

COSEWIC
Assessment and Status Report

on the

Provancher's Fleabane
Erigeron philadelphicus var. *provancheri*

in Canada



DATA DEFICIENT
2023

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

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Provancher's Fleabane in Lévis (Ross Cove); photo by Frédéric Coursol.

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COSEWIC Assessment Summary

Assessment Summary – May 2023

Common name

Provancher's Fleabane

Scientific name

Erigeron philadelphicus var. *provancheri*

Status

Data Deficient

Reason for designation

This small perennial plant is known to occur in southern Quebec. The understanding of the taxonomic concept for this plant has changed since its last assessment in 1992. It is unclear whether similar individuals in Ontario are part of the same Wildlife Species. Only detailed genetic and ecophysiological studies would resolve taxonomic issues

Occurrence

Ontario, Quebec

Status history

Designated Special Concern in April 1992. Species considered in May 2023 and placed in the Data Deficient category.



COSEWIC Executive Summary

Provancher's Fleabane *Erigeron philadelphicus* var. *provancheri*

Wildlife Species Description and Significance

Provancher's Fleabane (*Erigeron philadelphicus* var. *provancheri*) is a small perennial herbaceous plant belonging to the Aster family. It is characterized by 3 to 20 hairless, or nearly hairless, leaves that form a basal rosette. The stem, which is also hairless or nearly so, may be up to 20 cm long, and arises from the centre of the rosette. The inflorescence consists of 1 to 20 flower heads with white or pale pink petals. The fruits are achenes, crowned with silky whitish hairs. As a rare endemic, Provancher's Fleabane is of considerable biological interest and is an important component of the Great Lakes and St. Lawrence flora. There is still debate on whether the Ontario and Quebec subpopulations represent the same taxon.

Aboriginal (Indigenous) Knowledge

All species are significant and are interconnected and interrelated. There is no species-specific ATK in the report.

Distribution

Provancher's Fleabane is recorded only from northeastern North America. It has 29 known subpopulations, 21 of which occur in Canada. Quebec's 16 subpopulations are located in the Joliette region, the greater Quebec City region and southeastern and central Quebec. The five subpopulations in Ontario are found on the Saugeen (Bruce) Peninsula and adjacent Lake Huron islands, and near Manitoulin Island. It may also occur in other areas of Ontario, including near Lake Erie. It is also found in Vermont, New York, and possibly Michigan and Ohio.

Habitat

Provancher's Fleabane grows in crevices in calcareous rocks or pavement, as well as on damp cliffs, escarpments, and gravel areas that are calcareous in nature (e.g. limestone, shale), along rivers or the Great Lakes or near waterfalls or rapids. It also occurs in the upper portion of the freshwater intertidal zone of the St. Lawrence River and on shoreline alvars in Ontario. It is intolerant of competition from other plants.

Biology

Provancher's Fleabane is a perennial of open habitats that tolerates the shade generated by its sometimes vertical habitat. It blooms from mid-June to the first frosts, with peak flowering occurring in early summer. It reproduces asexually (by rhizomes) and sexually (by seeds). Seeds are dispersed by wind and water.

Population Sizes and Trends

Generally, the habitat and number of individuals of Provancher's Fleabane appear to be stable at its known sites, according to field observations. A more inclusive approach to the classification of this taxon based on leaf pubescence resulted in an increase in the number of subpopulations in Ontario and Quebec. Since the previous report, 14 new subpopulations have been located, and the size of the known subpopulations has declined at four sites and increased at nine others. The number of individuals has decreased by half at two sites.

Threats and Limiting Factors

The overall threat impact was calculated as low, with invasive non-native plants and introduced genetic material from the Philadelphia Fleabane being the main threats. Trampling and recreational bonfires are reported as threats to some subpopulations. Landslides may affect large portions of sites or even destroy entire sites. Fluctuating water levels due to the effects of climate change have also been identified as a threat to the subpopulations along the shores of Lake Huron.

Limiting factors for Provancher's Fleabane include the impacts of woody debris (driftwood) and the taxon's specific habitat requirements, including its affinity for a calcareous substrate, low levels of competition with other species and relatively high humidity levels.

Protection, Status and Ranks

The Quebec subpopulations of Provancher's Fleabane were assessed as Vulnerable (formerly described as "Vulnerable from 1990 to 1999", now defined as "Special Concern") by COSEWIC in April 1992 and Data Deficient in 2023. It was listed as a species of Special Concern on Schedule 3 of the federal *Species at Risk Act*. In Quebec, it has been designated Threatened since 2005 and is protected under the province's *Act Respecting Threatened or Vulnerable Species*. In Ontario, Provancher's Fleabane has no legal status; however, sites managed by Parks Canada are afforded some measure of protection. In New York State, Provancher's Fleabane is designated Endangered under the *Environmental Conservation Law of New York*.

Provancher's Fleabane has a global conservation rank of Vulnerable (G5T3), with national status ranks of Vulnerable (N3) in Canada and Critically Imperiled to Imperiled (N1N2) in the United States.

TECHNICAL SUMMARY

Erigeron philadelphicus var. *provancheri*

Provancher's Fleabane

Vergerette de Provancher

Range of occurrence in Canada (province/territory/ocean): Ontario, Quebec

Demographic information

Generation time (usually average age of parents in the population: indicate if another method of estimating generation time indicated in the IUCN guidelines [2011] is being used)	3 years. Precise data are not available, but cultivars have a lifespan of 4 years. Flowering does not occur until the beginning of the second year.
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Unknown. Numbers observed to be declining locally in some subpopulations, but increasing in others. Inferred small continuing declines in some subpopulations due to the encroachment of invasive species.
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Unknown.
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Unknown if declining overall in Canada , but declines as great as 59% at certain sites in known subpopulations. The known abundance of some subpopulations has increased because of more intense research efforts.
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown. Likely not substantial. Estimated population size is significantly larger than that in the previous update status report, but this is due to the greatly increased search effort and changes in the taxonomic concept.
[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. Potential for minor reductions suspected.
Are the causes of the decline a. clearly reversible and b. understood and c. ceased?	a. No b. No c. No
Are there extreme fluctuations in number of mature individuals?	Unlikely. There is insufficient information to indicate extreme fluctuations in the national population, though an extreme fluctuation was noted in 2011 at one site (Pointe de Saint-Vallier).

Extent and Occupancy Information

Estimated extent of occurrence (EOO)	108,252.44 km ²
Index of area of occupancy (IAO) (Always report 2x2 grid value.)	220 km ² is considered a minimum estimate. The search for other sites in Ontario on the shores of limestone rivers could reasonably increase this estimate.
Is the population “severely fragmented” i.e., is >50% of its total area of occupancy 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 distance larger than the species can be expected to disperse?	a. No b. Yes
Number of “locations” * (use plausible range to reflect uncertainty if appropriate)	Believed to exceed 10 and estimated to be 37 (Quebec locations threatened by invasive plants) and 65 (assuming that all 28 Ontario locations are also threatened by invasive plants)
Is there an [observed, inferred, or projected] decline in extent of occurrence?	No
Is there an [observed, inferred, or projected] decline in index of area of occupancy?	No
Is there an [observed, inferred, or projected] decline in number of subpopulations?	No
Is there an [observed, inferred, or projected] decline in number of “locations”**?	No
Is there an [observed, inferred, or projected] decline in [area, extent and/or quality] of habitat?	Yes. Although there is no obvious decline at most sites, there is an observed overall decline in the area and quality of the habitat at some sites, attributed primarily to encroachment by Coltsfoot and Reed Canarygrass.
Are there extreme fluctuations in number of subpopulations?	No
Are there extreme fluctuations in number of “locations”**?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each subpopulation)

Subpopulations (give plausible ranges)	Number of Mature Individuals in 2018 in Quebec and in 2021–2022 in Ontario
Quebec	
Coaticook	267
Crabtree	3

* See Definitions and Abbreviations on [COSEWIC website](#) for more information on this term.

Daveluyville	151
Drummondville / Sainte-Majorique-de-Grantham	351
Joliette	145
Lévis (Ross Cove)	877
Lévis (Etchemin River)	12
Ogden	16
Pont-Rouge / Neuville	2,905
Quebec City / Boischatel	912
Saint-Augustin-de-Desmaures / Quebec City	171
Saint-Ferréol-les-Neiges / Saint-Joachim	239
Saint-Vallier	362
Sainte-Anne-de-la-Pérade	632
Stanstead-Est	903
Waterville	4,106
Ontario	
Cave Point	10
Lucas Island	Unknown
Perseverance Island	Unknown
Terry Point	12
Tobermory	2,153
Total for Quebec and Ontario	14,087 (minimum) value

Quantitative Analysis

Is the probability of extinction in the wild at least [20% within 20 years or 5 generations, or 10% within 100 years]?	Quantitative analysis not performed
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Threats (actual or imminent, to populations or habitats, from highest impact to least)

Was a threats calculator completed for this species? Yes, see Appendix 1.
Overall Threat Impact: Low

- i. Other ecosystem modifications (Low – IUCN 7.3)
- ii. Introduced genetic material (Low – IUCN 8.3)
- iii. Industrial and military effluents (Unknown – IUCN 9.2)
- iv. Storms and flooding (Unknown – IUCN 11.4)

What additional limiting factors are relevant?

Limiting factors include impacts of woody debris (driftwood) and the species' specific habitat requirements, including its affinity for a calcareous substrate, low levels of competition with other species and relatively high humidity levels.

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	Critically Imperiled (S1) in Vermont and New York. Potential in Michigan and Ohio but not ranked.
Is immigration known or possible?	Possible
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	No, the available habitat in Canada is already occupied.
Are conditions deteriorating in Canada? ⁺	Yes
Are conditions for the source (i.e., outside) population deteriorating?+	No
Is the Canadian population considered to be a sink?+	No
Is rescue from outside populations likely?	Very unlikely

Data Sensitive Species

Is this a data sensitive species?	No
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Status History

COSEWIC Status History: Designated Special Concern in April 1992. Species considered in May 2023 and placed in the Data Deficient category.

Status and Reasons for Designation:

Status: Data Deficient	Alpha-numeric codes: Not Applicable
Reasons for Designation: This small perennial plant is known to occur in southern Quebec. The understanding of the taxonomic concept for this plant has changed since its last assessment in 1992. It is unclear whether similar individuals in Ontario are part of the same wildlife species. Only detailed genetic and ecophysiological studies would resolve taxonomic issues.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. Insufficient information available to apply criteria.
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. Insufficient information available to apply criteria.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. Insufficient information available to apply criteria.
Criterion D (Very Small or Restricted Population): Not applicable. Insufficient information available to apply criteria.
Criterion E (Quantitative Analysis): Not applicable. Insufficient information available to apply criteria.

⁺ See [Table 3](#) (Guidelines for modifying status assessment based on rescue effect).

PREFACE

The publication of the first status report for Provancher's Fleabane was done in 1991 by Sabourin and Paquette (1991). After Provancher's Fleabane was assessed as Vulnerable (formerly described as "Vulnerable from 1990 to 1999", now defined as "Special Concern") by COSEWIC in 1992, field surveys were conducted in 2002 at all known sites of the taxon in Quebec. A draft update status report was prepared (Coursol 2002), but it was not finalized, and a reassessment by COSEWIC did not take place. Since then, a great deal of fieldwork has been carried out in Quebec to assess the taxon's presence in potential habitats (Coursol 2005). During surveys in 2004 and 2005, 65 sites were surveyed along rivers in southern and central Quebec. This update led to the addition of nine new subpopulations (Coursol 2005). The broadening of the distinctive traits of the taxon by Nesom (2006) allowed its known range to be expanded, with the addition of five subpopulations in Ontario comprising 28 sites (previously classified as Philadelphia Fleabane) on the Saugeen (Bruce) Peninsula, in and around Bruce Peninsula National Park (BPNP) and Fathom Five National Marine Park (FFNMP) (Miller 2021, 2023). The taxon has been reported from Lake Erie but remains unconfirmed. It may also occur in Michigan in areas of suitable habitat but there has been no search effort in the region to separate the varieties of *Erigeron philadelphicus*. In 2018, a review of questionable sites in Quebec mentioned by Sabourin and Paquette (1991) led to three additional subpopulations being confirmed.

Since the previous report, there have been 14 new subpopulations identified, with subpopulation declines at four sites and increases at nine others. The number of individuals has decreased by half at two sites.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2023)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



Environment and
Climate Change Canada
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Canada

The Canadian Wildlife Service, Environment and Climate Change Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Provancher's Fleabane

Erigeron philadelphicus var. *provancheri*

in Canada

2023

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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Scientific Name:

Erigeron philadelphicus Linnaeus var. *provancheri* (Victorin & J. Rousseau) B. Boivin

Pertinent Synonyms:

Erigeron provancheri Victorin & J. Rousseau

Erigeron philadelphicus Linnaeus subsp. *provancheri* (Victorin & J. Rousseau)

J.K. Morton

Erigeron philadelphicus Linnaeus f. *angustatus* Victorin & J. Rousseau

English Common Name:

Provancher's Fleabane

Provancher's Philadelphia Fleabane

French Common Name:

vergerette de Provancher

vergerette de Philadelphie sous-espèce de Provancher

Family Name:

Asteraceae (Asters)

Provancher's Fleabane is a member of the genus *Erigeron*, which consists of about 390 species, including 173 in North America (Nesom 2006). The plant's taxonomy has been controversial since it was first described in 1940 by Marie-Victorin and Rousseau (1940), who recognized the Ontario plants as belonging to a separate entity, *Erigeron philadelphicus* forma *angustatus*, described by the same authors (1940) from specimens collected at Tobermory and on nearby Flower Pot Island, Bruce County, Ontario. Cronquist (1947) concluded that Provancher's Fleabane was merely the extreme of Philadelphia Fleabane in a subglabrous phase. Fernald (1950) considered Provancher's Fleabane to be a probable extreme of Philadelphia Fleabane. Nesom (2006) recognized the varieties *philadelphicus* and *provancheri* and a third variety, *glabra*, which grows in salt marshes on Vancouver Island, British Columbia. Morton (1988) used common garden studies and examined chromosome numbers in the three varieties and forma *angustatus* from Ontario, concluding that "forma *angustatus* was almost indistinguishable from *E. provancheri*, differing only in its tendency to be slightly more pubescent" and added forma *angustatus* as a synonym of variety *provancheri*. He also noted that all three varieties had the same chromosome number ($2n=18$). Morton (1988) came to the conclusion that there were three genetically distinct taxa in *Erigeron philadelphicus* after examining the morphology and behaviour of the plants in cultivation. Nesom (2006) supported Boivin's (1962) and Morton's (1988) classification of the subject taxon as a variety of Philadelphia Fleabane. On the basis of Nesom's Flora of North America treatment (2006), most of the sites excluded by Sabourin and Paquette (1991) and Coursol (2002) are now encompassed by this expanded

taxonomic concept, which includes plants with glabrescent (becoming glabrous with age) leaves, as well as forma *angustatus*. COSEWIC decided that only detailed genetic and ecophysiological studies would settle the taxonomic issue of whether the Ontario and Quebec subpopulations represent the same taxon.

Description of Wildlife Species

Provancher's Fleabane is a perennial herb growing from a rhizome, in contrast to Philadelphia Fleabane, *Erigeron philadelphicus* var. *philadelphicus*, which is an annual or biennial with fibrous roots (Nesom 2006; cover photo 1). The single or multiple stem is glabrous, puberulent or pubescent at the base and can reach a height of 20 cm. The thin, glabrous or glabrate (hairless or almost hairless) leaves are entire or rarely coarsely dentate and sometimes have a ciliate mid-vein or margins. The shiny and more or less fleshy 3–20, 10- to 60-mm-long oblanceolate basal leaves form a persistent rosette. The lanceolate stem leaves are clasping or sessile. The inflorescence consists of 1 to 20 flowering heads, each 10 to 22 mm in diameter and with 100–150 white to slightly roseate ligules. The involucre bracts are pubescent to glabrous. The fruits are lanceolate brownish achenes (cypselae), each crowned with a pappus of numerous silky hairs.

Provancher's Fleabane can be distinguished from Philadelphia Fleabane largely by its hairless leaves, shorter stature (2–20 cm versus 10–100 cm), white or pale pink (versus pink or purple) flowers, rhizome and perennial (versus annual or biennial) habit. Despite these often distinctive characteristics, Provancher's Fleabane can be difficult to identify in the field. This is mainly due to the considerable variation noted in the pubescence of individual plants. The leaves of Ontario plants are generally more pubescent than those in Quebec and the United States.

Designatable Units

Discreteness

Provancher's Fleabane is a perennial herb growing from a rhizome, in contrast to Philadelphia Fleabane, which is annual or biennial in nature, with fibrous roots (Nesom 2006; cover photo). Other phenotypic characters include its shiny and more or less fleshy oblanceolate basal leaves that form a persistent rosette, as well as other phenotypical characters separating it from Philadelphia Fleabane (see Morphological Description). Provancher's Fleabane plants from the St. Lawrence Estuary and from the Saugeen (Bruce) Peninsula (the latter referred to historically as *Erigeron philadelphicus* forma *angustatus*) were grown in cultivation both from seed and from transplants from the wild. They grew larger than in their exposed natural habitats. Some of the plants reached about twice the stature of wild plants, but were still much smaller than normal Philadelphia Fleabane plants. Both retained their smaller capitula, white or very pale ligulate florets and sparser pubescence (Morton 1988). There are no known genetic studies separating the varieties or comparing the Ontario and Quebec subpopulations.

Evolutionary Significance

The subpopulations are located in unique physical (water body type and size) habitats, resulting in local adaptation and representing evolutionary significance. Provancher's Fleabane grows adjacent to and intergrades with Philadelphia Fleabane (see **Threats**) and yet both taxa maintain their separate genetic features. The designatable units have been on independent evolutionary trajectories since the Pleistocene glaciation, due to differing glacial refugia (Belland 1987; Bernatchez 1997). It is inferred that Provancher's Fleabane has the adaptive trait of being able to withstand tidal inundation or long periods of submersion.

The considerable distances between the Ontario and Quebec centres of distribution and the scarcity or absence of suitable habitat (calcareous rock substrate along the shoreline of large rivers or lakes) preclude regular allele exchange. In both regions, the habitat consists of sparsely vegetated, seasonally flooded and/or ice-scoured shorelines on a calcareous substrate. Despite fairly significant geographic disjunctions, Provancher's Fleabane does not appear to meet the criteria for a separate designatable unit, as there are likely to be other suitable habitats to explore in Ontario before reaching this conclusion and genetic studies could also help to clarify the separation.

Special Significance

As a rare endemic taxon, Provancher's Fleabane is of considerable biological interest and may represent the ancestral source of *Erigeron philadelphicus* (s. str.) (Brouillet pers. comm. 2002). Provancher's Fleabane has no known commercial or medicinal uses and no evidence of Aboriginal uses was found during the preparation of this report.

ABORIGINAL (INDIGENOUS) KNOWLEDGE

Aboriginal Traditional Knowledge (ATK) is relationship-based. It involves information on ecological relationships between humans and their environment, including characteristics of species, habitats and locations. Laws and protocols for human relationships with the environment are passed on through teachings, stories and Indigenous languages, and can be based on long-term observations. Place names provide information about harvesting areas, ecological processes, spiritual significance or the products of harvest. ATK can identify life history characteristics of a species or distinct differences between similar species.

Cultural Significance to Indigenous Peoples

There is no species-specific ATK in the report. However, Provancher's Fleabane is important to Indigenous Peoples, who recognize the interrelationships of all species within the ecosystem.

DISTRIBUTION

Global Range

Provancher's Fleabane is endemic to northeastern North America (Figure 1). In Canada, it is known from Ontario and Quebec. In the United States, Provancher's Fleabane is known to occur in New York State and Vermont (Nesom 2006). The taxon may also be present in Michigan but is not tracked there due to taxonomic uncertainty. The plants in Michigan may be a western "population" or just dwarfed lakeshore plants (Reznicek pers. comm. 2021). Additional sites are reported from Ohio (GBIF 2023).



Figure 1. Global range of Provancher's Fleabane (map by F. Coursol)

Canadian Range

In Ontario, the taxon has been recorded in five subpopulations composed of 28 known sites on the Saugeen (Bruce) Peninsula and adjacent Lake Huron islands (Table 1, Figure 2). Many of these sites are less than five kilometres apart and the associated breaks in

habitat are probably less than three kilometres. Other potential observations (iNaturalist records) come from as far south as Dyer’s Bay on the eastern shore of the peninsula and Pike Bay on the western shore (30 km south of the southernmost historical subpopulation) (Tyler 2023). There is also a report of a collection from the Waterloo area (Coursol pers. comm. 2021), and other unconfirmed reports come from along Lake Erie (Skinner pers. comm. 2021) (also see Sampling Efforts and Methods).

Table 1. Name of known subpopulations in North America and of sites used in this report, with equivalents from the previous reports

Subpopulation	Name of site(s)	Former name
Quebec		
Coaticook	Coaticook Gorge	New record
Crabtree	Les Dalles	Saint-Liguori
Daveluyville	1) Maddington Falls	No change
	2) Sainte-Anne-du-Sault	Sainte-Anne-du-Sault
Drummondville / Sainte-Marjorique-de-Grantham	1) Saint-Joachim	Saint-Joachim
	2) Pointe aux Indiens	New record
Joliette	L’Assomption River	No change
Lévis	1) Ross Cove, east of the wharf	Saint-Nicolas
	2) West of the Aulneuse River	New record
Lévis	Etchemin River	Saint-Romuald
Ogden	Tomifobia River	No change
Pont-Rouge / Neuville	1) Jacques-Cartier River / Déry Bridge	Pont-Rouge
	2) upstream of Presqu’île aux Raisins	New record
Quebec City / Boischatel	Montmorency River	Beauport / Boischatel
Saint-Augustin-de-Desmaures / Quebec City	1) Île à Gagnon	No change
	2) Pointe de la Vieille-Église	No change
	3) Saint-Laurent Beach	Cap-Rouge
	4) Provancher Marsh	New record
	5) East of Provancher Marsh	New record
Saint-Ferréol-les-Neiges / Saint-Joachim	1) Sainte-Anne Canyon	Saint-Joachim
	2) Saint-Ferréol-les-Neiges	Sainte-Anne River, grand canyon
Saint-Vallier	1) Anse des Boutins	West of Pointe de Saint-Vallier
	2) Pointe de Saint-Vallier	No change
Sainte-Anne-de-la-Pérade	Chez Alaric Rapid and Rapide Sud	The two sites were amalgamated.

Subpopulation	Name of site(s)	Former name
Stanstead-Est	Burroughs Falls	No change
Waterville	1) Eustis Dam	No change
	2) Waterville	Coaticook River downstream of the city
Ontario		
Cave Point		New record
Lucas Island		New record
Perseverance Island		New record
Terry Point		New record
Tobermory	1) Baptist Harbour	New record
	2) Barney Lake	New record
	3) Cape Hurd	New record
	4) Cove Island	New record
	5) Dunks Bay	New record
	6) Echo Island	New record
	7) Flowerpot Island	New record
	8) Harbour Island	New record
	9) Hopkins Bay	New record
	10) Little Cove	New record
	11) North Otter Island	New record
	12) South Otter Island	New record
	13) Peters Island	New record
	14) Russel Island	New record
	15) Tobermory	New record
	16) Turning Island	New record
	17) Williscroft Island	New record
	18) North Point	New record
	19) Driftwood Cove	New record
	20) Doctor Island	New record
	21) Island (~200 metres to the southwest of Russel Island)	New record
	22) Dorcas Bay	New record
	23) Deadman Point	New record
	24) Larson Cove	New record

Note: The subpopulation straddles two municipalities.

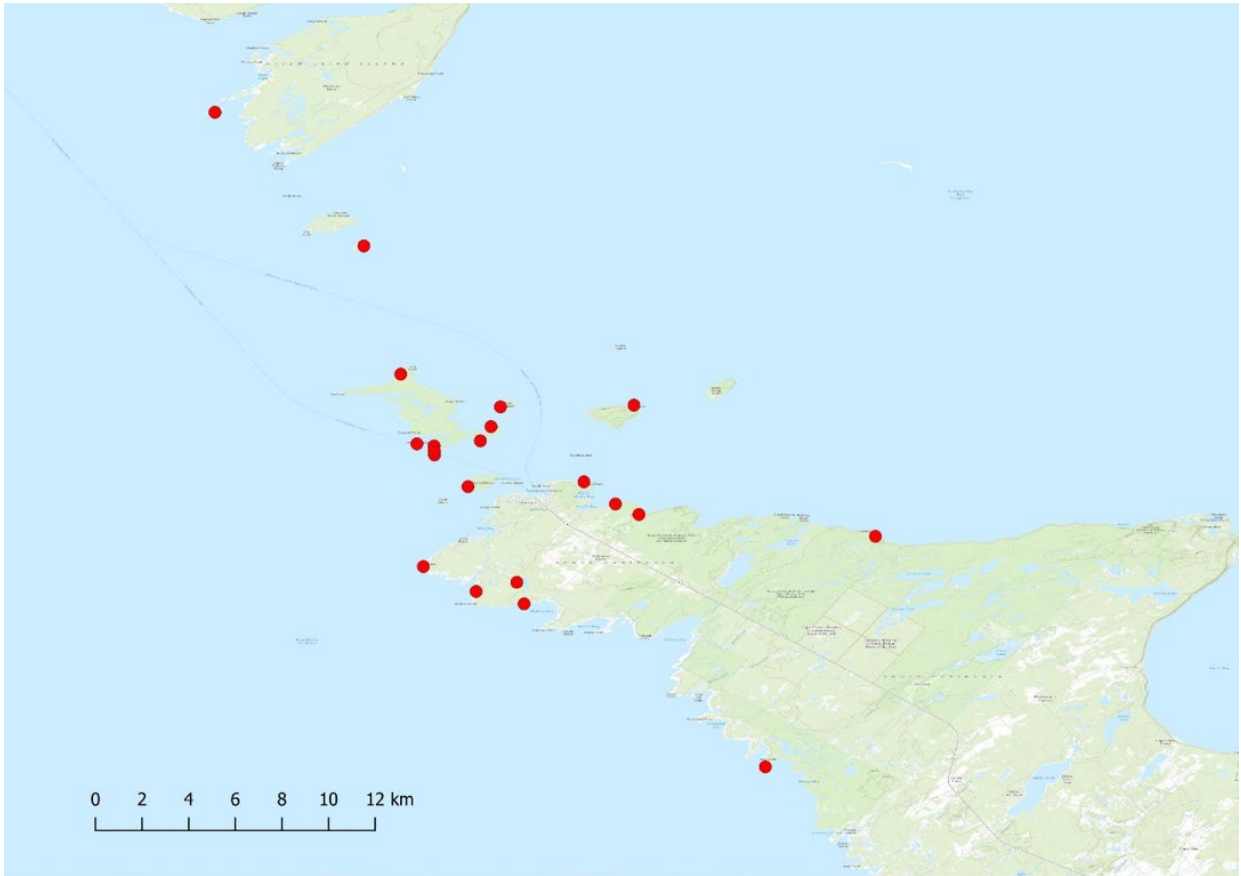


Figure 2. Range of Provancher's Fleabane in Ontario (map by F. Coursol)

In Quebec, Provancher's Fleabane is found in 16 subpopulations composed of 28 sites (Figure 3). Table 1 compares the names of the current subpopulations to those used in previous reports. A number of these are located on the banks of major rivers on the north shore of the St. Lawrence River, at the point where the rivers traverse a belt of limestone. In addition, in the Quebec City region, Provancher's Fleabane is found in freshwater estuarine habitats along the St. Lawrence. Geological factors may help to explain its distribution south of the St. Lawrence (Table 2).

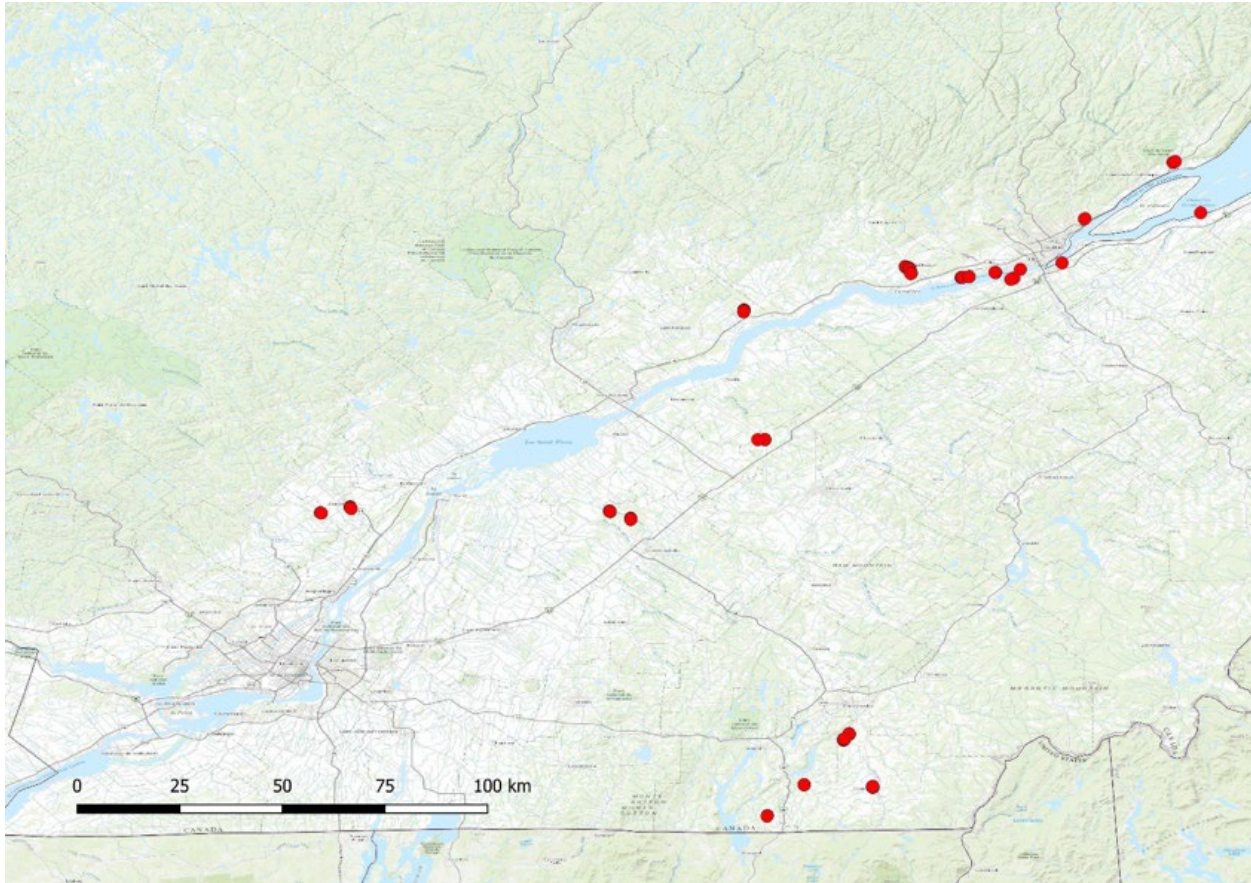


Figure 3. Range of Provancher's Fleabane in Quebec (map by F. Coursol)

Table 2. Local geology of known sites in North America

Subpopulation	Formation	Age	Rock type
Quebec			
Coaticook	Ayer's Cliff 3	Silurian to Devonian	Calcareous sandstone, argillaceous limestone, grey slate and brown sandstone
Crabtree	Ouareau	Middle Ordovician	Argillaceous micritic and nodular limestone, interbedded with shale
Crabtree	Deschambault	Ordovician	Crystalline limestone
Daveluyville (Maddington Falls)	Sillery 1 Group	Lower Cambrian	Alternation of red, green, grey or black shales interbedded with zones of impure sandstones and thin siltstone interbeds
Daveluyville (Sainte-Anne-du-Sault)	Sainte-Sabine	Middle Ordovician	<i>Argillaceous-calcareous, argillaceous-dolomitic, dolomitic and argillaceous slate; conglomeratic carbonate slate; argillaceous limestone and massive or laminar calcareous mudstone</i>

Subpopulation	Formation	Age	Rock type
Drummondville / Sainte-Marjorique-de-Grantham (Saint-Joachim)	Nicolet	Upper Ordovician	Grey shale and mudstone with lithic sandstone, siltstone, calcarenite and dolarenite interbeds
Drummondville / Sainte-Marjorique-de-Grantham (Pointe aux Indiens)	Sainte-Sabine	Middle Ordovician	<i>Argillaceous-calcareous</i> , argillaceous-dolomitic, <i>dolomitic and argillaceous slate</i> ; <i>conglomeratic carbonate slate</i> ; argillaceous limestone and massive or laminar calcareous mudstone
Joliette	Tétreauville	Middle Ordovician	Dense, dark bluish-gray limestone alternating with shale beds
Lévis (west of the Aulneuse River)	Saint-Nicolas 5	Middle Cambrian	Mudstone and red shale with a few siltstone and quartzose sandstone interbeds
Lévis (Ross Cove, east of wharf)	Saint-Nicolas 2	Middle Cambrian	Dark green and grey shale with a few siltstone and quartzose sandstone interbeds from 5 cm to 1 m thick
Lévis (Etchemin River)	Saint-Nicolas 4	Middle Cambrian	Alternation of feldspathic sandstone and red shale; a little quartzose sandstone
Ogden	Ayer's Cliff 2	Silurian to Devonian	Arenaceous limestone, calcareous mudslate: Burroughs, Waterville, Ogden Falls
Pont-Rouge / Neuville, (Jacques-Cartier River / Déry Bridge)	Deschambault	Ordovician	Crystalline limestone
Pont-Rouge / Neuville (upstream of Presqu'île aux Raisins)	Utica Shale	Middle Ordovician	Dark brown to black calcareous shale, argillaceous micritic limestone
Quebec City / Boischatel (Montmorency River)	Grondines Member	Middle Ordovician	Dark grey limestone, generally dense, rarely crystalline and with numerous argillaceous shale interbeds
Saint-Augustin-de-Desmaures / Quebec City (Saint-Laurent Beach)	Etchemin River Mélange	Middle Ordovician	Tectonic mélange in an argillaceous schist matrix
Saint-Augustin-de-Desmaures / Quebec City (Provancher Marsh)	Nicolet	Upper Ordovician	Grey shale and mudstone with lithic sandstone, siltstone, calcarenite and dolarenite interbeds
Saint-Augustin-de-Desmaures / Quebec City (east of Provancher Marsh) (Pointe de la Vieille-Église) (Île à Gagnon)	Les Fonds	Middle Ordovician	Slate; <i>dolomitic</i> slate
Saint-Ferréol-les-Neiges / Saint-Joachim (Saint-Ferréol-les-Neiges)	Lotbinière	Middle Ordovician	Dark grey shale with sandstone lamina
Saint-Ferréol-les-Neiges / Saint-Joachim (Sainte-Anne Canyon)	Utica Shale	Middle Ordovician	Dark brown to black calcareous shale, argillaceous micritic limestone
Saint-Vallier (Anse des Boutins) (Pointe de Saint-Vallier)	Lauzon 6	Lower Cambrian to Lower Ordovician	Grey and dark green mudslate with a few siltstone or calcisiltite interbeds

Subpopulation	Formation	Age	Rock type
Sainte-Anne-de-la-Pérade	Grondines Member	Middle Ordovician	Dark grey limestone, generally dense, rarely crystalline and with many argillaceous shale interbeds
Stanstead-Est	Ayer's Cliff 2	Silurian to Devonian	Arenaceous limestone, calcareous mudslate
Waterville (Eustis Dam) (downstream of city)	Ayer's Cliff 2	Silurian to Devonian	Arenaceous limestone, calcareous mudslate
Ontario			
Cave Point	Guelph	Silurian	Dolostone
Lucas Island	Guelph	Silurian	Dolostone
Perseverance Island	Guelph	Silurian	Dolostone
Terry Point	Guelph	Silurian	Dolostone
Tobermory (Baptist Harbour) (Barney Lake) (Cape Hurd) (Cove Island) (Dunks Bay) (Echo Island) (Flowerpot Island) (Harbour Island) (Hopkins Bay) (Little Cove) (North Otter Island) (South Otter Island) (Peters Island) (Russel Island) (Tobermory) (Turning Island) (Williscroft Island)	Guelph	Silurian	Dolostone
United States			
New York (Dutchess Co.), Norrie Point	Austin Glen	Middle Ordovician	Graywacke and shale
New York (Ulster Co.), Kingston	Austin Glen	Middle Ordovician	Graywacke and shale
New York (Greene Co.), Athens	Mount Merino and Indian River	Ordovician	Slate and shale
New York (Albany Co.), Peebles Island	Austin Glen	Middle Ordovician	Graywacke and shale
New York (Columbia Co.), Nuttan Hook	Germantown	Cambrian	Conglomerate, shale and limestone
New York (Rensselaer Co.), Schaghticoke	Germantown	Cambrian	Conglomerate, shale and limestone
Vermont (Orange Co.), Bedford	Gile Mountain	Lower Devonian	Quartzite (stratified rock from the Silurian-Devonian, Ammonoosuc fault)
Vermont (Chittenden Co.)	Winooski Dolostone	Upper Cambrian	Dolostone, phyllite

Population Spatial Structure and Variability

No genetic studies on Provancher's Fleabane are currently available. The morphological differences and the disjunct distribution in Ontario and Quebec might suggest that some population substructure is possible.

In this report, population refers to the sum total of all Provancher's Fleabane individuals in Canada. Subpopulations are defined as geographically or otherwise distinct groups in the population between which little demographic or genetic exchange is likely to occur (typically one successful migrant individual or gamete per year or less). Subpopulation size is measured in numbers of mature individuals only. A subpopulation corresponds reasonably well to the habitat-based plant element occurrence delimitation standards (NatureServe 2004), in which a subpopulation is defined as a group of occurrences that are separated by less than 1 km; or if separated by 1 to 3 km, with no break in suitable habitat between them exceeding 1 km; or if separated by 3 to 10 km, connected by linear water flow and having no break in suitable habitat between them exceeding 3 km. A site is a patch within a subpopulation. Location refers to a geographically or ecologically distinct area in which a single threatening event can rapidly affect all plants of Provancher's Fleabane.

Extent of Occurrence and Area of Occupancy

The extent of occurrence (EOO) is 108,252.44 km², which was calculated by the report writer using a minimum convex polygon that encompasses the known records in Quebec and Ontario. The index of area of occupancy (IAO) is 220 km², calculated on the basis of a 2 km x 2 km grid aligned with the Universal Transverse Mercator (UTM) 10 km x 10 km grid depicted on National Topographic System maps (Natural Resources Canada 2016). Because the taxon is restricted to shorelines and typically does not form dense colonies, its actual area of occupancy is much smaller than its IAO.

Search Effort

Subsequent to the draft COSEWIC update status report (Coursol 2002), surveys were conducted of 230 potential sites in southern Quebec (Coursol 2005). In 2018, counts and searches took place over 11 days, from mid-June to mid-October, at various localities in Quebec. In all, roughly 21.79 km of shoreline was surveyed, representing around 92.5 hours of search effort, not including the travel time required to reach the sites.

Because Provancher's Fleabane was not considered to occur in Ontario in the previous COSEWIC assessments, it has not been the focus of fieldwork in Ontario. In Ontario, there is little recent information on subpopulation size, trends or threats and a complete inventory of suitable habitats has not been carried out, aside from recent surveys in the northern Saugeen (Bruce) Peninsula area (Miller 2021, 2023).

HABITAT

Habitat Requirements

Provancher's Fleabane typically grows in crevices in calcareous rocks or pavement along rivers and the Great Lakes. In general, this riparian habitat is submerged during flash floods or major spring floods, except for those areas located on vertical escarpments or cliffs above the natural high-water line. Along the lower St. Lawrence River in eastern Quebec, the taxon is found exclusively on exposed freshwater tidal shores. In Ontario, it also occurs on shoreline alvars.

Provancher's Fleabane appears to be closely associated with underlying calcareous sedimentary bedrock and surface materials with an alkaline to circumneutral pH (Table 2). In Quebec, the variety typically occupies sites on seeping cliffs near waterfalls or rapids, but is also sometimes found on the higher, well-drained portions of shorelines. The greatest densities occur in damp rock crevices that the sun only reaches late in the day. Provancher's Fleabane also grows on gently sloping, damp, calcareous gravel areas in the upper portion of the freshwater intertidal zone of the St. Lawrence River. In Ontario, it occupies the well-drained upper portions of shorelines.

The absence of dense vegetation cover seems to be an important factor in habitat suitability. The ability of Provancher's Fleabane to become established and reproduce seems to depend on a natural disturbance regime of seasonal flooding, water erosion, and ice scouring.

Provancher's Fleabane is also capable of colonizing, and persisting in, open anthropogenic habitats adjacent to natural habitats. In the Coaticook River gorge, the variety has colonized the seeping concrete walls of the Belmont Dam, which is no longer in operation.

Provancher's Fleabane generally occurs in isolation. No associations or correlations can be made with the taxas sharing its habitat, because the vegetation at each site is very different.

Habitat Trends

No obvious decline has occurred in habitat quantity or quality at most of the sites visited since the surveys by Coursol (2005). Saint-Vallier is the only site where the variety has spread; Coursol (pers. obs.) has visited the site regularly for decades and the taxon has colonized a new rock. The known area occupied by the taxon at the two Waterville sites and the Pont-Rouge / Neuville, Saint-Ferréol-les-Neiges / Saint-Joachim, Lévis (Ross Cove) and Stanstead-Est sites has increased owing to a more intensive search effort. Although the estuarine habitat at the Saint-Augustin-de-Desmaures / Quebec City sites seems stable, the Provancher's Fleabane subpopulation on Île à Gagnon has declined dramatically.

In Ontario, the islands' isolation provides some measure of protection and there is little to suggest that the habitats have undergone any extreme modifications. Recent surveys have shown that most historical subpopulations in the Saugeen (Bruce) Peninsula area are still extant (Miller 2023). The impact of recent fluctuations in the Great Lakes (record low and high water levels) is unknown.

BIOLOGY

Life Cycle and Reproduction

Flowering begins around mid-June and continues throughout the summer, peaking in late June and early July, with some plants in bloom until the first hard frosts (October). The flowering phenology of both varieties of *Erigeron philadelphicus* has been studied for approximately 30 years on the Saugeen (Bruce) Peninsula, including the Tobermory area. First flowering takes place on average on June 29, with the earliest date June 18; the latest flowering date is November 19 (Johnson 2016). McDonald (1927) concluded that apomixis (the production of viable seeds without fertilization) does not occur in *Erigeron philadelphicus*, although it is present in Annual Fleabane (*Erigeron annuus*) and Rough Fleabane (*Erigeron strigosus*). Although this study did not include plants of the subject taxon, this conclusion probably holds true for Provancher's Fleabane as well.

Fleabanes are pollinated by various insects, mainly bees, wasps, flies, butterflies and moths, and beetles. It is not known which pollinators frequent Provancher's Fleabane but an anthophilous species of tachinid fly (*Clausicella* sp.) and a sweat bee (*Lasioglossum* sp.) have been photographed on the taxon's flowers.

Achene maturation and dispersal take place from mid-July to late fall (Coursol pers. obs. 2018). Long-distance seed dispersal occurs through anemochory (wind dispersal) and possibly hydrochory (water dispersal). The seeds appear to germinate in early summer or fall, with the plant overwintering as a small rosette. Morisset (2012) found recently emerged seedlings still bearing cotyledons in July 2011. Provancher's Fleabane also reproduces vegetatively by producing rosettes on its shallowly rooted rhizomes, which are solidly anchored in rock crevices. The taxon forms fairly dense clonal colonies of small, mostly non-flowering rosettes, with a few more vigorous individuals producing flowering stalks (Coursol pers. obs. 2018). Only rosettes bearing central flowering stalks were counted as mature individuals, with non-flowering rosettes being interpreted as immature (Coursol pers. obs. 2018).

Mature individuals generally make up from 10% to 20% of the population (Table 3; Coursol pers. obs.). When a greater percentage of mature individuals is found at a site, this is usually due to the small number of individuals present.

Table 3. Number of Provancher's Fleabane individuals in Quebec (2018) and Ontario (2021 and 2022)

Subpopulation	Rosettes	Central flowering stalks	Percentage of mature individuals	Type of count*
Quebec				
Coaticook	1,295	267	21%	Complete
Crabtree	19	3	16%	Complete
Daveluyville	1,228	151	12%	Complete
Drummondville / Sainte-Marjorique-de-Grantham	5,590*	351	6%	Partial
Joliette	1,941	145	7%	Complete
Lévis (Ross)	4,614	877	19%	Complete
Lévis (Etchemin River)	183	12	7%	Complete
Ogden	95	16	17%	Complete
Pont-Rouge / Neuville	11,636	2,905	25%	Partial**
Quebec City / Boischatel	4,506	912	20%	Complete
Saint-Augustin-de-Desmaures / Quebec City	443	171	39%	Complete
Saint-Ferréol-les-Neiges / Saint-Joachim	2,059*	239	12%	Partial
Saint-Vallier	1,295	362	28%	Complete
Sainte-Anne-de-la-Pérade	2,678*	632	24%	Partial
Stanstead-Est	5,034	903	18%	Complete
Waterville	34,442*	4,106	12%	Partial
Total	76,918	12,064	16%	
Ontario				
Tobermory 1) Baptist Harbour	60			
Tobermory 2) Barney Lake	Unknown			
Tobermory 3) Cape Hurd	509			
Tobermory 4) Cove Island	1,859			
Tobermory 5) Dunks Bay	582			
Tobermory 6) Echo Island	589			
Tobermory 7) Flowerpot Island	51			
Tobermory 8) Harbour Island	Unknown			
Tobermory 9) Hopkins Bay	6+			
Tobermory 10) Little Cove	590			
Tobermory 11) North Otter Island	412			
Tobermory 12) South Otter Island	270			
Tobermory 13) Peters Island	Unknown			
Tobermory 14) Russel Island	785			
Tobermory 15) Tobermory	181			
Tobermory 16) Turning Island	Unknown			
Tobermory 17) Williscroft Island	Unknown			
Tobermory 18) North Point	219			

Subpopulation	Rosettes	Central flowering stalks	Percentage of mature individuals	Type of count*
Tobermory 19) Driftwood Cove	494			
Tobermory 20) Doctor Island	165			
Tobermory 21) Island SW Russel	4			
Tobermory 22) Dorcas Bay	4			
Tobermory 23) Deadman Point	260			
Tobermory 24) Larsons Cove	~50			
Terry Point	78			
Cave Point	10			
Lucas Island	Unknown			
Perseverance Island	Unknown			
Total	7,178	2,153***		

*Partial: numbers were estimated. Complete: all rosettes were counted.

**The shoreline count in 2018 is not considered complete, because the water level was too high to access an island included in the count.

***Flowering stalks were not counted at all sites – based on 16 sites (average = 30%)

Physiology and Adaptability

Provancher's Fleabane is fairly easy to grow outside of its natural habitat. Marie-Victorin and Rousseau (1940) mentioned that it was being cultivated at the Montreal Botanical Garden, although no time period was given. More recently, the Montreal Botanical Garden has successfully cultivated multiple individuals of Provancher's Fleabane for approximately 12 years. Morton (1988) indicated that, when *Erigeron philadelphicus* was grown in combination with Provancher's Fleabane, introgression between the two varieties resulted in progeny intermediate in perennial habit, size, pubescence, ligule colour and flower head size. Provancher's Fleabane can be grown indoors at home for several months without affecting its size or degree of pubescence (Coursol pers. obs. 2018).

Provancher's Fleabane seems to be able to adapt to water level fluctuations because some subpopulations have persisted in the same sites despite dam construction and water diversion.

Dispersal and Migration

Provancher's Fleabane appears to spread vegetatively, enabling the taxon to gradually colonize the available habitat. In addition, sexual reproduction can be observed at the various sites by the presence of numerous isolated young rosettes dispersed around the mature plants. The pappus on the achenes promotes wind dispersal over a greater distance, up to 100 m or so. These types of distances were observed at the Saint-Vallier (Anse des Boutins) site, where Provancher's Fleabane had colonized a rock that did not contain the taxon during previous surveys. Water dispersal of seeds during seasonal floods or tides has not been formally documented, but could arguably occur over distances of many kilometres.

Interspecific Interactions

Philadelphia Fleabane appears to have allelopathic effects on various crop species (Guan 2009); it may also inhibit seed germination and root growth in other plants. Another study has shown that two substances in the roots of Philadelphia Fleabane have nematicidal properties (Kimura 1981). However, extracts from various parts of Philadelphia Fleabane did not display antimicrobial activity (Borchardt *et al.* 2008).

Philadelphia Fleabane is sometimes found near habitat in which Provancher's Fleabane is growing. At this small number of sites, hybridization between the two taxa appears to occur (Morton 1988; Johnson 2016; Coursol pers. obs. 2018; Miller 2021). Hybridization is discussed in detail in the **Threats** section.

Some pollinators (bee and tachinid) have been observed on the flowers of Provancher's Fleabane (see **Life Cycle and Reproduction**). In addition, leaves attacked by a leaf miner were noted at the Ross Cove site in Lévis.

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

Most sites in Quebec were visited under low-flow conditions to make it easier to travel along shorelines. Because clonal colonies (a group of genetically identical individuals, also known as a genet) cannot be easily delimited in the field, counts of basal rosettes were used to estimate the number of individuals. Detailed counts were made for smaller occurrences, while larger ones (over 5,000 individuals) were estimated by counting a small representative section (containing roughly 100 individuals) and extrapolating based on the entire area occupied by the occurrence.

The report writer did not conduct any surveys in Ontario, but Miller (2023) photographed and collected specimens in 2021 and 2022 throughout the Saugeen (Bruce) Peninsula area. Herbarium specimens collected by Marie-Victorin in Ontario in 1940 are more pubescent than specimens from Quebec or the United States. However, the recent integration of the Waterloo Herbarium specimens into the collections at the Marie-Victorin Herbarium has allowed a convincing specimen of Provancher's Fleabane to be identified in Ontario. In addition, a high-resolution iNaturalist record provides a second (and recent) line of evidence (<https://inaturalist.ca/observations/18581870>). Approximately 100 contemporary research-grade records (vetted by Miller [2023]) are documented in iNaturalist.

In 2021, Parks Canada surveyors Tyler Miller and Spencer Bennett conducted targeted surveys over four days (between July 6 and August 26) in the historical Cave Point–Tobermory–Terry Point population range (Scugog Lake to Tobermory to Halfway Log Dump / High Dump). They used a thorough search effort (TSE) method in ~60% of the range, and a vague or distant search effort (V/DSE) method in ~1% (Miller 2023). The TSE method involved searching suitable habitat within the wave splash zone of Lake Huron and

Georgian Bay, using binoculars when the habitat was beyond 10–15 m from the shore. The searches were conducted intermittently on foot (~15%) or from a vessel (~85%; +/- 5 m from shore). V/DSE occurred when pedestrians and other boats occupied the nearshore areas, and TSE could not be applied. Detailed sampling was carried out intermittently on foot between distant occurrences (~>150–200 m).

On July 4, 2021, surveyors Tyler Miller, Carl-Adam Wegenschimmel and Burke Korol searched ~5 km of Georgian Bay shoreline from Halfway Rock Point (east of the Grotto) to the west side of Stormhaven (Miller 2023).

During three days in 2022, additional targeted surveys were completed in Five Fathom Marine National Park to cover undocumented sites thoroughly. On July 15, surveyors Tyler Miller and Spencer Bennett carried out a census of the suitable habitat on Bears Rump Island and along three quarters of the northeastern side of Cove Island. On August 25, the same surveyors, with assistance from Laura Beaton-Williamson, censused the suitable habitat on the southeastern side of Cove Island (Miller 2023).

Abundance

The Canadian population of Provancher's Fleabane consists of a minimum of 76,918 rosettes, 12,064 of which were flowering (Table 3). This is inevitably an underestimate because there is little recent abundance information for Ontario beyond the work by Miller (2021, 2023). Specimens bearing central flowering stalks were considered to be mature individuals. The proportion of mature individuals in the different subpopulations generally ranged from 10% to 20%, with a mean value of 16% (Table 3). Lower values were mainly caused by searches carried out late in the season (Drummondville / Sainte-Marjorique-de-Grantham and Joliette) or in more closed habitat where there is greater competition, which is not favourable to the taxon (Lévis [Etchemin River]). The high percentage of mature plants found at the Saint-Augustin-de-Desmaures / Quebec City site is mainly attributable to the fact that it was difficult, if not impossible, to count young rosettes in this densely vegetated habitat.

The number of mature individuals (flowering plants) in the Ontario subpopulations was not recorded (Miller 2023). An estimate of the average percentage of mature individuals in the 2021 TSE occurrences was 30% (n=16; Miller 2023). However, rosettes collected for genetic barcoding turned out to be Mistassini Primrose (*Primula mistassinica*), calling into question the true ratio of immature to mature plants. Consequently, the estimates of mature individuals in Ontario remain questionable.

Fluctuations and Trends

According to the available field data, significant changes in numbers of Provancher's Fleabane can occur, depending on the subpopulation. The considerable increase in rosette numbers observed in some subpopulations can be attributed to more intensive search efforts rather than an actual increase in numbers. Certain subpopulations have thus seen their area increased by the discovery of new suitable habitats in previously unexplored

areas. Table 4 allows the results of the counts in 2002 and 2004–2005 to be compared; additional rosettes found due to the increased search effort in the area occupied by the taxon were excluded. Consequently, the counts in 2018 used the same boundaries as the previous surveys to facilitate comparisons between time points. The definition of an occurrence by NatureServe (2014) has modified the number of known subpopulations, with some occurrences now combined. According to these guidelines, sites are combined in a subpopulation if separated by less than 1 km; or if separated by 1 to 3 km with no gap in suitable habitat between them exceeding 1 km; or if separated by 3 to 10 km but connected by linear water flow and having no gap in suitable habitat between them exceeding 3 km.

Table 4. Variations in the number of Provancher’s Fleabane individuals in portions of known subpopulations

Subpopulation	Name of site	2002	2004–2005	2011	2018
Daveluyville	Maddington Falls		427	-	1,202
Daveluyville	Sainte-Anne-du-Sault		33		26
Drummondville / Sainte-Marjorique-de-Grantham	Saint-Joachim	3,078			5,007
Lévis	Ross Cove, east of the wharf	3,214			4,614
Ogden			190		95
Pont-Rouge / Neuville	East bank between McDougall and Bird dams	460			1,654
Pont-Rouge / Neuville	West bank between Déry Bridge and McDougall Dam	1,221			3,594
Quebec City / Boischatel	East bank	1,054			1,325
Quebec City / Boischatel	West bank	1,221			2,551
Quebec City / Boischatel	Total individuals	2,275			4,506
Saint-Augustin-de-Desmaures / Quebec City	Cap-Rouge	3			8
Saint-Augustin-de-Desmaures / Quebec City	Île à Gagnon	409			421
Saint-Augustin-de-Desmaures / Quebec City	Pointe de la Vieille-Église	179			153
Saint-Augustin-de-Desmaures / Quebec City	Total individuals	591			329
Saint-Ferréol-les-Neiges / Saint-Joachim			3,078		2,059
Saint-Vallier	Anse des Boutins	888		872	588
Saint-Vallier	Pointe de Saint-Vallier	843		314	707
Saint-Vallier	Total individuals	1,526		1,186	1,295

Note: The figures for the 2011 counts are provided for information purposes only. Only the 2002 and 2004–2005 counts were used to calculate the percent change.

Sites with Declines

The Saint-Vallier subpopulation consists of two sites (Pointe de Saint-Vallier and Anse des Boutins), and separate counts were carried out at each site. According to surveys done by Pierre Morisset in 2011 (CDPNQ 2018), rosette numbers at Anse des Boutins were stable in 2011 relative to 2002 but fell significantly in 2018. Although significant variations in numbers occurred at the Pointe de Saint-Vallier site, a general downward trend was observed. Overall, numbers at the type locality have declined by 15% according to the most recent counts, despite the colonization of a new rock by the taxon.

In the Saint-Ferréol-les-Neiges / Saint-Joachim subpopulation, the number of rosettes has decreased by 33% since 2002. The construction of the hydroelectric power station has perhaps had a more significant impact on rosette numbers than anticipated, even though the taxon's habitat has not been affected. A clear picture of the trend in this subpopulation cannot be obtained from the survey data available from CDPNQ (2018).

At Ogden, rosette numbers have decreased by 50%. Canopy closure near the shoreline does not appear to favour the occurrence of Provancher's Fleabane. In addition, large amounts of driftwood from the Tomifobia River have buried part of the colony.

In the Saint-Augustin-de-Desmaures / Quebec City subpopulation, numbers are declining at the known sites and even the most suitable site no longer contains the taxon. At Île à Gagnon, rosette numbers fell by 3%, while numbers at Pointe de la Vieille-Église declined by 15%. Overall, a 44% decline was recorded in this subpopulation, before the amalgamation of the Saint-Laurent Beach (former Cap-Rouge) site and the two Neuville sites.

Sites with Increases

The Pont-Rouge subpopulation can be divided into a number of sections defined by their positions relative to the dams and Déry Bridge. Upstream of McDougall Dam, the number of rosettes found along the east bank rose to 1,654 in 2018 from only 460 in 2002, which represents a 360% increase. This increase can be explained by the greater search effort expended and the lower water level, which facilitated access to the limestone pavement, which is steeper in this section. In addition, the number of rosettes increased by 294% along the west bank between McDougall Dam and Déry Bridge. The results of counts in 2018 along the east bank cannot be compared, because they did not include the part of the site located on an inaccessible islet.

The Drummondville / Sainte-Marjorique-de-Grantham subpopulation consists of two sites. The Drummondville site (formerly Saint-Joachim) had roughly 3,078 rosettes in 2002. Around 5,007 rosettes were counted in 2018, a 63% increase. This increase is mainly attributable to better estimates of the number of rosettes on the upper part of the rock wall, which is inaccessible.

The Daveluyville subpopulation had only 395 individuals in 2004–2005 at the Maddington Falls site (at the foot of the falls on the west side of the river), while 1,202 rosettes were counted there in 2018. This subpopulation now includes another site located 1.7 km downstream from the falls (Sainte-Anne-du-Sault in the 2005 report). This second site had only 33 rosettes in 2005 and, since then, numbers have declined by 21% (total of 26 rosettes). No disturbances or changes were observed at this site.

In the Sainte-Anne-de-la-Pérade subpopulation, rosette abundance rose from around 59 in 2005 to 2,678 in 2018, an increase of 4,539%. However, this does not truly reflect a subpopulation increase (and therefore was excluded from Table 4); instead, it can be explained by the lower water level, which provided access to a larger area of exposed limestone pavement. The habitat of this subpopulation did not change, but the timing of the survey allowed a more accurate count. In this subpopulation, two sites that were initially considered separate and distinct are now combined because the limestone pavement that was flooded in 2005 is now exposed and extends between the two sets of rapids.

The Ross Cove subpopulation in Lévis increased by 44%, from 3,214 rosettes in 2002 to 4,614 rosettes in 2018. This increase is partly attributable to the colonization of new rocks by the taxon. In addition, a site containing a few individuals was added west of the former wharf (roughly 500 m away).

In the Quebec City / Boischatel subpopulation, rosette numbers increased from 2,275 to 4,506 despite the disturbances affecting the subpopulation. Numbers along the east bank of the Montmorency River increased by 26% despite trampling and bonfires. Numbers on the west bank, which is less accessible, doubled (209% increase). The reduced accessibility probably discouraged people from using this side of the river, allowing Provancher's Fleabane to become re-established there.

Rescue Effect

The known distribution of Provancher's Fleabane outside Canada is limited to nine subpopulations; the closest Vermont occurrences are separated from Quebec subpopulations by about 100 km. As the majority of the taxon's population is in Canada, rescue from the United States is unlikely.

THREATS AND LIMITING FACTORS

The threat classification below is based on the International Union for the Conservation of Nature–Conservation Measures Partnership's unified threats classification system (IUCN-CMP 2012; see also Master *et al.* 2012). According to the threats calculator, the overall threat impact on this taxon is Low.

Threats

IUCN Threat 7. Natural system modifications (Low impact)

7.3. Other ecosystem modifications (Low impact)

Coltsfoot, *Tussilago farfara*, is the species that occurs most often in Provancher's Fleabane habitat in Quebec (Figure 4) and grows in all the taxon's subpopulations in the province, in numbers ranging from a few individuals to dense colonies. Coltsfoot appears to be harmful on vertical rock walls, where it may shade or outcompete Provancher's Fleabane.



Figure 4. Coltsfoot growing in Provancher's Fleabane habitat (photo by F. Coursol)

Reed Canarygrass, *Phalaris arundinacea*, does not generally use the same rocky habitat preferred by Provancher's Fleabane, but its presence appears to impact some subpopulations along riverbanks. Provancher's Fleabane appears to be protected to some degree from invasive species at sites that are subject to significant flooding or ice scouring or on rock outcrops with little soil.

European Reed (*Phragmites australis* subsp. *australis*) is being monitored and managed in Fathom Five National Marine Park, along the western shore of the former St. Edmunds Township, and along the shoreline of Bruce Peninsula National Park to Pine Tree Harbour (Miller 2021). Many of these infestations do not overlap with suitable Provancher's Fleabane habitat. However, a few infestations are located along the edge of Lake Huron, in the moist interface between the lake and limestone rock barrens/alvars, boulder/cobble and wet crevasses, which would certainly negatively impact the suitable habitat and/or stands of Provancher's Fleabane where the two taxons coexist (Miller 2019).

Mossy Stonecrop (*Sedum acre*) is known to occur in Fathom Five National Marine Park, Bruce Peninsula National Park, and outside of the parks in suitable island shoreline habitat. The infestations are being monitored and have yet to be managed. This species has a local tendency to dominate dry and/or wet limestone shorelines, crevasses and alvars, which would certainly negatively impact the suitable habitat of Provancher's Fleabane where the two taxa coexist (Miller 2019).

IUCN Threat 8. Invasive & other problematic species & genes (Low impact)

8.3. Introduced genetic material (Low impact)

Provancher's Fleabane introgresses with typical Philadelphia Fleabane wherever the two grow in close proximity (Morton 1988). This often happens because Provancher's Fleabane grows in storm-lashed rocky crevices by the lake and Philadelphia Fleabane occurs in nearby open habitats immediately behind the shore. In such situations, intermediates in stature, capitulum size, floret colour and pubescence can be found. The risk of hybridization seems to be the greatest in the artificial (disturbed) habitat in the Saint-Ferréol-les-Neiges / Saint-Joachim subpopulation. The natural high-water line seems to influence the distribution of the two fleabanes at the site. The risk of hybridization also exists in the Saugeen (Bruce) Peninsula area, and could theoretically increase with climate change, especially on lower-elevation shorelines (Miller 2021). As historic high-water levels are being recorded in Lake Huron (Ausable Bayfield Conservation Authority 2020), much of the suitable habitat for the species is shrinking/shifting and is now closer to the forest edge, where you can also find var. *philadelphicus* in many subpopulations. Greater proximity increases the potential for cross-pollination (Miller 2021).

8.6. Diseases of unknown origin (*Unknown impact*)

A fungal disease or a nutrient deficiency of some sort seems to be affecting certain subpopulations of Provancher's Fleabane. Wine-red spots were repeatedly observed on foliage in the Coaticook, Waterville, and Joliette subpopulations. A sample was taken in December, which was too late in the season to determine the exact cause, but the presence of an ascomycete was observed. A phosphorous deficiency is probably the most probable hypothesis. The affected individuals appeared otherwise healthy and some of the mature individuals affected had central flowering stalks.

IUCN Threat 6. Human intrusions and disturbance

6.1 *Recreational activities (Negligible Impact)*

The impact of recreational activities on Provancher's Fleabane is generally negligible wherever the plant is growing on vertical rock walls. Bonfires on the shorelines of rivers have a local impact on a few individuals at some sites, as does trampling associated with swimming and sunbathing. Recreational activities related to tourism have increased significantly on the Saugeen (Bruce) Peninsula (Miller 2021). From 2010 to 2021, Bruce Peninsula National Park saw a 124% increase in visitation, with an estimated 500,000 visitors in 2021 (Parks Canada 2020, 2021a). All the high-use visitor nodes and popular destinations overlap with suitable Provancher's Fleabane habitat. For example, in 2020, Little Cove, which has a subpopulation of approximately 590 individuals, had 40% more visitors than in 2019 (Parks Canada 2020) (impacts were not monitored or assessed). Fathom Five National Marine Park has fewer visitors than Bruce Peninsula National Park and its visitation trends appear to have plateaued since 2017; however, visitation is concentrated in fewer areas (e.g. Flowerpot Island, Little Dunks Bay). On average, from 2010–2021, these areas received an estimated 283,000 visitors per year (Parks Canada 2021b). Visitors use, and fan out along, a dozen concentrated shoreline locations (combined Bruce Peninsula National Park and Fathom Five National Marine Park) with suitable habitat for the species. The associated recreational activities and impacts include, but are not limited to, climbing (including in and out of the water), graffiti vandalism (via paint or carving into the rock), and littering (stowing litter in crevasses and cracks). Outside of these localities, recreational activities are limited and are of little threat (Miller 2021).

IUCN Threat 9. Pollution

9.2 *Industrial & military effluents (Unknown impact)*

In 1988, a spill of more than 700 tonnes of crude oil occurred at the Saint-Romuald terminal during the unloading of the tanker *Zantoria*. Three subpopulations representing 8% of Canada's total population could be exposed during the mixing of waters by the tides: the Saint-Augustin / Quebec City and Lévis (Ross Cove) subpopulations, located approximately 15 km upstream, and the Saint-Vallier subpopulation, approximately 37 km downstream.

IUCN Threat 11. Climate change & extreme weather

11.4 Storms & flooding (Unknown impact)

High water levels, like those in Lake Huron in 2020 (Ausable Bayfield Conservation Authority 2020), are expected to continue. A water-level fluctuation model suggests that Lake Huron water levels may rise by 0.23 m on average by 2050 and 1.29 m by 2100 (Kayastha 2021). However, it is essential to recognize that most models for the Great Lakes show uncertainty and substantial variability. With this variability, it should also be noted that the predicted extreme high-water levels are similar to that of the lows. In addition, the standard water-level fluctuation patterns in Lake Huron appear to be characterized by the highest levels in July and the lowest, in February (Wilcox *et al.* 2007). Plants in the Tobermory subpopulation are located from 1 m to 15 m from the water (average 3.22 m; n=74) and 0.3 m to 6 m in elevation above the current water level (average 1.32 m; n=78) (Miller 2021).

Storm events, and their associated disturbances, are anticipated to increase in frequency and severity. For example, Wiarton, which is in the centre of the Saugeen (Bruce) Peninsula, is projected to receive a 30–50% increase in wind gust events of over 70 km/h by 2081–2100 (Cheng *et al.* 2014). These events, paired with the anticipated overall decrease in annual winter ice cover on the Great Lakes (Fujisaki-Manome *et al.* 2020), may increase the potential for disturbance (e.g. erosion) to this coastal plant taxon. Winter ice cover likely plays a crucial role in shielding Provancher's Fleabane from severe winter storms (e.g. extreme northerly winter storms). This anticipated trend may also explain the confounding observation of the paucity of occurrences of Provancher's Fleabane along the northern shore of Bruce Peninsula National Park, from approximately Driftwood Cove to High Dump.

Limiting Factors

Wood debris (driftwood) has been observed at some sites, but this type of disturbance, which is natural in origin, does not seem to be increasing. It can have an effect on the number of individuals by burying them over a fairly long period. The decrease in the number of individuals in the Ogden subpopulation is caused by driftwood.

All the colonies share an affinity for a calcareous substrate, low levels of competition from other species and relatively high humidity levels, which are often associated with a narrowing in a watercourse. Accordingly, suitable habitat only makes up a very small portion of the EEO in the taxon's range in Quebec and even less in Ontario.

Number of Locations

For COSEWIC assessment purposes, a location is defined as the area in which the most immediate threat can rapidly affect all individuals present. Habitat encroachment by invasive non-native plants represents the greatest threat affecting all subpopulations of Provancher's Fleabane in Quebec. Based on this definition, there are 37 locations in

Quebec (Table 5), but the number of locations in Ontario cannot be determined at present. Assuming that invasive non-native plants affect all the sites in Ontario, 26 locations in Ontario would be affected (Table 5).

Table 5. Ownership and protection of Provancher’s Fleabane sites

Subpopulation	No. of locations	Ownership
Quebec		
Coaticook	1	Public (Ville de Coaticook)
Crabtree	1	Public
Daveluyville (Maddington Falls)	2	Public; private (1 owner)
Daveluyville (Sainte-Anne-des-Saults)	1	Private (1 owner)
Drummondville / Sainte-Marjorique-de-Grantham (Saint-Joachim)	1	Public (Hydro-Québec)
Drummondville / Sainte-Marjorique-de-Grantham (Pointe aux Indiens)	1	Public (Drummond RCM)
Joliette	1	Public (Ville de Joliette)
Lévis (Ross Cove, east of the wharf)	4	Public (Ville de Lévis); private (3 owners)
Lévis (west of the Aulneuse River)	1	Private (Nature Conservancy of Canada)
Lévis (Etchemin River)	1	Public (Ville de Lévis)
Ogden	1	Public
Pont-Rouge / Neuville	2	Public (Quebec Department of Natural Resources and Forests [MRNF]); private (R.S.P. Énergie Inc.)
Quebec City / Boischatel (Montmorency River)	1	Public (Hydro-Québec)
Saint-Augustin-de-Desmaures / Quebec City (Saint-Laurent Beach)	2	Private (2 owners)
Saint-Augustin-de-Desmaures / Quebec City (Provancher Marsh)	1	Société Provancher
Saint-Augustin-de-Desmaures / Quebec City (east of Provancher Marsh)	1	Private (1 owner)
Saint-Augustin-de-Desmaures (Pointe de la Vieille-Église) (Île à Gagnon)	1	Private (Fondation québécoise pour la protection du patrimoine naturel [FQPPN])
Saint-Ferréol-les-Neiges / Saint-Joachim (Sainte-Anne Canyon)	3	Public (Hydro-Québec); private (2 owners)
Saint-Vallier (Pointe de Saint-Vallier)	1	Private (Nature Conservancy of Canada, Canadian Heritage of Quebec)
Saint-Vallier (Anse des Boutins)	2	Private (Nature Conservancy of Canada, Canadian Heritage of Quebec; Ferme François Roy S.E.N.C.)
Sainte-Anne-de-la-Pérade	1	Public
Stanstead-Est	1	Public (Hydro-Québec)
Waterville (Eustis Dam)	4	Public (Government of Quebec, Ville de Sherbrooke); private (2 owners)
Waterville (downstream of Waterville)	2	Private (2 owners)

Subpopulation	No. of locations	Ownership
Ontario		
Baptist Harbour	1	Land trust properties; private (~25% protected public, 75% private)
Barney Lake	1	Private (Escarpment Biosphere Conservancy)
Cape Hurd	1	Private (~95% private; 5% protected)
Cave Point	1	Bruce Peninsula National Park; all protected
Cove Island	1	Fathom Five National Marine Park ~98% protected public; 2% private
Dorcas Bay	1	Bruce Peninsula National Park; 10% private
Dunks Bay	1	Private (Bruce Trail Conservancy); public (Fathom Five National Marine Park and Bruce Peninsula National Park) (~66% public; 33% private)
Echo Island	1	Public (Fathom Five National Marine Park)
Flowerpot Island	1	Public (Fathom Five National Marine Park)
Harbour Island	1	Public (Fathom Five National Marine Park)
Hopkins Bay	1	Private (1 owner?)
Larsons Cove		Private
Little Cove	1	Little Cove Provincial Park (managed by Bruce Peninsula National Park) (~90% protected public; 10% private)
Lucas Island	1	Public
North Otter Island	1	Public (Fathom Five National Marine Park)
Perseverance Island	1	Public
Peters Island	1	Public (Fathom Five National Marine Park)
Russel Island	1	Public (Fathom Five National Marine Park)
South Otter Island	1	Public (Fathom Five National Marine Park)
Terry Point	1	Public (Johnston Harbour–Pine Tree Point Provincial Nature Reserve)
Tobermory	2+	Fathom Five National Marine Park; private (1+ owners) (~98% private; 2% protected public)
Turning Island	1	Public (Fathom Five National Marine Park)
Williscroft Island	1	Public (Fathom Five National Marine Park)
North Point	1	Private
Driftwood Cove	1	Public (Bruce Peninsula National Park)
Doctor Island	1	Private
Island SW of Russel Island	1	Public (Fathom Five National Marine Park)

PROTECTION, STATUS AND RANKS

Legal Protection and Status

Provancher's Fleabane is listed on Schedule 3 of the federal *Species at Risk Act*, as it was assessed as Vulnerable by COSEWIC in April 1992. In Quebec, it has been designated a Threatened species since 2005 and is protected under the *Act Respecting Threatened or Vulnerable Species*. Under this legislation, possessing, trading or harming this taxon or disturbing its habitat is prohibited.

In the United States, Provancher's Fleabane has no federal status. In Vermont, it is not on the list of species protected under the state's *Endangered Species Law* (10 V.S.A. Chap. 123). In New York State, Provancher's Fleabane is designated Endangered under the *Environmental Conservation Law of New York*, Section 9-1503.

Non-Legal Status and Ranks

In Ontario, Provancher's Fleabane was not tracked by the Natural Heritage Information Centre for a period of 14 years (2005–2019) due to uncertainty about its presence in Ontario, but was reinstated as a tracked species on January 8, 2019 (Oldham pers. comm. 2019).

Provancher's Fleabane has a global conservation rank of Vulnerable (G5T3, last assessed in 2015) with national status ranks of Vulnerable (N3) in Canada and Critically Imperiled to Imperiled (N1N2) in the U.S. (NatureServe 2018). It has been assigned the subnational status rank of Vulnerable (S3) in Quebec, Possibly Imperiled (S2?) in Ontario (Oldham, pers. comm. 2019), and Critically Imperiled (S1) in Vermont and New York (NatureServe 2018).

Habitat Protection and Ownership

In both Ontario and Quebec, the mean high-water line is generally used to define the boundary of public land along large, non-tidal watercourses. Therefore, most Canadian sites where the taxon occurs (below that high-water mark) would be considered to be on public land. However, colonies of Provancher's Fleabane often extend slightly higher on cliffs or escarpments and consequently may also be located on private land. On Quebec sites subject to tides, the portion of the shoreline below the high-water mark (high-tide line) is generally considered to be public land, except for land along the St. Lawrence River to which title was obtained before Confederation. Property boundaries in the Quebec City region extend into the foreshore. Table 5 provides details on the ownership and protection of each site.

In Quebec, plant habitat is considered a protected area under the *Regulation Respecting Threatened or Vulnerable Plant Species and their Habitats*, made under the *Act Respecting Threatened or Vulnerable Species*. Provancher's Fleabane is protected at three sites: Anse-Ross (Ross Cove), Marches-Naturelles (Quebec City / Boischatel) and Rives-

Calcaires-du-Pont-Déry. In Ontario, the Terry Point subpopulation is located in Johnston Harbour–Pine Tree Point Provincial Nature Reserve; the Cave Point subpopulation is within the boundaries of the Bruce Peninsula National Park (federal); and all sites located on islands (except Perseverance and Lucas islands), and possibly the Tobermory site, lie within Fathom Five National Marine Park.

Some sites in Ontario and Quebec are owned by non-governmental organizations whose mission is to protect them. In Quebec, the Saint-Vallier subpopulation (except for a new rock on the western boundary), and the Provancher Marsh, Pointe de la Vieille-Église and Île à Gagnon sites (which are associated with the Saint-Augustin-de-Desmaures / Quebec City subpopulation) are owned by conservation organizations. In Ontario, the Barney Lake and Dunks Bay sites are owned by conservation organizations.

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Frédéric Coursol received a degree in biological sciences from the Université de Montréal in 1992. He has written five status reports on threatened or vulnerable species in Quebec (*Saururus cernuus*, *Onosmodium molle* var. *hispidissimum*, *Cicuta maculata* var. *victorinii*, *Gentianopsis victorinii* and *Eriocaulon parkeri*). For COSEWIC, he participated in the drafting of status reports on Quebec Rockcress (*Boechera quebecensis*), Serpentine Sandwort (*Minuartia marcescens*) and Parker's Pipewort (*Eriocaulon parkeri*) and updated status reports on Provancher's Fleabane (*Erigeron philadelphicus* var. *provancheri*), Victorin's Gentian (*Gentianopsis virgata* subsp. *victorinii*), Victorin's Water-Hemlock (*Cicuta maculata* var. *victorinii*) and Anticosti Aster (*Symphyotrichum anticostense*), the latter in collaboration with Jacques Labrecque and Luc Brouillet. His knowledge of estuarine taxa comes from fieldwork carried out in 1995 for the 2001 report he co-authored with L. Brouillet and D. Bouchard on the threatened and vulnerable plants and other rare plants of the upper St. Lawrence Estuary between Grondines and Saint-Jean-Port-Joli. He contributed to the writing of a collective work entitled *Plantes rares du Québec méridional*, and provided close to half of the species photographs for that work. Lastly, he assisted in compiling data for VASCAN, the Database of Vascular Plants of Canada, which is a comprehensive list of the vascular plants recorded in Canada, Greenland (Denmark) and Saint-Pierre-et-Miquelon (France).

COLLECTIONS EXAMINED

Specimens collected on Bruce Peninsula (Ontario) and preserved at the Marie-Victorin Herbarium (Centre de la biodiversité, Institut de recherche en biologie végétale, Université de Montréal) were examined. Specimens collected in New York State and kept in the Valdosta State University (VSC) Herbarium were examined online through the institution's virtual herbarium. Steve Young (2018) sent photographs of sites recently discovered in New

York State. David Werier (2018) sent virtual links to his herbarium specimens in the William and Lynda Steere Herbarium of the New York Botanical Garden. Records on the iNaturalist website were verified, including those provided by Brian Popelier in Ontario.

Appendix 1. Threats Calculator for Provancher's Fleabane (*Erigeron philadelphicus* var. *provancheri*) in Canada

Species or Ecosystem Scientific Name	Provancher's Fleabane (<i>Erigeron philadelphicus</i> var. <i>provancheri</i>)		
Element ID	1052591	Elcode	PDAST3M362
Date (Ctrl + ";" for today's date):	2019-12-12		
Assessor(s):	David Fraser (moderator), Angele Cyr (COSEWIC Secretariat), Stephanie Pellerin (VP SSC), Karolyne Pickett (EC), Frederic Coursol (report writer), Jana Vamosi (VP Co-chair), Dan Brunton (VP SSC), Jacques Labrecque (QC), Bruce Bennett (VP SSC)		
References:	Miller (2021)		
Overall Threat Impact Calculation Help:	Level 1 Threat Impact Counts		
	Threat Impact		high range
	A	Very High	0
	B	High	0
	C	Medium	0
	D	Low	2
Calculated Overall Threat Impact:			Low
Assigned Overall Threat Impact:	D = Low		
Impact Adjustment Reasons:			
Overall Threat Comments	Generation time estimated at 3 years. It is observed flowering at 2 years and lives for four years.		

Threat	Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
1 Residential & commercial development	Negligible	Small (1-10%)	Negligible (<1%)	High (Continuing)	
1.1 Housing & urban areas	Negligible	Small (1-10%)	Negligible (<1%)	High (Continuing)	Habitat loss via development – is occurring throughout at least 1/3 of its historical – contemporary candidate range. This area incorporates privately owned shorelines subject to development and alteration, including the construction of houses, floodproofing/break-walls, boat launches, docks, and backfilling to the water's edge. These development and alteration activities even occur along the shorelines in FFNMP.
1.2 Commercial & industrial areas					
1.3 Tourism & recreation areas					
2 Agriculture & aquaculture					
2.1 Annual & perennial non-timber crops					

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
2.2	Wood & pulp plantations						
2.3	Livestock farming & ranching						
2.4	Marine & freshwater aquaculture						
3	Energy production & mining						
3.1	Oil & gas drilling						
3.2	Mining & quarrying						
3.3	Renewable energy						
4	Transportation & service corridors						
4.1	Roads & railroads						
4.2	Utility & service lines						
4.3	Shipping lanes						
4.4	Flight paths						
5	Biological resource use						
5.1	Hunting & collecting terrestrial animals						
5.2	Gathering terrestrial plants						
5.3	Logging & wood harvesting						
5.4	Fishing & harvesting aquatic resources						
6	Human intrusions & disturbance		Negligible	Negligible (<1%)	Slight (1-10%)	High (Continuing)	
6.1	Recreational activities		Negligible	Negligible (<1%)	Negligible (<1%)	High (Continuing)	Bonfires and trampling have a low local effect on subpopulations both in Quebec and Ontario.
6.2	War, civil unrest & military exercises						
6.3	Work & other activities						
7	Natural system modifications	D	Low	Pervasive - Large (31-100%)	Slight (1-10%)	High (Continuing)	
7.1	Fire & fire suppression						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
7.2	Dams & water management/use		Not Calculated (outside assessment timeframe)	Large (31-70%)	Extreme (71-100%)	Low (Possibly in the long term, >10 yrs/3 gen)	Dam construction has affected subpopulations in the past. A proposed dam could impact the Waterville subpopulation but it is unknown if and when plans will proceed. Flooding of the dam is what would cause the impact on the individuals of this species. The Waterville subpopulation that would be affected represents 50% of the entire population. It is estimated that 80% of Waterville individuals would be affected by the new dam.
7.3	Other ecosystem modifications	D	Low	Pervasive - Large (31-100%)	Slight (1-10%)	High (Continuing)	Coltsfoot is invading all subpopulations of Provancher's Fleabane in Quebec in numbers ranging from a few individuals to dense infestations, but we do not know its prevalence in Ontario. This invasive species spreads quickly but would likely cause less than a 10% decline within 10 years because the habitat near riverbanks reduces the ability of invasives to gain a foothold. Reed Canarygrass appears to be affecting some subpopulations along riverbanks. In Ontario, European Reed and Mossy Stonecrop are less problematic but still affect some subpopulations along riverbanks.
8	Invasive & other problematic species & genes	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	
8.1	Invasive non-native/alien species/diseases						
8.2	Problematic native species/diseases						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
8.3	Introduced genetic material	D	Low	Small (1-10%)	Slight (1-10%)	High (Continuing)	Provancher's Fleabane hybridizes with Philadelphia Fleabane when the two varieties grow in close proximity, which can occur more readily in anthropogenically altered environments. Dam construction does sometimes increase the prevalence of Philadelphia Fleabane. Because some hybridization occurs naturally, this threat has been scored based exclusively on the subpopulations where Philadelphia Fleabane appears to be increasing as a result of dam construction: Saint-Ferréol-les-Neiges / Saint-Joachim (Sainte-Anne Canyon).
8.4	Problematic species/diseases of unknown origin						
8.5	Viral/prion-induced diseases						
8.6	Diseases of unknown cause		Unknown	Large (31-70%)	Unknown	High (Continuing)	An unknown fungal disease or nutritional deficiency has been observed in some individuals. Individuals do not appear to be overly compromised in vigour thus far but more research is needed. It currently affects the largest subpopulation (Waterville; ~45% of the population). This threat appears to have arisen recently and will need to be monitored to determine if it can cause declines in the number of individuals.
9	Pollution		Unknown	Small (1-10%)	Unknown	Moderate (Possibly in the short term, < 10 yrs/3 gen)	
9.1	Domestic & urban waste water						
9.2	Industrial & military effluents		Unknown	Small (1-10%)	Unknown	Moderate (Possibly in the short term, < 10 yrs/3 gen)	A crude oil spill occurred in 1988. Some subpopulations (Neuville, Saint-Augustin, 8% of population) are subject to the risk of effluents/oil spills in the St. Lawrence that may occur over the next 10 years.
9.3	Agricultural & forestry effluents						

Threat		Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
9.4	Garbage & solid waste					Wood debris (driftwood) observed at some sites but this does not appear to be increasing. Not scored because it is likely of natural origin.
9.5	Air-borne pollutants					
9.6	Excess energy					
10	Geological events	Not a Threat	Small (1-10%)	Neutral or Potential Benefit	Moderate (Possibly in the short term, < 10 yrs/3 gen)	
10.1	Volcanoes					
10.2	Earthquakes/tsunamis					
10.3	Avalanches/landslides	Not a Threat	Small (1-10%)	Neutral or Potential Benefit	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Landslides occur with relatively high frequency in the habitat occupied by Provancher's Fleabane. A landslide impacted one subpopulation recently and could occur again (Saint-Joachim). Landslides are a natural occurrence in these habitats, which could have short-term negative impacts on the species but long-term benefits as this species is adapted to habitats with high levels of natural disturbance.
11	Climate change & severe weather	Unknown	Restricted (11-30%)	Unknown	High (Continuing)	
11.1	Habitat shifting & alteration					
11.2	Droughts					
11.3	Temperature extremes					
11.4	Storms & flooding	Unknown	Restricted (11-30%)	Unknown	High (Continuing)	Storm events and their associated disturbances are expected to increase in frequency and severity at the Lake Huron sites. These events, paired with the anticipated overall decrease in annual winter ice cover on the Great Lakes, may increase the potential for disturbance (e.g. erosion) to this plant taxon that occurs in coastally exposed habitats. Winter ice cover likely plays a crucial role in shielding this taxon from severe winter storms.
11.5	Other impacts					

Classification of Threats adopted from IUCN–CMP, Salafsky et al. (2008)