss”.

Dignard (2011) additionally recorded that, in northern Québec, associated species include: *Salix argyrocarpa*, *Salix glauca* var. *cordifolia*, *Salix herbacea*, *Betula glandulosa*, *Vaccinium uliginosum*, *Vaccinium casepitosum*, *Sibbaldia procumbens*, *Dryopteris expansa*, *Phegopteris connectilis*, *Packera paupercula*, and *Deschampsia flexuosa*.

Diane Allen and Paul Hines, in 2012 and 2013, found the species growing in not-particularly-basic low woods on the “Battery Trail” between L’Anse-au-Loup - L’Anse-au-Diable, in association with: “balsam fir, alder, willow, currant, and viburnum”.

Overview of Biology



Figure 7. Close-up view of a portion of the underside of a frond at Yankee Point showing two pinnae with sori on the pinnules. Clustered sporangia and a membranous indusium comprise each sorus. Note that there is no evidence of aborted sporangia. Photo: J. E. Maunder, with permission.

The diploid sporophyte of this fern reproduces asexually with haploid spores produced in sporangia clustered in sori on the underside of its fronds. As with all ferns, spores that find suitable substrate germinate and grow into photosynthetic prothalli (gametophytes) where fertilization takes place between flagellate sperm and eggs attached to the prothalli. The resultant diploid zygotes grow into new sporophytes.

The rarity of calcicole ferns such as *Cystopteris montana* does not seem to be as strongly linked to the availability of appropriate microhabitat as was once thought. Rather, it may be more closely tied to problems with dispersal and establishment (Wild and Gagnon 2005), or competition. This species seems to be producing healthy sporangia (although spore viability should be tested), unlike *Thelypteris quelpaertensis* (Burzynski 2003), another disjunct fern found in western

Newfoundland. Lack of appropriate conditions for prothallus growth has often been cited as a reason for the rarity of some ferns.

It might be possible to determine generation time by excavating rhizomes of this fern and estimating minimum age from petiole scar clusters and amount of branching, but there are so few plants at Yankee Point that it would be unreasonable to attempt this.

The genus *Cystopteris* is considered to be taxonomically problematic because many species hybridize easily where their ranges overlap. However *Cystopteris montana* is not known to hybridize with other North American members of the genus (http://zipcodezoo.com/Plants/C/Cystopteris_montana/).

Population Size and Area of Occupancy

Population Size

Newfoundland: 44-74 fronds located

Labrador: unknown.

Estimated Extent of Occurrence (EEO)

Newfoundland: 0.01 km²

Labrador (historical plus recent data): ~300,000 km²

[calculated with area calculation tool from:

http://www.oocities.org/xpf51/ANGLE_CALCULATORS/TRIANGLES.html#SSS)]

Index of Area of Occupancy (IAO)

This index is calculated on the basis of a 2 km by 2 km grid.

Newfoundland: 4 km²

Labrador: 48 km² [approximation - there is little information about the areal extent of occurrence of this species in Labrador, so a reasonable assumption has been made that each of the 12 local populations/subpopulations fits within a 2 km by 2 km area.]

Aboriginal, Traditional and Local Ecological Knowledge

There is no mention of *Cystopteris montana* in Arnason *et al.* (1981). No aboriginal, traditional, or local ecological knowledge of this species was available.

Trends

The Yankee Point population was only re-discovered in 2007, and there is little information about the historical occurrences in Labrador. Thus, very little can be said about trends.

In Newfoundland, limestone barrens habitat has been in decline since the early 1970s when road-building began along the coast of the Great Northern Peninsula. The Yankee Point area was severely damaged in the early and mid-1970s when a tunnel crossing to Labrador was proposed and preparation work was started. A semi-active quarry lies within 80 m of the *Cystopteris montana* colony. Residential building has occurred in the area as well; a house stands about 50 m from the nearest plants.

Based upon M. L. Fernald's description of the first collection of this species, in Newfoundland, at Yankee Point in 1924, it appears that *Cystopteris montana* may have been more common there at the time, and not restricted to the dark shade of the spruces. More specifically, while Fernald's description of the population is brief and not quantified, it seems to provide some evidence to suggest that quarrying and other activities on the barrens have reduced population numbers significantly over the last 83 years.

Nothing can be said about trends in Labrador owing to data deficiency.

Threats and Limiting Factors

Apart from general habitat shifting related to anthropogenic climate change, there are no known threats to this species in Labrador. Nonetheless, it should be noted that all of the Labrador occurrences are relatively close to human habitation. For instance, the Smoky Mountain area at Labrador City is the local ski hill (J. E. Maunder, pers. comm.).

Most of the threats to *Cystopteris montana* on the Island of Newfoundland are related to its extremely restricted habitat and its susceptibility to anthropogenic disturbances.

The greatest threat to the Yankee Point site may be its proximity to the proposed landing point for hydro power cables from the Lower Churchill (Labrador) Power

Project (NALCOR Energy 2012a, 2012b). Yankee Point was originally identified as the cable landing site, although the current plan is for the cable to come ashore a little further north, at Shoal Cove. Recently, a spokesperson for NALCOR assured the Limestone Barrens Species at Risk Recovery Team that the Yankee Point site would not be directly affected by work at the landing site or the transmission corridor.

Nonetheless, Yankee Point is close enough to the currently identified landing site at Shoal Cove that there may still be pressure for sub-contractors and others to use it as a housing, staging, and/or storage site for the project. Additionally, there is a good possibility of associated, increased, gravel extraction at Yankee Point; some [possibly unassociated] increase in extraction has already begun. If any of the above threats are fully realized, there is a great chance that the single Island population of *Cystopteris montana* will be damaged or destroyed.

The following threat assessment table is applicable to the Yankee Point site:

Threat	Cause	Type	Scope	Severity	Frequency
Habitat loss	Quarrying and industrial disturbance	Anthropogenic	Small	Severe	High
Habitat loss	Home construction and general urban expansion	Anthropogenic	Small	Severe	Moderate to High
Habitat loss	Tree cutting (for firewood and other purposes)	Anthropogenic	Small	Severe	Moderate to High
Pollution	Garbage dumping (illegal dumping is increasing due to the centralization of waste disposal sites)	Anthropogenic	Small	Moderate	Moderate
Habitat shifting and alteration	Climate change	Anthropogenic	Ubiquitous	Potentially severe	Ongoing

Yankee Point, although damaged by previous human use, is also an important site for *Braya longii* (ENDANGERED) and many other rare limestone barrens plants.

Existing Protection

There is no existing protection for the Yankee Point site.

There is no existing protection for any of the historical Labrador sites, except for the historical Ramah site, and the Mt. Eloit site (N. of Nachvak Fjord) both of which are located within the Torngat Mountains National Park and fall under the protection of the Canada National Parks Act.

Special Significance

There is no known scientific or cultural significance to this species other than as a good example of a boreal-cordilleran range disjunction.

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Durocher, Adam, Atlantic Canada Conservation Data Centre, Corner Brook, NL.

Goltz, James, Veterinarian and Naturalist, Fredericton, NB.

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LeBlond, Richard, Associate of the University of North Carolina Herbarium. Chapel Hill, NC, USA.

Maunder, John E., Curator Emeritus, Natural History, Provincial Museum of Newfoundland and Labrador (now "The Rooms Provincial Museum"), St. John's, NL.

Meades, Susan J., Botanical Researcher; Director of Northern Ontario Plant Database project, Sault Ste. Marie, ON.

Squires, Susan E., Ecosystem Management Ecologist, Endangered Species, Department of Environment and Conservation, Corner Brook, NL.

Collections Examined

Digital Flora of Newfoundland and Labrador Vascular Plants, http://digitalnaturalhistory.com/flora_cystopteridaceae_index.htm#cystopterismontana , 37 images examined.

Herbarium of the Canadian Museum of Nature (CAN), examined online data - no NL collections.

Herbarium of Gros Morne National Park (GMNP), one specimen examined.

Marie-Victorin Herbarium (MT), Institut de recherche en biologie végétale, Université de Montréal, examined online data - no NL collections.

Michael Burzynski, personal photograph collection, 14 photos examined.

Richard LeBlond, personal collection, photograph of two fronds examined.

The “Flore du Québec-Labrador nordique” project (Université Laval) has verified all collections of this species from the northern Québec-Labrador region (N of 54 degrees) that are held by MT, MTMG, QUE, DAO, CAN, NFLD, NFM, CDFN, QFBE, GH, SFS (46 collection lots).

Rank or Status

Global	
G-rank	G5 (01 Nov. 2011) (NatureServe Jan. 2013) Status Undetermined
IUCN	Not assessed
National	
N-rank	N3N4 (31 Oct. 2011) (NatureServe Jan. 2013)
National General Status	Sensitive to Secure
COSEWIC	Not assessed
Provincial	
Provincial General Status	
Newfoundland S-rank	S1 (NatureServe Jan. 2013)
Newfoundland General Status	Critically Imperiled
Labrador S-rank	S1S2 (NatureServe Jan. 2013)
Labrador General Status	Critically Imperiled /Imperiled
Adjacent Jurisdictions	
Nova Scotia S-Rank	SNA
Nova Scotia General Status	Unconfirmed
Prince Edward Island S-Rank	Not present
Prince Edward Island General Status	N/A
New Brunswick S-Rank	Not present
New Brunswick General Status	N/A
Québec S-Rank	S3 (NatureServe Jan. 2013)
Québec General Status	Vulnerable

Appendix A: Population Information

Recently Verified Occurrences/Range Use (recorded within the last 25 years)

Newfoundland, Yankee Point

- R. LeBlond, July 2007. 51°19.463 N, 56°42.199 W. No count of plants. Two fronds collected.
- C. Hanel, P. Sokoloff, July 2008. Confirmed LeBlond's sighting.
- J. E. Maunder, July 2008. Extended the LeBlond site a little to the northwest.
- S. Squires *et al.*, 23 July 2009.
- S. Squires *et al.*, 5 August 2009. Visited LeBlond's site, found 44 plants (fronds) within 50 metres of the coordinates. They searched the woods around the gravel pit and the forest on the other side of the main gravel road without finding more plants. There was no sign of recent heavy equipment use nearby.
- J. Goltz, August 2011. Made the most recent survey of the Yankee Point site. He found a total of 72 plants (fronds): 60 at N51°19.468, W56°42.099 (NAD83 21U 520789E 5685950N); 10 at N51°19.493, W56°42.151 (520728, 5686000); 2 at N51°19.492, W56°42.149 (520730, 5685990); and 2 at N51°19.486, W56°42.159 (520719, 5685980). Altitude 5 m. Goltz was unable to locate any plants using R. LeBlond's GPS coordinates (perhaps using a different datum). He also spent a lot of time searching the woods flanking the old gravel pit, and reported recent bulldozer activity in the area.
- M. Burzynski, R. Smith, A. Voitk, M. Voitk, H. Mann, P. Mann, G. Gulden, and J.-O. Aarnaes, September, 2012. Checked site briefly, did not conduct a survey since frost had killed off most fronds. One frond collected as voucher, deposited in GMNP herbarium.
- Wildflower Society of Newfoundland and Labrador. June 26, 2013. Brief visit. Site unchanged.



Figure A-1. Yankee Point, Savage Cove to northeast, Highway 430 to southeast. White areas indicate gravel quarries, and a central parking lot and construction site. Red triangle marks the copse of trees where *Cystopteris montana* is growing. Houses can be seen nearby, to the southeast of this site. Base photo: Google Earth.

Labrador

Mark Vellend. July 22, 1995. Dyke Lake. ~ 20 km SE of the Schefferville area - in Labrador. 54 40 N 66 36 W. Verified by the "Flore du Québec-Labrador nordique" project (Université Laval)

Diane Allen and Paul Hines. August 20, 2012 and August 8, 2013. L'Anse-au-Loup - L'Anse-au-Diable (along "Battery Trail" to the Red Cliffs).

51.54932N 56.77637W (175 m elevation, "a couple [of] hundred plants")

51.54891N 56.77622W (176 m elevation, "off trail, beginning at 6-10 feet to the right, in 2 open areas and also under the shrubs and trees", "a couple [of] hundred plants")

51.55182N 56.78201W (187 m elevation, 26 plants)

Nearby in Québec

N. Dignard (2011) Ford River valley, 35 km above the confluence with George River, between 58°00'25.45"N and 58°00'28.51 "N - 65°24'14.72"W and 65°24'20.63"W. Altitude 370-380 m . Along an unnamed tributary to the George River about 4 km above their confluence facing the Qavviasianiavik embankment 57°37'03.72" N 65°28'47.35" W. Altitude 245 m (in the gorge at the base of the falls, in the scree and on the path descending from the plateau. Partly within the mist of the falls.

Benoit Tremblay, 2012. Lac le Fer – Lac Helluva region. 55 20 N 67 29 W, 55 20 N 67 30 W.

Historical Verified Occurrences/Range Use (recorded prior to the last 25 years)

Newfoundland

M. L. Fernald, August 1924. Yankee Point area, between Flower's Cove and Sandy Cove. Described "...mossy glades full of *Cystopteris [montana]* ..." [based upon the re-discovery of the original discovery site]

Labrador

M. L. Fernald, 1926, Forteau [based upon Fernald's unimpeachable reputation].

The "Flore du Québec-Labrador nordique" project (Université Laval) has verified all collections of this species from the northern Labrador region (N of 54 degrees) that are held by MT, MTMG, QUE, DAO, CAN, NFLD, NFM, CDFN, QFBE, GH, SFS (7 collection localities).

Nearby in Québec

M. L. Fernald, 1911, Blanc Sablon [based upon Fernald's unimpeachable reputation].

The "Flore du Québec-Labrador nordique" project (Université Laval) has verified all collections of this species from the northern Québec region (N of 54 degrees) that are held by MT, MTMG, QUE, DAO, CAN, NFLD, NFM, CDFN, QFBE, GH, SFS (17 collection localities).

Recent Search Effort (areas searched within the last 25 years with estimate of effort)

Newfoundland –Yankee Point and general vicinity

Richard LeBlond. 2007. Search effort - 10 minutes.

John E. Maunder. July 2008. Search effort - 1 person hour.

Claudia Hanel and Paul Sokoloff. July 2008. Search effort - 10 person hours, concentrated between Flowers Cove and Savage Cove.

Susan Squires and one other searcher, 23 July 2009. Search effort - 2 person hours.

Susan Squires and one other searcher, 5 August 2009. Search effort - 4 person hours.

Jim Goltz, August 2011. Search effort - 4 person hours.

Michael Burzynski, Roger Smith, Andrus Voitk, Maria Voitk, Henry Mann, Phyllis Mann, Gro Gulden, and Jon-Otto Aarnaes, September, 2012. Search effort - 4 person hours.

Labrador

C. Hanel working with two 3-person teams did not encounter this species during extensive fieldwork by the Labrador Straits Botanical Initiative during the summer of 2004. However, she was not searching specifically for *Cystopteris montana*.

Diane Allen and Paul Hines botanized in the Labrador Straits extensively during 2012 and 2013. The “Battery Trail” locality was walked and carefully botanized on both August 20, 2012 and August 8, 2013.

Other Locations

General Surveys: In 1999 and 2001, the Newfoundland Rare Plant Project surveyed 1,645 sites on the west and northeast coasts of Newfoundland, with special emphasis on the Point Riche-Port au Choix-St. John Island area. Rare plant inventories have been conducted by Parks Canada personnel in Gros Morne, Port au Choix, and other Parks Canada Agency sites in western Newfoundland and Labrador since 1996. John E. Maunder, formerly of the Provincial Museum, has checked sites throughout the west coast of the Island, as have Botanical Researcher Susan J. Meades (1990s), Henry Mann, formerly of Sir Wilfred Grenfell College (1970s to present), and Nathalie Djan-Chékar of the Provincial Museum. Claudia Hanel, Ecosystem Management Ecologist, Wildlife Division, Newfoundland and Labrador Department of Environment and Conservation, has carried out extensive botanical field work in the nearby Doctor’s Brook and Squid Cove areas.

Targeted Surveys: In 1976, Stuart G. Hay produced *The Vascular Flora of St. Barbe South, Newfoundland*. André Bouchard and his team from l’Université de Montréal conducted botanical fieldwork throughout western Newfoundland between 1984 and 1990, leading to the publication of *The Rare Vascular Plants of the Island of*

Newfoundland in 1991. They also concentrated on Parks Canada sites, producing rare plant reports for Gros Morne National Park (1986 and 1996), Port au Choix National Historic Site (1992), and L'Anse aux Meadows National Historic Site (1993). Claudia Hanel, has conducted surveys and inventories of rare plant species throughout western Newfoundland, with special emphasis on limestone barrens and slopes.

Potential Sites Unexplored

This is a relatively small fern that is easily overlooked.

Despite all of the attention that the limestone barrens, along the west coast of the Great Northern Peninsula of Newfoundland, have received from botanists in the last two decades, there is yet only one known location for *Cystopteris montana* on the Island. Further searching in this limestone habitat would seem to be worthwhile.

In Labrador, the western and northern regions seem to offer the greatest potential for new records, since much of the interior has never been well botanized. Southern Labrador, from the Québec border near Blanc Sablon, to Cartwright and perhaps beyond, may also offer good prospects (J. E. Maunder, pers. comm.).

Appendix B: Supplementary Details

Additional Habitat Information

M. L. Fernald's description of a walk from Flowers Cove to Sandy Cove in 1924 when *Cystopteris montana* was first recorded in Newfoundland (Fernald 1926):

“But when, slightly before we reached Savage Cove, a few triangular fronds of a wonderfully delicate fern attracted our attention in the roadside thicket, the temptation was too much for us. I had already grown familiar with but not hardened to *Cystopteris montana* (Lam.) Bernh. in the Shickshocks, but it is not a fern to neglect, and Long had never seen it; besides, it was new to Newfoundland. So we were soon botanizing the openings in the spruce thicket near Savage Cove, fascinating springy and mossy glades full of the *Cystopteris*, the mosslike *Selaginella selaginoides* (L.) Link, the flexuous black-topped *Carex atratiformis* Britton, *Listera convallarioides* (Sw.) Nutt. with watery amber racemes and *Salix vestita* Pursh, one of the most beautiful of willows, with deeply rugose rounded leaves dark green above but white beneath with a dense silk.”

And later in the same document:

“*C. montana* ...Found directly across the Straits, at Forteau and Blanc Sablon on the Labrador side.”

In an earlier article (Fernald 1911) he describes the plants at Blanc Sablon: “Occasionally in the wet moss there was a delicate carpet of *Cystopteris montana*...”.

Synonyms for *Cystopteris montana* Throughout its Range

Aspidium montanum (Lam.) Sw.
Athyrium montanum (Lam.) Röhl. ex Spreng.
Cyathea montana (Lam.) J. Sm.
Cyste montana (Lam.) Dulac
Cystopteris allioni Newman
Cystopteris myrrhidifolia (Vill. ex Gilib.) Newman
Filicula montana (Lam.) Farw.
Filix montana (Lam.) Underw.
Polypodium montanum Lam.
Polypodium myrrhidifolium Vill. ex Gilib
Rhizomatopteris montana (Lam.) A.P. Khokhr.

(ref.: www.tropicos.org/Name/26602776)