Status Review No. 5



The Species Status Advisory Committee

Status Review of Mackenzie's Sweetvetch

Hedysarum boreale subsp. mackenziei

in Newfoundland and Labrador



Department of Fisheries and Land Resources Forestry and Wildlife Research Division

2019

Available in alternate formats.

Please contact the Department of Fisheries and Land Resources at 709-637-2025 or endangeredspecies@gov.nl.ca.

Cover Photographs

Left: an inflorescence of *Hedysarum boreale* with its characteristic purple flowers. Right: a patch of *H. boreale* in surrounding heathland.

Photos by Claudia Hanel.

Recommended Citation

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Authors

The initial draft of this status review was prepared by Sander Bennett Boisen, PhD Candidate, Department of Biology - Plant Evolution and Diversity Group, Memorial University of Newfoundland. Significant contributions to the report were made by John E. Maunder.

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Date of Status Review: March 8, 2019

Common Name Mackenzie's Sweetvetch

Scientific name

Hedysarum boreale subsp. mackenziei

Status

Threatened

Reasons for Recommendation

COSEWIC criteria D2:

Canadian population with a very restricted index of area of occupancy (< 20 km²) such that it is prone to the effects of human activities or stochastic events within a very short time period (1-2 generations) in an uncertain future, and is thus capable of becoming extinct, extirpated or critically endangered in a very short period of time.

Range in Newfoundland and Labrador

Newfoundland only: Port au Port Peninsula

Status History

In April 2006, the species was assessed as Endangered by the Species Status Advisory Committee, in the document entitled: "The Status of Mackenzie's Sweetvetch (*Hedysarum boreale* subsp. *mackenzii*) [*sic*] in Newfoundland and Labrador" www.flr.gov.nl.ca/wildlife/endangeredspecies/ssac/Mackenzies_Sweetvetch_SSAC.pdf [Web version may be abridged].

In August 2010, the species was listed as Endangered in Newfoundland and Labrador under the Newfoundland and Labrador Endangered Species Act.

Because the species is not rare nationally, it has not been assessed by COSEWIC and is not protected under the federal Species at Risk Act.

Overview

Wildlife Species Description and Significance

General Description of the Species:

Perennial herb 15-40 cm tall. Usually found in prostrate mats with several branching stems. Thick, fibrous taproot. Stems sparsely to densely hairy; mostly decumbent; aerial stems, when present, erect to ascending. Leaves compound and odd-pinnate; abaxial surface hairy. Entire blade 20-80 mm long and 10-30 mm wide. The 9-15 oval-lanceolate leaflets opposite or rarely alternate; 5-8 mm wide and 5-15 mm long. Petioles 5-25 mm. Stipules glabrous, (2)-4-8.5 mm long and (1)-2-3 mm wide. Stipules sheath the stem and are brown or black near tips. Flowering stems without leaves and hairy. Inflorescence a 20-80 mm long raceme of 5-15 flowers (see Figure 1, left image). Flowers large and typical of the pea family; usually 15 mm long and purplish-rose in color. Filaments of the anthers of equal or near-equal length. Nine anthers are fused to form a tube; 1 more is free. Calyx 5-lobed and brown-black; the teeth quickly taper to a narrow tip. Fruit a loment, of multiple sections, breaking at constrictions between the seeds; dry and brown at maturity; 30-40 mm long and 6-8 mm wide; (see Figure 1, right image). Seeds small and brown; 2.5-3 mm long and 3-6 mm wide.

Adapted from Species Status Advisory Committee (2006) and from Aiken et al. (2007).

Taxonomy and Designatable Units:

Two subspecies of *Hedysarum boreale* Nuttall are currently recognized in Canada (VASCAN database):

Hedysarum boreale Nuttall subsp. mackenziei (Richardson) S.L. Welsh Hedysarum boreale Nuttall subsp. boreale

This review will focus strictly on *H. boreale* subsp. *mackenziei*, except where comparisons are required.

Mackenzie's Sweetvetch Mackenzie's Hedysarum Sainfoin de Mackenzie

Family: Fabaceae (Peas)

Synonyms:

Hedysarum americanum var. mackenziei (Richardson) Britton
Hedysarum boreale subsp. dasycarpum (Turczaninow) D.F. Murray and Elven
Hedysarum boreale var. leucanthum (Greene) M.E. Jones
Hedysarum boreale var. mackenziei (Richardson) C.L. Hitchcock
Hedysarum dasycarpum Turczaninow
Hedysarum leucanthum (Greene) Greene
Hedysarum mackenziei Richardson
Hedysarum mackenziei var. leucanthum Greene

In NL, there is one designatable unit.

Social and Cultural Significance:

None known.

The Mi'kmaq used a plant called "licorice root" as a blood thinner and stomach soother, according to Chief Jasen Benwah of the Benoit First Nation, Newfoundland (SSAC 2006). However, the plant in question was almost certainly Alpine Sweetvetch (*Hedysarum alpinum*).

Great care must be taken not to confuse the latter species with the closely related *Hedysarum boreale* subsp. *mackenziei*, which is said to be quite poisonous. It has been reported that in the early days of Arctic exploration, Sir John Richardson and his men mistook *Hedysarum boreale* for the edible *H. alpinum* and all those who ate it became ill (Heller 1953; see also Kuhnlein and Turner 1991).

Distribution

Global:

H. boreale subsp. *mackenziei* is endemic to North America. It is found in large parts of Canada and in four American states (NatureServe; Aiken et al. 2007). Its distribution in the USA is likely small. However, there is a potential for subspecies *mackenziei* to be confused with the more southern and western subspecies *boreale*. The status of *H. boreale* subsp. *boreale* has not been established in the USA (NatureServe).

National:

H. boreale subsp. mackenziei has been found in all parts of Canada except Labrador, New Brunswick, Nova Scotia and Prince Edward Island.

Its status has not yet been established in Alberta, Northern Territories and Nunavut, but it is generally secure within the central and western part of its Canadian range (NatureServe).

Provincial:

In Newfoundland and Labrador, the species is known only from two small, closely situated areas on Newfoundland's Port au Port Peninsula: Cape St. George and a set of unnamed hills collectively called Garden Hill lying between Cape St. George and Mainland (see Figures section).

Cape St. George Population:

The Cape St. George population was the first known population of the species in Newfoundland; having been discovered in 1922 by K. K. Mackenzie and L. Griscom. It may be the more vulnerable of the Newfoundland populations since few seedlings have been found in recent years and habitat degradation is high.

Garden Hill Population:

Individual unnamed hills in the Garden Hill area contain patches of *subsp. mackenziei.* For reporting purposes, they have been given unofficial names: First, Second, Third, Fourth and Coastal Hill. Second Hill is quite expansive, while Coastal Hill, Third and Fourth Hill are relatively small in area. Coastal, Second, Third and Fourth Hill are all within a few hundred meters of each other while First Hill is separated from them by about 1 km. It is likely that these sub-populations experience gene flow through pollination, and may be even more geographically connected than originally thought because about half the potential habitat area has not been surveyed yet (mostly the areas that are difficult to reach on foot) (Claudia Hanel, pers. comm. 2018).

The Extent of Occurrence is 9.3 km², and the Indexed Area of Occurrence is 20 km^2 .

Habitat

In arctic habitats *Hedysarum boreale* subsp. *mackenziei* is found on dry tundra on gravel-clay soils but can also inhabit rocky and scree slopes. Usually found within other vegetation. On the Island of Newfoundland *H. boreale* subsp. *mackenziei* is found only in open, dry limestone barrens as part of heath communities (SSAC 2006). Unlike some limestone barrens plants, it has an affinity for low heath patches rather than open gravel.

Biology

The biology of the species was well summarized in the SSAC 2006 species status report, but is here updated by some recent observations.

The subspecies *Hedysarum boreale* subsp. *boreale* has been extensively studied in Utah in the process of developing a cultivar to seed for range improvement in the intermountain West (Upper Colorado Environmental Plant Center 1994). The species fixes nitrogen, and this capability can be enhanced by inoculation of the seeds with *Rhizobium* bacteria and mycorrhizal fungi (Redente and Reeves 1981). In a nursery the plants started to produce seed in their second year (Johnson et al. 1989), although plants growing *in situ* might be expected to mature later. *Hedysarum boreale* subsp. *boreale* plants are long-lived (up to 20 years) (Treshow and Harper 1974).

During trials of *Hedysarum boreale* subsp. *boreale* to select for seed yield it was noted that the seed yield per plant varied greatly from year to year and from plant to plant (Upper Colorado Environmental Plant Center 1994). Plants were not very tolerant of competition and are susceptible to grazing damage from wild ungulates and livestock due to its high palatability (Upper Colorado Environmental Plant Center 1994). However, in Newfoundland there is no evidence that *H. boreale* subsp. *mackenziei* is being targeted by moose or other herbivores (Claudia Hanel, pers. comm. 2018).

In Newfoundland, plants have been observed to flower from early June to August. The species requires insect pollination. In Alaska and the Yukon Territory this service is at least partially performed by bees of the genus *Megachile*, and to a lesser degree, *Bombus* (McGuire 1993). It is not known whether the same bee genera are its chief pollinators in Newfoundland (SSAC 2006), although both genera occur on the Island (David Langer, pers. comm. 2019).

The rust fungus *Uromyces hedysari-obscuri* was collected on *Hedysarum boreale* subsp. *mackenziei* in Alaska (Anderson 1940). This fungus also exists in Newfoundland (Louise Lefebvre, Assistant Curator, National Mycological Herbarium, pers. comm. 2006). A fungal pathogen leaving black patches on leaves has been found on *H. boreale* (Hanel, pers. comm. 2018). It is unclear if infection is part of annual senescence or if it is the result of a seasonal pathogen. Not all populations appeared to contain infected individuals. Identification of isolates from infected leaves is required.

If increasing population size or the maintenance of plants *ex situ* were to be considered as conservation initiatives, direct seeding would probably be preferred. The plants dislike root disturbance (Plants for a Future 2004) and are not easily transplanted (Ontario Rock Gardening Society 2002).

In a recent survey report of *H. boreale* subsp. *mackenziei* in Newfoundland (Claudia Hanel, pers. comm. 2018) several details about seedlings and fruits were noted. A tendency for seedlings to grow close to, or underneath, nearby members of *H. boreale* subsp. *mackenziei* suggests that seeds do not disperse very far or that there is a positive interaction between mature individuals and seedlings. The attributes of the loment fruit-type provide seeds with an effective means of dispersal. However, given the patchiness of suitable habitat for H. boreale subsp. mackenziei in Newfoundland, seeds will most likely not end up in a place conducive to establishment. Only 106 of the 361 monitored plants had flower stalks, averaging 11.58 flowering stalks per plant. Eighteen percent of flowering stalks failed to produce seeds. Some flowers completely failed to set fruit, leading to "empty" flower stubs after flower senescence. This was particularly prevalent in one of the Cape St. George plots. Some stalks completely aborted even before buds opened. This, again, was particularly prevalent in one of the Cape St. George plots. Other plants had fruits present, but these were barren of fertile seeds. Many fruits had a mixture of viable and vestigial seeds, leading to overall low numbers of seeds per fruit. Overall the reproductive success of *H. boreale* subsp. mackenziei varied substantially in the survey. There does not seem to be one underlying cause of the low reproductive success found in the surveyed plants. One possible explanation for empty flowers and floral abortions may be low-temperatures at the time of flower formation. A small effective population size may lead to inbreeding depression and an associated low degree of seed viability. Low seed viability can also arise from poor auto-fertility if cross-pollination is not frequent.

Population Size and Trends

Surveys in 2000, 2001, 2007, 2011, 2014, 2016 and 2017 have extended the area known to be occupied by the species and have increased the estimated population size.

Several 5m x 5m plots were established to get a population size baseline. Claudia Hanel summarized the preliminary results of the surveys and monitoring efforts and provided some updated population estimates.

The Cape St. George population had an estimated 400 individuals when censused in 2006, but has not been censused since. In six plots established within this population, since 2006, approximately 200 plants have been counted, but because these plots do not encompass even half of the area known to be occupied it is believed that the total population in this area is more than 400, possibly as high as 1000.

From 2000 to 2017, the Garden Hill population had varying estimated population sizes, ranging from 2000 to 3000 individuals. An upper estimate of 10,000

individuals distributed across all of the Garden Hill sites is not improbable, with an upper estimate of 2000 individuals on Third Hill, and 3000 on Fourth Hill, alone.

An estimated total of about 10,400-11,400 individuals (flowering and non-flowering) for all of the Newfoundland populations is a plausible number.

In the monitoring plots, roughly 70% of individuals were vegetative at the time of survey (July and August 2016) and 30% were reproductive. Thus, the number of flowering individuals, for Newfoundland, was >10,400 x 0.3 = >3120.

No seedlings were observed at the Cape St. George population, while First and Second Hill sites had 52% and 37% seedlings present respectively. The complete lack of seedlings in the Cape St. George population is potentially worrisome.

In the six plots established since 2006, a total of 361 plants were counted when the plots were established. As the plots have not been resurveyed, no population trends are discerned. However, the high proportion of seedlings could be indicative of a continued persistence in the area. Future resampling of monitoring plots will permit the detection of population trends.

Threats and Limiting Factors

The main threat to the species in Newfoundland appears to be habitat degradation caused by human activity. The limestone barrens are of limited extent and are sensitive to disturbance. Motor vehicles can leave long-term damage to the habitat. ATVs, in particular, can access large parts of the limestone barrens. During the survey periods at Cape St. George, ATV drivers were often observed outside the established ATV trails. Similarly, 'donuts' were left were ATV drivers had turned in tight circles, with wheels spinning, resulting in degradation of habitat through soil compaction, water puddling and erosion.

A threats assessment for *H. boreale* subsp. *mackenziei* in Newfoundland, employing the protocol of Salafsky et al. (2008), is presented below:

- 1. Residential and commercial development
 - 1.1. Housing and Urban areas

The area is under pressure from land development because it is very scenic. Between Cape St. George and the Garden Hill several buildings have been constructed. The property was originally operated as a resort but has changed hands at least once and is no longer a tourist establishment. An adjacent parcel of land has been cleared for a residential development.

- 3. Energy Production & Mining
 - 3.1. Oil & Gas drilling

In 2008 seismic exploration for oil was carried out that spanned most of the Port au Port Peninsula, including the Garden Hill. A drill rig was required to travel along surveyed lines; therefore woody vegetation present along these lines was cut.

H. boreale subsp. *mackenziei* occurs in treeless habitat, so the main threat from this seismic exploration was being driven-on by a drill rig. A single Mackenzie's Sweetvetch plant was found approximately 20m from the proposed seismic line. Seismic lines from previous exploration near Cape St. George are visible on aerial imagery. Drilling and extraction of oil has taken place in the area almost halfway between Cape St. George and the Garden Hill. Given that oil is known to occur in the area it is likely that both exploration and extraction will be considered in the future.

- 4. Transportation & Service Corridors
 - 4.1. Roads & Railroads

A recent road and parking lot upgrade at Boutte du Cap Municipal Park at Cape St. George has had an unknown impact on the species. The work was carried out without consultation with the Provincial Wildlife Division. Owing to the construction of a parking lot close to the plants, the site is now more accessible to regular tourist foot traffic. Further owing to the construction effort, the surface hydrology has changed, as water flows have been diverted to different areas. Serious soil erosion has resulted. It is not yet known if any of the *H. boreale subsp. mackenziei* plants were negatively impacted by the altered water and soil flows.

- 6. Human Intrusions & Disturbance
 - 6.1. Recreational activities

There is a hiking trail system that bisects parts of the Cape St. George, Second Hill, and Fourth Hill sites. Parts of this trail are clearly used by ATVs, and other parts are just flagged, primarily for foot traffic. The amount of foot and ATV traffic is highest at Cape St. George, so a few plants midway along the trail were impacted. At Second Hill the trail and ATV use is concentrated on the bare rock and gravel ridges, so there were no plants observed directly in the path of the vehicles. At Fourth Hill the traffic was light enough that the plants, which were abundant in the trail, showed no signs of impact.

11. Climate Change & Severe Weather

Like all enclaves of arctic/alpine and coastal tundra in Newfoundland the limestone barrens on the Port au Port Peninsula are vulnerable to climate change. With warming temperatures it is expected that the area occupied by woody vegetation will increase. It is likely that *H. boreale* subsp. *mackenziei* will be impacted.

Protection, Status and Ranks

Hedysarum boreale subsp. mackenziei was designated as endangered under the Newfoundland and Labrador Endangered Species Act in August of 2010. Critical habitat has not yet been formally designated for this species. However, the habitats in which *H. boreale* subsp. mackenziei occurs have been designated as provincial Sensitive Wildlife Areas (SWAs).

Although not associated with legislation, SWA status affords effective habitat protection by triggering a review by the Forestry and Wildlife Branch of any proposed land uses in the designated area. This includes land use registrations under the provincial Environmental Assessment Act as well and any land use applications referred through the provincial Interdepartmental Land Use Committee (ILUC). During such reviews, land use applications may be declined if they will negatively impact species at risk or their habitats, conditions may be placed on land use activities, and/or mitigations can be developed to halt or reduce any potential negative effects on species at risk (J. Humber, pers. Comm., 2018).

All ranks listed below for *Hedysarum boreale* subsp. *mackenziei* are based on the "Wild Species 2015: The General Status of Species in Canada" data (Canadian Endangered Species Conservation Council 2016), and NatureServe (2018).

Category	/	Rank
Global		
G-	rank:	G5
IU	CN:	Not listed
National		
N-	rank:	N5
CC	DSEWIC:	Not assessed
Provincia	I	
Ne	ewfoundland (Island):	S1, critically imperiled
Adjacent	Jurisdictions:	
Qı	uebec S-Rank	S2, imperiled

Status Review Report

Hedysarum boreale subsp. mackenziei Mackenzie's Sweetvetch, Mackenzie's Hedysarum, Sainfoin de Mackenzie Range of occurrence in NL (NF/ LB): Newfoundland only – restricted to Port au Port Peninsula.

Existing SSAC Assessment:

Date of last assessment: April 2006			
Reason for designation at last assessment:			
 Only found in 2 adjacent populations in restricted area of the island portion of the province Boreal - Arctic disjunct Habitat degradation due to human activity Site is highly degraded and under threat with the quality of the habitat declining over the past 15 years based on expert observation over that time period Data pertaining to the rate of decline or fluctuations in number of mature individuals are not known at this time No rescue effect possible due to disjunction 			
Criteria applied at last assessment:			
 Qualified as Endangered under the SSAC/COSEWIC criteria B1, B 2.(a) and B 2.(b) iii) 			

SSAC Recommendation:

□No change in status and criteria

□No change in status, new criteria

* A change in the status is being recommended

Evidence supporting this Status Review:

Wildlife species:	
Change in eligibility, taxonomy or designatable units:	Yes 🗆 No 🖂
Range:	
Change in Extent of Occurrence (EO):	Yes 🛛 No 🗆 Unk 🗆
Change in Index of Area of Occupancy (IAO):	Yes ⊠ No 🗆 Unk 🗆
Explanation:	
More properly, "n/a". "AO", not "IAO", was used in the 2006 report.	
Change in no. of known or inferred current locations*	Yes 🗆 No 📄 Unk 🖂
Significant new survey information:	Yes 🛛 No 🗆 Unk 🗆
Explanation:	
Extensive surveys have been performed since the last assessment. Several new sites have been found, but all of them are very close to sites known at the time of the previous assessment and all are believed to be part of the same population. Some of these new patches are partially threatened by ATV use and oil exploration and extraction.	
Population Information:	
Change in number of mature individuals:	Yes ⊠ No 🗋 Unk 🗋
Explanation: Mainly owing to new surveys.	
Change in population trend:	Yes □ No □ Unk ⊠
Explanation:	
The original count made in 1995 was ~100 mature plants (SSAC 2006). Since that time additional surveys have found numerous additional plants. However, these additional plants reflect increased search effort and are not attributed to an	

increasing population trend.	
Change in severity of population fragmentation:	Yes □ No ⊠ Unk □
Change in trend in area and/or quality of habitat:	Yes ⊠ No 🗆 Unk 🗆
Significant new survey information:	Yes ⊠ No 🗆
Explanation:	
Thousands of previously unknown individuals were found during surveys conducted since 2006.	
Threats:	
Change in nature and/or severity of threats:	Yes □ No□ Unk ⊠
Explanation:	
Human activity and associated habitat degradation remains the greatest threat.	
Some habitat has been altered by road construction, but it is not yet known whether this will have a negative impact on the population.	
Off-road vehicle use has continued.	
Exploration for oil occurred in 2007/2008.	
Protection:	
Change in effective protection:	Yes ⊠ No □
Explanation:	
The species was listed as Endangered under the NL Endangered Species Act in 2010. Preliminary talks about a formal Stewardship agreement have begun between the Province and the Municipality of Cape St. George.	

Rescue Effect:	
Change in evidence of rescue effect:	Yes 🗆 No 🖂
Quantitative Analysis:	
Change in estimated probability of extirpation:	Yes 🗆 No 🗋 Unk 🖂
Details: No quantitative analysis was performed.	

Summary and Additional Considerations:

The recent surveys show that the population size of the species is higher than was previously estimated.

Acknowledgements and authorities contacted:

Claudia Hanel – Ecosystem Management Ecologist – Botanist, Forestry and Wildlife Research Division, Government of Newfoundland and Labrador

Adam Durocher - Data Manager, Atlantic Canada Conservation Data Centre

Author of Status Review:

Sander Bennett Boisen

Technical Summary

Hedysarum boreale subsp. mackenziei

Mackenzie's Sweetvetch, Mackenzie's Hedysarum Sainfoin de Mackenzie

Range of occurrence in the province: 2 populations along roughly 10 kilometers of coastal limestone hills on the Port au Port Peninsula

Demographic Information

1.	Generation time (usually average age of parents in the population)	Estimated at 10-15 years
2.	Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	No
3.	Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	n/a
4.	[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Unknown
5.	[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown
6.	[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.	Unknown
7.	Are the causes of the decline a. clearly reversible and b. understood and c. ceased?	n/a
8.	Are there extreme fluctuations in number of mature individuals?	Unknown, but unlikely

Extent and Occupancy Information

9.	Estimated extent of occurrence	9.30 km ²
10.	Index of area of occupancy (IAO) (Always report 2x2 grid value).	20 km²

11.	Is the population "severely fragmented" i.e., >50% of its total area of occupancy is in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a large distance?	No
12.	Number of locations*	Unknown, but likely >10
13.	Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	No
14.	Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	No
15.	Is there an [observed, inferred, or projected] continuing decline in number of sub-populations?	No
16.	Is there an [observed, inferred, or projected] continuing decline in number of locations*?	No
17.	Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Observed and projected decline in quality
18.	Are there extreme fluctuations in number of sub- populations?	No
19.	Are there extreme fluctuations in number of locations*?	No
20.	Are there extreme fluctuations in extent of occurrence?	No
21.	Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each sub-population)

22.	Sub-populations [total of all adult plants x 0.3 = total flowering plants; see text]	N Mature Individuals
	Cape St. George	400-1000 x 0.3 = 120-300
	Garden Hill	>5000 to as much as 10000 x 0.3 =

^{*} See Definitions and Abbreviations on <u>COSEWIC website</u> and <u>IUCN 2010</u> for more information on this term.

	>1560-3120
Total	>1960-3420

Quantitative Analysis

23.	Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	n/a

Threats (actual or imminent, to populations or habitats)

24.	Threats and IUCN categories summary:	
	1.1. Housing and Urban areas	
	3.1. Oil & Gas drilling	
	4.1. Roads & Railroads	
	6.1. Recreational activities	
	11. Climate Change & Severe Weather	

Rescue Effect (immigration from outside NL)

25.	Status of outside population(s) most likely to provide immigrants to NL?	Quebec (S2)
26.	Is immigration known or possible?	Unknown
27.	Would immigrants be adapted to survive in NL?	Probably
28.	Is there sufficient habitat for immigrants in NL?	Potentially
29.	Is rescue from outside populations likely?	Unlikely

Data Sensitive Species

30.	Is this a data sensitive species?
	No

Current Status

31. Status History (COSEWIC or SSAC)		
In April 2006, the species was assessed as Endangered by the Species Status Advisory Committee, in the document entitled: "The Status of Mackenzie's Sweetvetch (<i>Hedysarum boreale</i> subsp. <i>mackenzii</i>) in Newfoundland and Labrador"		
In August 2010, the species was listed as Endangered in Newfoundland and Labrador under the Newfoundland and Labrador Endangered Species Act.		
Because the species is not rare nationally, it has not been assessed by COSEWIC and is not protected under the federal Species at Risk Act.		
32. Criteria (old):		
 B1. Extent of occurrence <5,000 km² B2. Area of occupancy <500 km² (a) Known to exist at < 5 locations (b) Continuing decline observed, inferred or projected in iii) area, extent and/or quality of habitat 		
33. Year Assessed: 2006		
34. Reasons for Designation:		
Qualified as Endangered under the SSAC/COSEWIC criteria B1, B 2. (a) and B 2.(b) iii):		
 Found only in 2 adjacent populations in restricted area of the island portion of the province Boreal - Arctic disjunct Habitat degradation due to human activity • Site is highly degraded and under threat with the quality of the habitat declining over the past 15 years based on expert observation over that time period Data pertaining to the rate of decline or fluctuations in number of mature individuals are not known at this time No rescue effect possible due to disjunction 		

35. Author of Technical Summary: Sander Bennett Boisen

36. Additional Sources of Information: n/a

Recommended Status and Reasons for Designation

37.	Recommended Status: Threatened	38. Alpha-numeric Code: D2	
39.	Reasons for Designation:		
 Species is a Boreal-Arctic disjunct limited to the Port au Port peninsula occurring over a small area of distribution (IAO = 20 km²). Additional search efforts have increased the population estimate for the species and expanded the known range slightly. However, habitat degradation is ongoing and the species faces several continuing threadue to human activity, with the most imminent threat being ATV activity. Rescue effect is highly unlikely due to disjunction. 		c disjunct limited to the Port au Port peninsula and area of distribution (IAO = 20 km ²). have increased the population estimate for the the known range slightly. However, habitat and the species faces several continuing threats with the most imminent threat being ATV activity. hlikely due to disjunction.	

Applicability of Criteria

40. Qualifies as Threatened under D2: Population with a very restricted index of area of occupancy (<20 km²) such that it is prone to the effects of human activities or stochastic events within a very short time period (1-2 generations) in an uncertain future, and is thus capable of becoming extinct, extirpated or critically endangered in a very short period of time.

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Claudia Hanel, March 20th 2018

Jessica Humber – Ecosystem Management Ecologist – Biodiversity, Forestry and Wildlife Research Division, Government of Newfoundland and Labrador, March 2018.

Figures



Figure 1: *H. boreale* inflorescence with characteristic purple flowers (left) and an immature fruit pod (right). Photos courtesy of Claudia Hanel.



Figure 2: Status of *H. boreale* subsp. *mackenziei* in North America. Color indicates conservation status with the following key: Red – Critically Imperiled, Orange – Imperiled, Yellow – Vulnerable, Light Green – Apparently Secure, Dark Green – Secure, Brown – Not Ranked or Under Review. Source: NatureServe Explorer 2019.



Figure 3: The distribution of *H. boreale* on the south western part of the Port au Port Peninsula. Prepared by Adam Durocher, Atlantic Canada Conservation Data Centre.



Figure 4: The distribution of *Hedysarum boreale* and its extent of occurrence in Newfoundland. Prepared by Adam Durocher, Atlantic Canada Conservation Data Centre.



Figure 5: The distribution of *Hedysarum boreale* subsp. *mackenziei* and its index of area of occupancy in Newfoundland. Prepared by Adam Durocher, Atlantic Canada Conservation