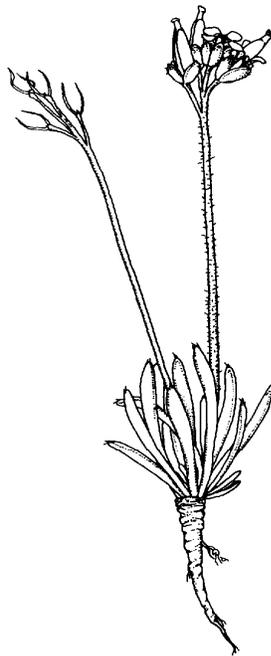


COSEWIC
Assessment and Status Report

on the

Long's Braya
Braya longii

in Canada



ENDANGERED
2000

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

Please note: Persons wishing to cite data in the report should refer to the report (and cite the author(s)); persons wishing to cite the COSEWIC status will refer to the assessment (and cite COSEWIC). A production note will be provided if additional information on the status report history is required.

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Meades, S.J. 1997. COSEWIC status report on the Long's Braya, *Braya longii* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ontario. 1-21 pp.

Production note:

Subsequent to the original designation of this species in 1997, additional information on populations of this species was compiled by the Recovery Team. This new data has been incorporated into the Recovery Plan. This new data was available to COSEWIC at its designation meeting in May 2000 and is hereby appended to the status report as supplementary information.

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COSEWIC Assessment Summary

Assessment summary – May 2000

Common name

Long's Braya

Scientific name

Braya longii

Status

Endangered

Reason for designation

Highly restricted endemic of limestone barrens with very few small populations under continued threat of habitat destruction.

Occurrence

Newfoundland

Status history

Designated Endangered in April 1997. Status re-examined and confirmed in May 2000. Last assessment based on an existing status report with an addendum.



COSEWIC Executive Summary

Long's Braya *Braya longii*

Description

Braya longii Fernald, Long's Braya, Brassicaceae (Cruciferae). Long's Braya is a caespitose perennial (1-10 [16] cm tall) with linear-spatulate leaves and scapose racemes of small white flowers.

Braya longii, which has glabrous siliques, can be distinguished easily in the field from the somewhat smaller *Braya fernaldii*, which has pubescent siliques. The petal claws of *B. longii* are bluish- to reddish- violet; petal limbs are white. Petals of *Braya fernaldii* have been described as pink, but field observations indicate that most plants have white petals, which may or may not be tinged with pink.

Distribution

Braya longii is a Newfoundland endemic, found only along the Strait of Belle Isle in insular Newfoundland, a more restricted range than *B. fernaldii*, which is found at several sites on the northern half of the Great Northern Peninsula.

Braya longii is only known from between Yankee Point and Sandy Cove, Nfld.

Habitat

Braya longii inhabits limestone barrens. It may be found in turfey areas of limestone barrens or in loose limestone gravels.

Long's Braya is restricted to the Strait of Belle Isle Ecoregion, which is characterized by tundra-like vegetation, extreme winter cold, extreme exposure, and shallow calcareous soils.

Biology

Braya longii is a perennial plant with stout taproots, essential for anchorage in the loose gravels characteristic of limestone barrens in northern Newfoundland.

Brayas are self pollinated and produce viable seed; seed set is reported to be nearly 100% (Harris 1985). However, seed dispersal is passive and, thus, only small isolated colonies usually develop.

Brayas die back to the crown during winter.

When found in newly colonized areas, *Braya longii* is usually the dominant plant. Other colonizers that may be found near or within braya colonies are *Draba* spp., *Saxifraga aizoides*, and *Saxifraga oppositifolia*. In areas less recently disturbed, *Braya* is found as scattered individuals among the typical limestone barren flora.

Brayas are colonizers of disturbed calcareous gravels.

Population numbers, sizes, and trends

Braya longii is known from only 4 populations at 3 locations; population size ranges from 3 to >200 plants. The Sandy Cove site has two populations, separated by disturbance.

Long's Braya has maintained continuous populations at the same three locations since 1924 and 1925, when first discovered by B. Long and M.L. Fernald. However, gravel quarrying at two of these locations has apparently destroyed much of the original populations.

Limiting factors

Continued gravel quarrying and removal of gravels for road construction is the main threat to *Braya longii* populations.

Quarrying and road construction are responsible for the decline in population numbers of Long's Braya. The largest known *B. longii* population is located on a seldom-used gravel parking area, where future disturbance or potential site destruction is a real possibility.

Continued quarrying and road construction in coastal barrens is the activity that most threatens braya populations and habitat. If population levels are reduced to very low levels, predation by moth larvae of a collected, but yet unidentified, species could further damage populations with few individuals. ATV traffic also poses a potential threat in some areas.

Existing protection

Although described as critically endangered (S1) (Bouchard *et al.* 1991), *Braya longii*, as a species, is not protected by legislation in Canada or Newfoundland.

The author has proposed to the Newfoundland government, through the WERAC committee, that the area between Sandy Cove and Shoal Cove - the type locality for *Braya longii*, be exempt from gravel quarrying.

No rehabilitation, re-introduction efforts, or research programs currently exist for *Braya longii*.

Protection through Ecological Reserve status can only be granted by the Cabinet of the Government of Newfoundland and Labrador.

All existing *Braya longii* populations occur either on Crown Land or within municipal boundaries; none are known to exist on private land.



COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determines the national status of wild species, subspecies, varieties, and nationally significant populations that are considered to be at risk in Canada. Designations are made on all native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fish, lepidopterans, molluscs, vascular plants, lichens, and mosses.

COSEWIC MEMBERSHIP

COSEWIC comprises representatives from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership), three nonjurisdictional members and the co-chairs of the species specialist groups. The committee meets to consider status reports on candidate species.

DEFINITIONS

Species	Any indigenous species, subspecies, variety, or geographically defined population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* 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.

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.



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

COSEWIC Status Report

on the

Long's Braya *Braya longii*

in Canada

2000

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SPECIES INFORMATION

Name and classification

Braya longii Fernald, *Rhodora* 28:202. (1926)

Syn: *Braya purpurascens* (R.Br.) Bunge var. *longii* (Fern.) Boivin, *Le Natur. Canadien* 94, p. 646 (1967).

Long's Braya, Long's Rockcress

Brassicaceae (Cruciferae), Mustard Family

Angiosperm, dicot

Type: Newfoundland. Straits of Belle Isle, gravelly and peaty limestone barrens, Sandy (or Poverty) Cove, 25 July 1925, Fernald, Long & Gilbert 28,424, GH (holotype).

Description

Long's Braya is an erect, scapose perennial with a deep taproot, simple to branched caudex, and somewhat fleshy, basal leaves. Plants range in size from 1 to 10 (occasionally to 16) cm tall (Fernald 1970). Although described as scapose, flowering stems often have a single leaf subtending the inflorescence. The scape is green to purplish and somewhat pubescent with simple and branched hairs. The entire, linear-spatulate to narrowly oblanceolate leaves are generally 1-4 cm long and 1-3 mm wide. Leaves are glabrous except for a few hairs found along the lower margin of the expanded leaf bases and on the obtuse tips. The compact raceme is dense in flower, but lengthens in fruit. Flowers have 4, green to purple-tinged, convex, oval sepals, 2.0-3.0 mm long. One or more sparse hairs can be found near the obtuse tip of the otherwise glabrous sepals. Petals are divided into a claw and limb, are 4-5 mm long and about half as wide. Petal limbs are white, while the claw is usually tinged with bluish- or reddish-violet. As in all crucifers, each flower has 4 tall stamens and 2 short. The thick, capitate style is 0.4 to nearly 1.0 mm long. The erect, primarily glabrous siliques are lance-subulate, 4.0-9.0 mm long, and 1.0 to nearly 2 mm wide (Fernald 1970). With the aid of a hand lens, occasional simple hairs may be observed on some plants. The margins of the septum are broadly expanded at the base, forming a sack-like pouch around the bottom of the lowermost seed in each locule (Harris, 1985). Seeds number about 10-16, are about 1.0-1.5 mm long, and arranged primarily in a single row (Fernald, 1970).

Long's Braya is very similar to Fernald's Braya (*Braya fernaldii*) in general appearance. The main differences found in *B. fernaldii* are the pubescent fruit, the smaller petals (2 to rarely 4.0 mm long and only 1.0-1.3 mm wide), and the more purplish color of the somewhat persistent sepals, which are smaller (2.0-2.6 mm long) and more pubescent than those of *B. longii* (Harris 1985). The scarious margin and

convex shape of the sepals are also more pronounced in Fernald's braya. Fernald (1926) consistently describes *Braya fernaldii* as the "pink-flowered braya", however, in the field the petals of this plant appear white to the naked eye and are difficult to distinguish from flowers of Long's Braya. Stigmas are generally narrower and longer than those of *B. longii* flowers. Siliques of Fernald's Braya also exhibit the expanded, pouch-like septum base that separates these two braya species from the *Braya glabella* (*purpurascens*) species complex (Harris 1995).

Detailed descriptions of *Braya longii* and *Braya fernaldii* can be found in Fernald (1926, pp. 202; 1970, p.712), Abbe (1948, p.12), and Harris (1985, pp.110,148).

A photocopy of a *Braya longii* plant collected at Yankee Point is illustrated in Figure 1. Figure 2 is an illustration of *Braya fernaldii* with details of the flowers and fruits of both *B. fernaldii* and *B. longii* provided for comparison. Also, the sack-like base of the septum is illustrated for *B. longii*. Additional illustrations of both brayas can be found in Harris (1985, p.112).

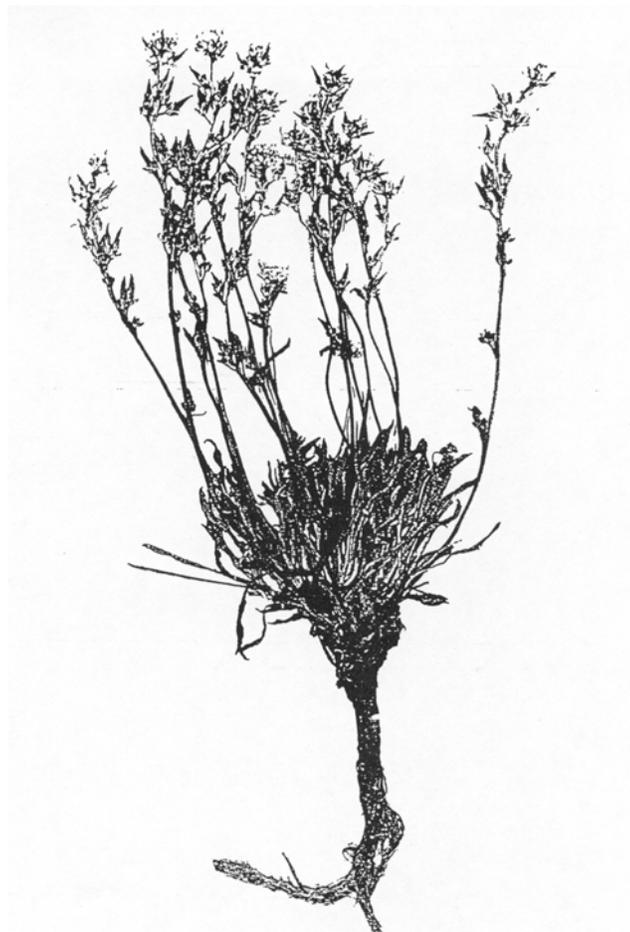


Figure 1. Photocopy of a *Braya longii* specimen

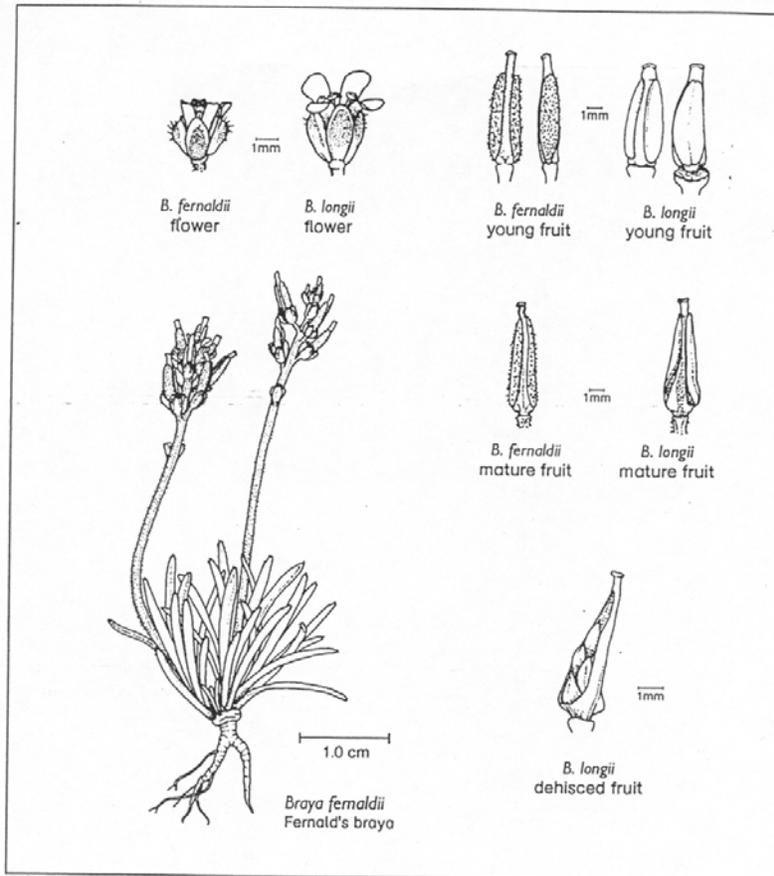


Figure 2. *Braya fernaldii* plant with young fruit. Enlargements show comparison between *B. fernaldii* and *B. longii* flowers, young fruit, and mature fruit. Dehiscent fruit of *Braya longii* shows pouch-like base of silique

Considering how similar the two Newfoundland brayas appear to each other and to the arctic *Braya glabella* Richards. [syn: *Braya purpurascens* (R.Br.) Bunge], Boivin (1967) decided to treat these two species as varieties of *B. purpurascens*. Kartesz (1994) lists both taxa as separate species in his *Synonymized Checklist of the Vascular Flora of the United States, Canada, and Greenland*. Also, a recent revision of the North American *Braya* (Harris 1985) concludes these species are distinct:

"*Braya longii* and *B. fernaldii* are also very closely related to each other, close enough that they could well be treated as a single species of two varieties. However, they are consistently distinguishable one from another, though admittedly only on the basis of characters subject to a great deal of variation in other taxa in this section, and equally well treated as separate species. Morphology and EST (isozyme) patterns clearly show that both of these species are most closely related to *B. glabella* var. *glabella* and almost certainly diverged from that taxon. The TAXMAP analysis of morphological attributes suggests that *B. longii* is more similar to *B. glabella* than is *B. fernaldii*, and it may, therefore, be the connecting link between the latter two species." (Harris 1985)

DISTRIBUTION

Braya longii is a Newfoundland endemic with a range restricted to three locations between Yankee Point and Sandy Cove - the type locality. Figure 3 shows the distribution of *Braya longii*.



Figure 3. Range of *Braya longii*

Since the geographic range of Long's Braya is restricted to such a small area, Figure 4 is included to show its range location relative to the major geographic points of western Newfoundland. General sites for *Braya longii* are indicated in Figure 5.

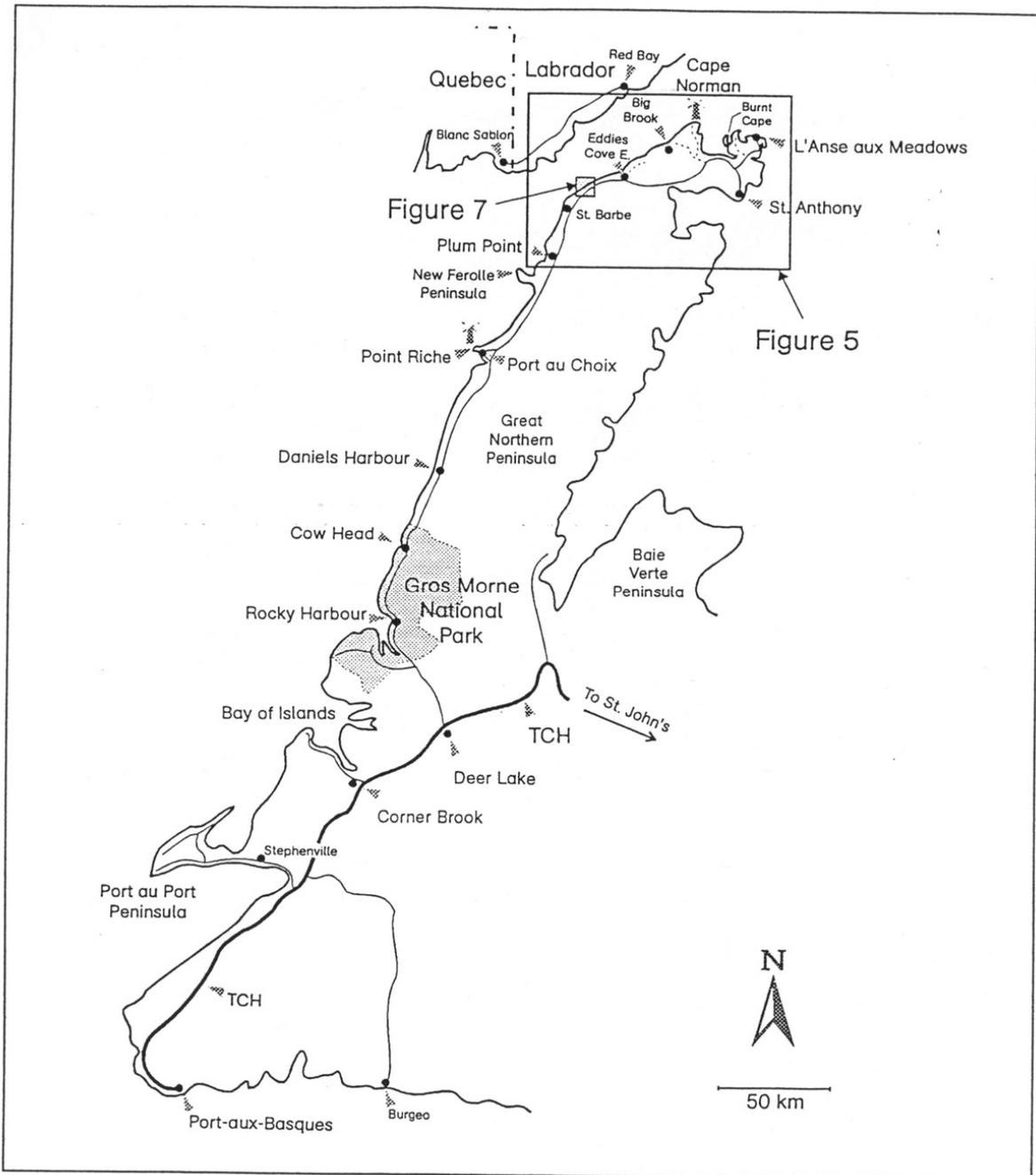


Figure 4. Map of western Newfoundland, showing location of Figure 5 (*Braya longii* sites) and Figure 7 (Quarry activity near *Braya longii* sites)

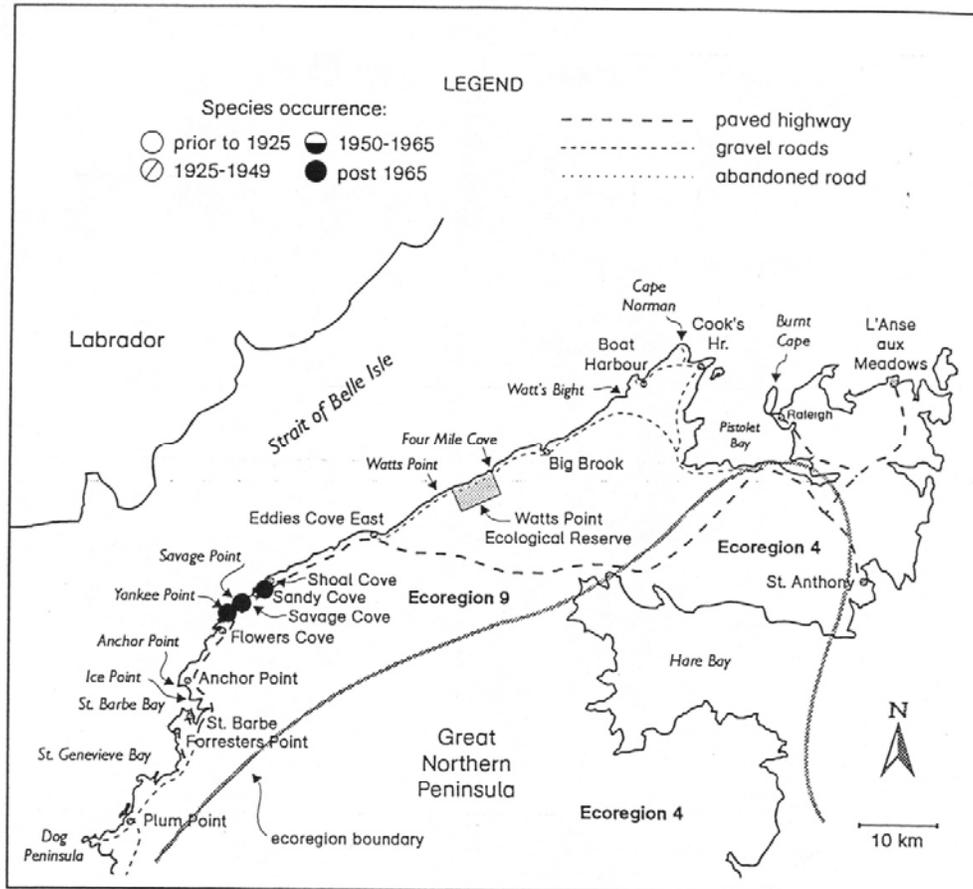


Figure 5. Location of *Braya longii* sites.

There are 3 known *Braya longii* sites: Sandy Cove, Savage Point, and Yankee Point; all recently verified. Sandy Cove is the type locality. Although much of this site was disturbed during road construction and subsequent quarrying, specimens of Long's *Braya* were found at two sites within this location. The Savage Point site was recently confirmed by Harris (1982, ALTA) and Bouchard, *et al.* (1987, MT). The Yankee Point site was not relocated until this past summer, possibly because it is not listed on current topographic maps. Maps of quarry sites, obtained by the author through the courtesy of the Nfld. Dept. of Mines and Energy, provided information that led to this population's rediscovery.

Misidentifications

A collection, labelled *Braya fernaldii* from Savage Point (Bouchard, *et al.*, 1987, MT) and examined by the author, proves to be a specimen of *Braya longii*. Previously, Savage Point was confirmed as a site for *Braya longii* by Fernald *et al.* (1925, CAN, PH) and Harris (1982, ALTA).

HABITAT

All North American brayas, including *Braya longii*, are calciphiles - inhabiting only limestone substrates. Long's Braya may occur in either turfy areas between rocks or in areas with loose limestone gravels, such as quarry sites. Long's Braya is restricted to Ecoregion 9 - the Strait of Belle Isle Ecoregion, as is Fernald's braya. This ecoregion has the most tundra-like vegetation on the Island, is characterized by limestone barren, and supports a unique mixture of calciphile, Gulf of St. Lawrence endemic, arctic-alpine, and Cordilleran and Amphi-atlantic disjunct species (Damman, 1983; S.J. Meades, 1990).

The barren areas on which *Braya* grows are often windswept in winter, exposing the plants to extreme winter cold and scouring winds. Frost action plays an integral part in preventing other plants from establishing in preferred braya sites. In summer, the exposed sites offer little or no shade. The shallow soils and loose calcareous gravels, characteristic of limestone barrens, are well-drained, thus the stout taproot is necessary to both anchor the plant and reach adequate moisture. Braya populations are most robust and grow in greatest numbers in recently disturbed areas. On sites with minimal disturbance, braya occurs only as scattered individuals.

The natural plant association type in which most braya populations occur is the extremely exposed "rock-garden heath": *Potentilletum-Dryadetosum integrifoliae* subassociation (W.J. Meades 1983). This subassociation is characterized by sparse plant cover (rarely exceeding 50%), low species abundance, and soils with low nutrient retention. Within this type, large sorted frost polygons develop as a result of the intense soil-frost activity. This community is characterized by *Potentilla fruticosa*, *Dryas integrifolia*, *Salix calcicola*, *Tofieldia pusilla*, *Anemone parviflora*, *Saxifraga aizoides*, and *Saxifraga oppositifolia*.

At Sandy Cove, *Braya longii* was observed in this habitat, as well as in exposed soil-gravel pockets, which develop as a result of erosion (through wind and frost action) in the crowberry-dwarf willow subassociation: *Empetretum-Salicetosum reticulatae* (W.J. Meades 1983). This community is characterized by *Empetrum eamesii*, *Salix reticulata*, *Salix vestita*, *Stellaria longipes*, *Plantago maritima*, *Euphrasia randii*, and *Festuca viviparum*.

Recently disturbed and human-made sites, such as quarries, have little vegetation community development and are quickly colonized by braya - if a seed source is nearby. Other early colonizers noticed in such braya populations include *Draba* spp., *Saxifraga aizoides*, *Saxifraga oppositifolia*, *Sedum roseum*, *Minuartia rubella*, and *Plantago maritima*. If left undisturbed, these human-made gravel habitats will gradually, over a period of 50-100 years, succeed to the *Potentilletum-Dryadetosum integrifoliae* subassociation.

BIOLOGY

All braya species are known to be self-pollinated, including *Braya longii*. Field observations indicate that seed set is highly successful. These observations are confirmed by Harris:

"Rather than being due to agamospermy and polyploidy, this study suggests that the peculiar patterns of morphological variation noted for the small, isolated populations of *Braya* may be due to polyploidy coupled with autogamy. Greenhouse observations showed *Braya* to be completely autogamous. Almost without exception, as soon as the flowers would begin to open, the anthers would come into contact with the stigmas and self-pollination would occur. This was especially true in members of the *B. glabella* species complex; fruit set from self-pollination was almost 100% successful." (Harris 1985)

The formation of small isolated colonies is characteristic of Long's *Braya*. Seed dispersal is passive - seeds drop onto the loose calcareous gravels or soil following dehiscence of the siliques; wind can disperse the 1-1.5 mm seeds for only short distances.

In the recently colonized gravel parking area at Yankee Point, *Braya longii* was the dominant plant. Other colonizers that have been observed near or within this pioneer *Braya* populations are *Draba incana*, *D. glabella*, *Saxifraga aizoides*, *Saxifraga oppositifolia*, and *Minuartia rubella*. In areas that were disturbed less recently, *Braya longii* was found only as scattered individuals among the typical limestone barren flora - probably as a result of competition from other species.

No asexual reproduction has been observed in *Braya longii*. This species is a perennial that dies back to the crown (caudex) during winter. With age, the caudex branches, resulting in numerous stems originating from each taproot. It is not known how long a single braya plant can survive, but judging from the number of stems on some plants, individual brayas can live for several years.

Since self-pollination is assured by the floral anatomy, self- or cross- pollination by insects is secondary. No known pollinator has been recorded, but in several collections of *Braya longii* and *B. fernaldii* made by the author, small moth larvae (3.25 mm long) were found within flower buds. On both braya species, these caterpillars fed primarily on ovaries and young siliques. In 1995, two larvae from collected plant specimens were placed in a film canister. Some time later, the author noticed that one larva had pupated and metamorphosed into a small, non descript brown moth; the other had died and deliquesced. More larvae were observed from collections made by the author in 1996 and one larva was drawn (Figure 6). This sketch and a second, dried larva were submitted for identification to Kathryn Nystrom, an entomologist with the Great Lakes Forestry Centre in Sault Ste. Marie. Attempts to identify this moth have, to date, produced no results. It may be necessary to obtain freshly preserved larvae for an accurate identification. Contrary to being considered an integral part of the life cycle of *braya*, this moth may be considered another limiting factor to the survival of small, isolated braya populations (by reducing seed set).

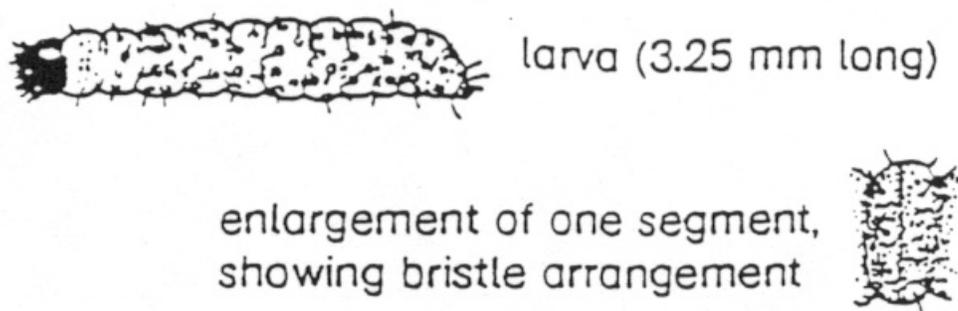


Figure 6. Larva of moth found feeding on braya.

SPECIAL SIGNIFICANCE OF THE SPECIES

Braya longii is a colonizer of disturbed calcareous gravels.

Braya longii is also of historical importance as a Newfoundland endemic described by Dr. Merrit Lyndon Fernald of the Gray Herbarium at Harvard. *Braya longii* was first discovered at Sandy Cove on August 1, 1924 by Dr. Bayard Long, a long-time field companion of Fernald's. This discovery was recounted in Fernald's classic 1926 *Rhodora* article:

"It was 5 o'clock and we were due at Flower Cove at 6:30; but we had to collect some *Statice* and the turf slopes about the little rock crests were brilliantly rosy-purple with *Hedysarum alpinum* L., *Epilobium latifolium* L. and an *Oxytropis*. It took time to dig and clean these but at 5:45 we quit, wondering whether we could possibly cover the four miles of ledgy and peaty path and have time to get out of our seal-skin Straits boots (made after the Esquimaux or "Huskimaw" fashion) and flannel shirts and be dressed to go out to tea in forty-five minutes. But Long called a halt! From the deep crevices at the crest he was extracting a strange Crucifer and Parson and Mrs. Richards would have to forgive our tardiness—for any species of the arctic genus *Braya* in this latitude is rare; in fact, we knew of only one species and this was something entirely distinct." (Fernald 1926, p.76).

He continues:

"Sunday, (July 12, 1925) after the conventional heavy dinner, Griscom and I started for a brisk non-botanical walk to Sandy Cove and back. We adhered very faithfully to the non-botanical programme, but at Sandy Cove I could not resist the temptation to look on the rocky crest for the *Braya* which, a year before, Long had discovered there in fruit. It was now in full bloom, with large white petals tinged outside with blue-violet; and later in the season we found it in profusion on the gravel-and rock-barrens of Savage Point and in less abundance on Yankee Point. When Long first found a few over-ripe specimens in 1924 and thus made us all late to Mrs. Richards' supper, I called it *B. purpurascens* (R. Br.) Bunge, a wide-ranging arctic species; but now, with a splendid series in all stages from bud to ripe fruit, it stands apart as a perfectly distinct species with which it is only right to associate the name of its discoverer; for, if there is a keener collector or discoverer of rare and local plants than Bayard Long, I have yet to meet him." (Fernald 1926, p.93).

POPULATION NUMBERS, SIZES AND TRENDS

Braya plants can be very small (as short as 1 cm) and are often hidden between rocks, so it was necessary to approximate population numbers.

Sandy Cove

At this location, which has two populations separated by disturbance, only three individuals of *Braya longii* were seen at the first, more southerly site - located closer to the community of Sandy Cove. In 1995 and 1996, respectively, approximately 50 and 35 plants were located by the author at the more northerly Sandy Cove population - located closer to Shoal Cove.

Savage Point

Current population size of the Savage Point site is unknown.

Yankee Point

This site boasts over 200 individuals of *Braya longii* in an area about 30 m by 2 m. Many specimens from this location, including the one shown in Figure 1 are extremely robust and much taller than specimens found at Sandy Cove. Unfortunately, the habitat is a parking area of limestone gravel, quarried from the site. The parking area is located near several gravel pits and, except for one protected corner, is subject to continuous traffic by large gravel trucks. This site was located during a field trip with the Newfoundland Wildflower Society, led by the author. Even with 19 people searching the few remnants of undisturbed barren adjacent to the parking area, no other populations of braya were located at Yankee Point.

LIMITING FACTORS

Major limiting factor

Collection data and field observations indicate that *Braya longii* is a very successful colonizer of disturbed calcareous gravels. But over time, the number of braya plants decreases as the site stabilizes and competition from other species causes it to be displaced. Prior to the arrival of humans in Newfoundland, disturbance was caused exclusively by frost, wind, and soil erosion.

In areas of continued natural disturbance, Long's Braya can easily maintain a population. However, two conditions must be met: there must be appropriate habitat and there must be a seed source. A large percentage of the coastal limestone barrens has been destroyed in Newfoundland during the past 20 years, primarily during road construction. Also, much of the coastal barrens between Yankee Point and Shoal Cove has been used as a source of gravel for local construction. The short-distance dispersal mechanism of *Braya longii* prevent this species from seeking out new areas once a site is destroyed. Although human-made locations have provided suitable habitat for *Braya longii* at Yankee Point, it would not take much more traffic or quarrying to completely remove Long's Braya from this site, as has probably occurred throughout much of the Sandy Cove site.

The continued survival of *Braya longii* depends upon the availability of disturbed limestone gravels. This situation provides a real conundrum - braya depends upon disturbance, yet disturbance (albeit man-made) has removed many potential braya sites.

Destruction of its habitat, through continued gravel quarrying and removal of gravels for road construction, must be considered the most serious threat to populations of *Braya longii*. Figure 7 illustrates current quarry pressures on populations of Long's Braya.

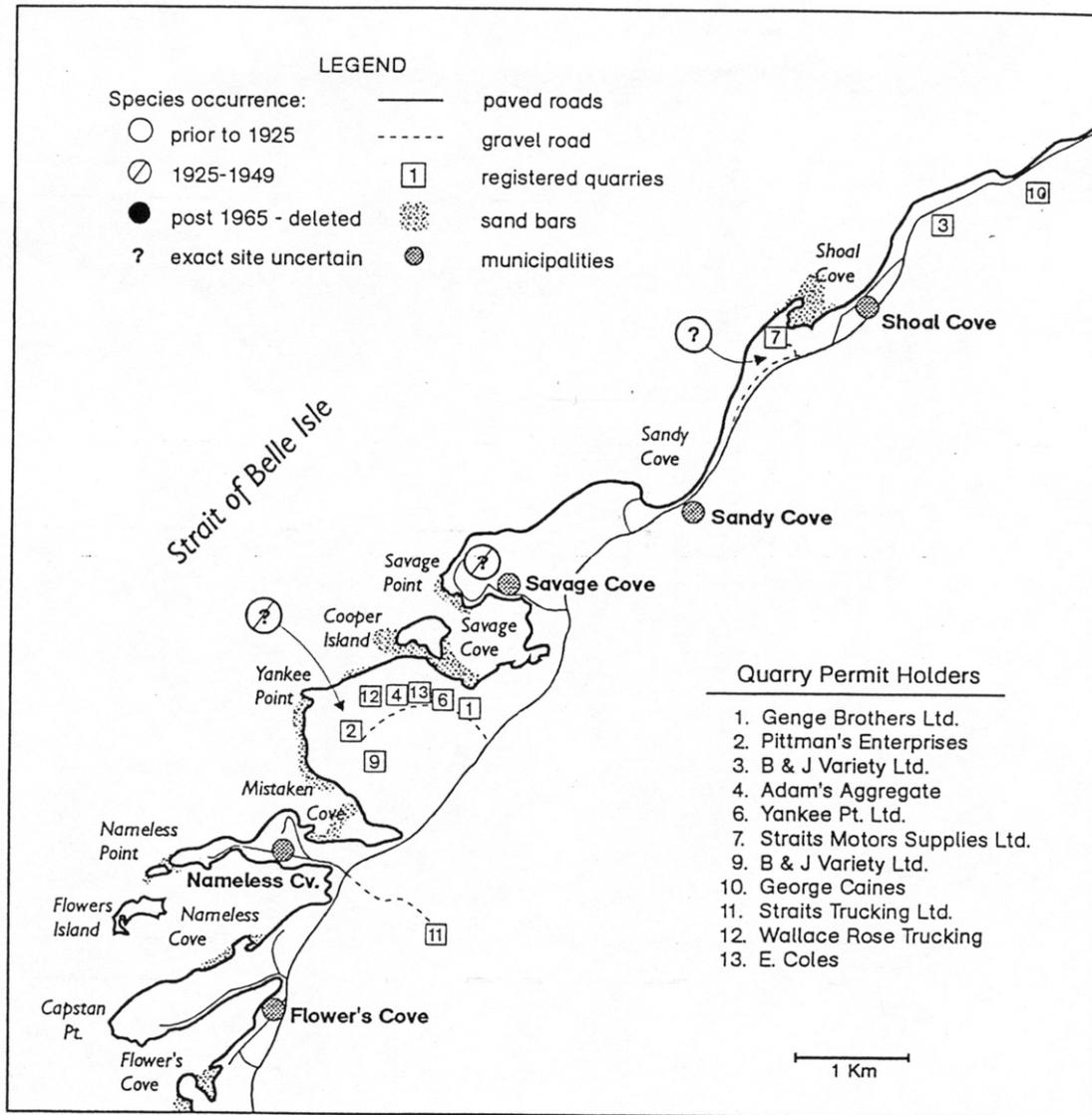


Figure 7. Quarry activity near *Braya longii* sites.

Minor limiting factors

If population levels are reduced to very low levels, predation by moth larvae of an unidentified species, which feed on ovaries and young braya fruits, could cause reduced seed production. Such a reduction could threaten some braya populations with few individuals.

Other possible threats include ATV and vehicle traffic, particularly across barrens adjacent to communities.

ASSESSMENT OF STATUS

Existing protection or other status designations

Braya longii is not protected, as a species, by legislation in Canada or Newfoundland.

Long's Braya is considered rare in Newfoundland. In *The Rare Vascular Plants of the Island of Newfoundland* (Bouchard *et al.* 1991), *Braya longii* was given an S1 rank: critically endangered. This species is also considered rare in Canada by Argus and Pryer (1990).

Provincially, the only protection currently accorded plant species is through inclusion of a given population in either an Ecological Reserve or Wilderness Area. These sites are protected from development and quarrying, but may not be exempt from localized destruction by unregulated activities, such as ATV and vehicular traffic. A particular area of biological significance can be declared an Ecological Reserve in Newfoundland only through a Cabinet Decree. Cabinet receives official recommendations from the Wilderness and Ecological Reserve Advisory Council (WERAC). Declaration of a reserve takes a minimum of 2 years, often more than 10 years.

Based on recommendations by the author, WERAC has requested of the Dept. of Mines and Energy that the area between Sandy Cove and Shoal Cove be exempt from future quarrying. This area is one of several coastal limestone barren sites that are being considered for protection due to their botanical significance. Although most of these areas will not be recommended for protection as Ecological Reserves, it is hoped that a moratorium on quarrying will be placed on all Northern Peninsula coastal limestone barrens, west of the coastal highway, in order to protect the unique indigenous flora of this region of Newfoundland.

No rehabilitation, re-introduction efforts, or research programs currently exist for *Braya longii*.

All existing *Braya longii* populations occur either on Crown Land or within municipal limits, but not on private land.

ASSESSMENT OF STATUS AND AUTHOR'S RECOMMENDATION

Loss of habitat through quarrying and road construction, coupled with the lack of long distance dispersal mechanisms reported by Harris (1985), put *Braya longii* at extreme risk.

The restricted range of *Braya longii*, along with potential threats from community growth and adjacent quarry sites, put Long's *Braya* at particular risk of extinction. The one large population at Yankee Point could be bulldozed if the site is abandoned. Much of the type locality at Sandy Cove has been destroyed by quarry activity. Thus, it is recommended that Long's *Braya* be considered an endangered species.

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The author wishes to express her appreciation to the following people who helped with this study:

Most sincere thanks go to:

Dr. James G. Harris, Utah Valley State College, Orem, Utah, for sharing his great knowledge of Newfoundland's braya and for his thoughtful support.

Dr. Stuart Hay, Dr. André Bouchard, and Dr. Luc Brouillet, Marie-Victorin Herbarium, Université de Montréal, Montreal, Quebec, for sharing their field knowledge and notes, excellent advice and valued friendship, and loan of herbarium specimens.

Ms. Kathryn Nystrom, entomologist at Great Lakes Forestry Centre, Sault Ste. Marie, Ontario, for continued attempts to identify the moth larvae found on Braya.

Mr. Paul Dean, Deputy Minister, Dept. of Mines & Energy, Govt. of Newfoundland and Labrador, St. John's, NF, for providing me with maps of quarry sites on the Great Northern Peninsula.

Dr. Erich Haber, COSEWIC, for his support and continued patience following our untimely move from Newfoundland to Sault Ste. Marie.

The Canadian Wildlife Federation for funding the preparation of this status report.

THE AUTHOR

Susan J. Meades is a freelance plant taxonomist and botanical illustrator who has studied the Newfoundland flora for 19 years. She has a B.A. (botany major) from Rutgers, NCAS, an M.Sc. (in botany) from Eastern Illinois University, and was a Ph.D. candidate at the Univ. of Connecticut before moving to Newfoundland and starting a family with her husband Bill. For the last five years, Susan has been working on an illustrated guide to the wildflowers of Newfoundland and Labrador and is currently updating the province's vascular plant checklist. She has also contributed text and illustrations for "Indicator Plant Species in Canadian Forests" (1997), Newfoundland's "Forest Site Classification Manual" (1989), an Environmental Science text - "Finding the Balance" (1993), and has written a "Forestry Module - Biology 3201" (high school level) and a 376-page report "Natural Regions of Newfoundland and Labrador" (1990). Susan currently lives in Sault Ste. Marie, Ontario, with her husband and two children, but is still active in conserving Newfoundland's endangered habitats and native flora.

Appendix 1. Record of fieldwork conducted

Reports on both *Braya longii* and *Braya fernaldii* were prepared by the author for COSEWIC, thus fieldwork included visits to most historical sites of these two species. Two of the three known *Braya longii* sites reported in the literature were visited by the author. The third was verified in 1982 by Harris and in 1987 by Bouchard, *et al.* Several locations with habitat suitable for the establishment of braya were also visited; these are listed after the known sites. Sites at which *Braya longii* was observed are indicated by an asterisk (*) in the list below. All locations visited by the author during fieldwork for the Status Report on Braya in Newfoundland are shown on Figure 8.

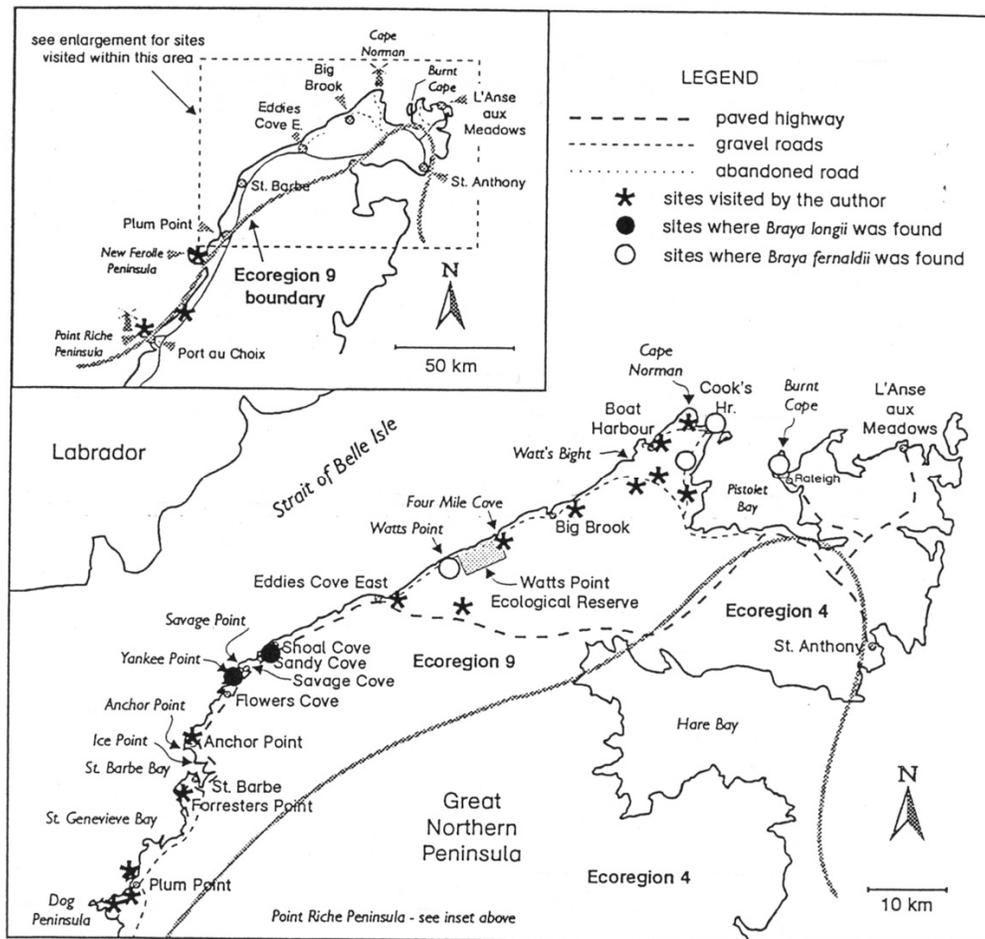


Figure 8. Historical and potential braya sites visited during the preparation of this report.

Sites	Dates
Historical Braya sites visited in 1994-5	
Burnt Cape	July 16, Aug. 19 & 25, 1995
Cook's Harbour, north of community	July 16, 1995
Big Brook	August 24, 1995
Four-Mile Cove	August 24, 1995
Watts Point, south of the reserve	July 15, 1995
Sandy Cove*	July 15, Aug 17, 1995
Point Riche Peninsula	July 17, 1994
Potential sites checked for <i>Braya</i> in 1995	
Limestone barrens along the road to Big Brook	August 25, 1995
Eddies Cove East	August 25, 1995
Anchor Point	August 17, 1995
Forresters Point	August 17, 1995
Brig Bay	August 16, 1995
Reef's Harbour, New Ferolle Peninsula	August 16, 1995
Coastal strip north of Port au Choix	July 29, 1995
<i>Braya</i> sites visited in 1996	
Cook's Harbour, north of community	July 11, 1996
Cook's Harbour, 3.5 mi. south of community	July 11 & 20, 1996
Cape Norman	July 11 & 20, 1996
Watts Point, south of the reserve	July 9, 1996
Sandy Cove*	July 9 & 18, 1996
Yankee Point*	July 9 & 18, 1996
Burnt Cape	July 10 & 19, 1996
Potential sites checked for <i>Braya</i> in 1996	
Boat Harbour	July 20, 1996
Limestone barrens east of Eddies Cove East, along the road to St-Anthony	July 20, 1996
Old Ferolle Island, off Plum Point	July 13, 1996
Bird Cove, near Plum Point	July 14, 1996

Appendix 2. Other information sources

Collections consulted:

Specimens of *Braya fernaldii* (8 sheets), *Braya longii* (1 sheet), and *Braya glabella* (4 sheets) were secured on loan from the Marie-Victorin Herbarium, Université de Montréal, Montreal, Quebec.

Knowledgeable individuals consulted:

Dr. James G. Harris, botany professor
(author of recent revision of the North American *Braya*, 1985; expert on *braya* in North America)
Utah Valley State College
800 West 1200 South
Orem, Utah, U.S.A. 84058-5999

Dr. Stuart Hay, curator of the Marie-Victorin Herbarium, Université de Montréal
(co-author of the *Rare Vascular Plants of the Island of Newfoundand*, Bouchard *et al.*, 1991) (expert on rare flora of Newfoundland)
Marie-Victorin Herbarium, IRBV
4101 est, rue Sherbrooke
Montreal, Quebec,
H1X 2B2

Summary of materials on file:

Retained by the author are:

- photographs (slides and/or prints) of all *braya* sites visited. Prints of the most pertinent slides were submitted separately to COSEWIC (Dr. Erich Haber).
- *Braya longii* collections by S.J. Meades (Some of these collections will be distributed to Montreal and Grenfell College in Corner Brook at a later date).:
 - Sandy Cove, July 15, 1995, S.J. Meades, 95/7/15-3
 - Sandy Cove, Aug 17, 1995, S.J. Meades, 95/8/17-15
 - Sandy Cove, July 9, 1996, S.J. Meades, 96/7/9-8
 - Yankee Point, July 9, 1996, S.J. Meades, 96/7/9-1
- field notes on some *Braya* sites from Drs. S. Hay, A. Bouchard, and L. Brouillet, Université de Montréal.
- reprints of pertinent information (Fernald, 1926; Abbe, 1948; Harris, 1985).
- correspondence with knowledgeable persons consulted for this report.

ADDENDUM

Table 1. Distribution and abundance of Long's Braya on the Great Northern Peninsula, NF (from south to north). Population size and density refers to flowering individuals. Sparse = <0.1 plants/m²; H=Historic location

Extant	Location	Dates	Investigators	Population Size (#Fl. Plants)		Population Density (#Fl./M2)	
Site No.		Visited		D=Disturbed, N=Natural		D=Disturbed, N=Natural	
1	ANCHOR Pt. (East of hwy 430)	2000	Recovery Team	no disturbed area	N=50	n/a	n/a
2	YANKEE Pt.	2000	Recovery Team		N=10		sparse
		1998	Recovery Team	D = 1600		D = 0.6	
		1996-7	S.J. Meades	D = 200	no natural area		
		1925	Fernald Team	herbarium specimen, unknown population size and density			
3	SANDY COVE (landing strip)	1998	Recovery Team	D = 2400	N = 900	D = 0.92	N = 0.09
		1987	Bouchard Team	herbarium specimen, unknown population size and density			
	(called Savage Point)	1982	Harris	herbarium specimen, unknown population size and density			
	(called Savage Point)	1925	Fernald Team	herbarium specimen, unknown population size and density			
4	SANDY COVE (gravel crusher)	1998	Recovery Team	D = 500	N = 600	D = 1.5	N = sparse
		1996	S.J. Meades	D = 35		[D = sparse]	
		1995	S.J. Meades	D = 50		[D = sparse]	
		1982	Harris	herbarium specimen, unknown population size and density			
		1925	Fernald Team	herbarium specimen, unknown population size and density			
		1924	Fernald Team	herbarium specimen, unknown population size and density			
4	SANDY COVE LION'S CLUB (East of the crusher site)	2000	Recovery Team	D=760	N=180	n/a	n/a
5	SHOAL COVE	2000	Recovery Team	D=35	no natural area	n/a	
H	GREEN ISLAND COVE	1998	Recovery Team	no plants located			
		1982	Harris	herbarium specimen, unknown population size and density			
		1981	I.J. Greene	herbarium specimen, unknown population size and density			

Recovery Team includes members as listed on page i.

Fernald Team includes M.L. Fernald, B. Long, B. Dunbar, F.A. Gilbert, K.M. Wiegand, N. Hotchkiss, A.S. Pease, and/or L. Griscom.

Bouchard Team includes A. Bouchard, S. Hay, L. Brouillet, and/or I. Saucier.

D = anthropogenically disturbed; H = historic location