New England Plant Conservation Program

Hieracium robinsonii (Zahn) Fernald
Robinson's Hawkweed

Conservation and Research Plan
for New England

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SUMMARY

Hieracium robinsonii (Zahn) Fernald is a rare, presumably perennial member of the Asteraceae (Aster family). It was once a candidate for listing under the Endangered Species Act and is listed as Division 1 (globally rare) in *Flora Conservanda*. The only remaining United States occurrence is in northern New Hampshire, where the species is ranked S1. It is currently known from Québec (S2), Nova Scotia (S2), and New Brunswick (S1), with a total of nine extant occurrences in Canada. There are four historic occurrences from Maine, two from Newfoundland, one from New Brunswick, nine from Québec, and 12 from Nova Scotia.

The species is confined to gravels and ledges along rivers. Its habitat appears to be most abundant in Nova Scotia, and more populations are likely to be found there. Habitat is limited in New England, though extensive surveys of areas with potentially suitable habitat may locate new populations.

The New England occurrence appears to be secure, though no long-term data on population fluctuations are available. It is not known when or why Maine occurrences disappeared. The current occurrence is likely to remain the only population in the United States, unless other populations are found. Threats to the taxon appear to be minimal; however, dams and hydropower projects could extirpate populations and reduce available habitat. Little is known about the species' biology and reproductive strategies, and lack of genetic variation may be a limiting factor for the species' long-term survival.

The conservation objective for the taxon in New England is to maintain the single extant occurrence at approximately 350 individuals. Education of landowners to ensure the protection of the New England occurrence is the most important conservation action. Research to understand the species' life cycle, reproductive success rate, breeding system, and chromosome number would be of great value. Regular inventories of extant populations and *de novo* searches for additional occurrences are necessary. Germination trials and seed banking are currently underway. Reintroduction is not considered a feasible option.

PREFACE

This document is an excerpt of a New England Plant Conservation Program (NEPCoP) Conservation and Research Plan. Full plans with complete and sensitive information are made available to conservation organizations, government agencies, and individuals with responsibility for rare plant conservation. This excerpt contains general information on the species biology, ecology, and distribution of rare plant species in New England.

The New England Plant Conservation Program (NEPCoP) of the New England Wild Flower Society is a voluntary association of private organizations and government agencies in each of the six states of New England, interested in working together to protect from extirpation, and promote the recovery of the endangered flora of the region.

In 1996, NEPCoP published "*Flora Conservanda*: New England." which listed the plants in need of conservation in the region. NEPCoP regional plant Conservation Plans recommend actions that should lead to the conservation of *Flora Conservanda* species. These recommendations derive from a voluntary collaboration of planning partners, and their implementation is contingent on the commitment of federal, state, local, and private conservation organizations.

NEPCoP Conservation Plans do not necessarily represent the official position or approval of all state task forces or NEPCoP member organizations; they do, however, represent a consensus of NEPCoP's Regional Advisory Council. NEPCoP Conservation Plans are subject to modification as dictated by new findings, changes in species status, and the accomplishment of conservation actions.

Completion of the NEPCoP Conservation and Research Plans was made possible by generous funding from an anonymous source, and data were provided by state Natural Heritage Programs. NEPCoP gratefully acknowledges the permission and cooperation of many private and public landowners who granted access to their land for plant monitoring and data collection.
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I. BACKGROUND

INTRODUCTION

Hieracium robinsonii (Zahn) Fernald is a rare member of the Asteraceae (Aster family). Once known from five locations in the United States, it is now only extant at one site in northern New Hampshire. There are nine extant occurrences in the northeastern Canadian provinces, where it is ranked S1 or S2. The species is considered globally imperiled, with a rank of G1G2 (NatureServe 2001).

Hieracium robinsonii is presumably a perennial that grows in a very specific habitat, namely on open ledges and cliffs along rivers. The species has not been studied, so little is known about its precise habitat preferences or its life cycle or reproductive strategy. It does not appear to have any obvious threats, though changes in river hydrology could extirpate current occurrences and reduce available habitat.

This conservation plan summarizes available information on *Hieracium robinsonii*'s distribution, habitat, life cycle, and conservation status. It also highlights information gaps and provides guidelines to maintain the species' existence in New England. The conservation objective for the species is to maintain the existing population at its current numbers.

DESCRIPTION

Hieracium robinsonii is a member of the Asteraceae (Aster family), tribe Lactuceae, which is characterized by having only perfect, ligulate flowers and milky sap (Gleason and Cronquist 1991). *Hieracium robinsonii* is not stoloniferous, and may have a well-developed basal rosette at the time of flowering. Leaf-blades are up to 8 cm long by 2 cm wide, with cauline leaves that are reduced in size up the stem. The leaves have a few coarse teeth on each side, and may have red mottling on the upper surface (Gleason and Cronquist 1991). The upper leaf surface has long hairs, while the lower surface is glabrous or only hairy on the midrib (Fernald 1950). Blooming plants range from 10 to 35 cm tall. The stem is sparsely hairy with stellate hairs and long spreading hairs. Plants usually have a solitary flowering head, but can produce up to 10 heads in an open corymbiform inflorescence. The flowering heads are bright yellow and larger than those found in most other hawkweeds, composed of 40-80 ligulate flowers, and 2-3(-4) cm in diameter. According to Gleason and Cronquist (1991), the peduncles have hairs that are not stipitate-glandular. However, all the herbarium specimens at the Gray Herbarium prove this statement to be false. The peduncles have stellate hairs, a few long glandless hairs, and a few black stipitate-glandular hairs. The involucral bracts may have some short black glandular hairs as well as black glandless hairs and stellate hairs (Gleason and

Cronquist 1991). The involucral bracts are attenuated to a narrowly caudate tip, with the longer bracts to 1.3 cm long. The achenes are black with a tawny pappus, and are 3 to 5 mm long.

Hieracium robinsonii is most similar to *Hieracium lachenalii*, an introduced weed of disturbed areas which can also have red mottled leaves with a few coarse teeth. The two have overlapping ranges and cannot be distinguished without close inspection, though their habitats usually differ. A combination of characters (primarily leaf width, glandular hair abundance, and phyllary size), rather than a single character, is used to distinguish between the species (Table 1). The habitat also differs for the species, though in Canada *Hieracium robinsonii* has been known to colonize roadsides (Jacques Labrecque, Centre de données sur le patrimoine naturel, personal communication).

Table 1. Differences between *Hieracium robinsonii* and *Hieracium lachenallii*

Character	***H. robinsonii***	***H. lachenalii***
Leaf width	Up to 2 cm	1.5 to 5.5 cm
Phyllary length	To 1.3 cm	To 1 cm
Involucral width (from dried specimens)	1.5 to 2 cm	Seldom over 1 cm
Inflorescence structure	Open, remotely branched corymb	Numerous heads from clustered branches
Black stipitate-glandular hairs	Few on peduncle, phyllaries with some short black glandular hairs as well as black glandless hairs and stellate hairs	Abundant on peduncle, phyllaries frequently appear to have hyaline edge around central black stripe created by hairs

There is some disagreement over the status of the plant called *Hieracium ungavense*, which is found only in Québec. Currently, it is treated as a synonym of *Hieracium robinsonii*. However, occurrences that were identified as *Hieracium ungavense* are clustered far to the northwest of any other Québec populations. It differs from *Hieracium robinsonii* by having a stem that is hirsute in the lower third, more and larger leaves that are mostly sessile, a larger involucre (1.7 – 2.2 cm in diameter), and longer achenes (4.0 – 4.2 mm) (Labrecque, personal communication). These characters overlap to some degree with herbarium specimens of *Hieracium robinsonii*. Further work, including genetic analysis, needs to be done to determine if they are separate species.

TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY

Hieracium robinsonii was named by M. L. Fernald in 1943, in honor of Benjamin L. Robinson (Fernald 1950). Previously, Zahn had published it in 1921 as a variety of the Scandinavian species *Hieracium smolandicum* (Almq. ex Dahlst.) Dahlst. (Fernald 1943). Lepage (1958) published a Canadian species, *Hieracium ungavense*, which is listed in Kartesz (1994) as a synonym of *Hieracium robinsonii*. At one point, Lepage (1960) synonymized the two, but his 1971 work listed both names in a key to the hawkweeds of Québec. He separated them based on petioles, leaf hairs, involucre size, and achene size. These character do not seem to hold up on herbarium specimens, yet no definitive work has been done showing that the taxa are separate or synonymous. Québec records for *Hieracium robinsonii* currently include records of *Hieracium ungavense* as well (Labrecque, personal communication).

There is no recent literature that discusses the position of *Hieracium robinsonii* within the genus *Hieracium*. Fernald (1950) placed it in subgenus *Archieracium* Fries along with *Hieracium lachenalii* and *H. canadense*. Stace (1998) reviewed the copious literature that exists on *Hieracium* sectional divisions and converted *Flora Europaea*'s groupings into sections, but did not provide a list of the species that fall into each section. Consequently, the current position of *Hieracium robinsonii* is not clear and it is not certain which species are its closest relatives. There is also no literature that discusses possible origins of *Hieracium robinsonii*'s current distribution. Hounsell and Smith (1968) studied Arctic-alpine and boreal disjunct species in Nova Scotia in the same habitat used by *Hieracium robinsonii*, but made no mention of the species. They inventoried six stations for minor variations in habitat and the corresponding relict flora. Three of the stations correspond to known locations for *Hieracium robinsonii*, so habitat features from those places are mentioned below.

SPECIES BIOLOGY

Hieracium robinsonii is a rosette-forming perennial or monocarpic perennial. It is possible that the species might be biennial, monocarpic, or a short-lived perennial. It does not reproduce vegetatively. Gleason and Cronquist (1991) list the species as a perennial, as the other members of *Hieracium* are, but plants at the New Hampshire population had senescent basal leaves at the time of fruiting in August 2002. In July, at the time of anthesis, all flowering individuals had healthy basal rosettes, yet there was no evidence that new basal rosettes were being formed on the fruiting plants in August. Immature plants had a basal rosette but no flowering scape. Rosette size in flowering plants varied greatly and corresponded to overall plant height and the number of flowers produced. It is not clear whether plants that have set fruit generate a new basal rosette in the fall or in the spring. There is no information on the lifespan of an individual plant.

Hieracium robinsonii flowers in July and August, with bright yellow heads that might attract bees and flies as pollinators. Pollinators have not been observed or documented. An

individual plant may begin to flower in mid-July and continue to flower into early September, so it is possible to have buds, flowers, and mature fruit on one specimen.

The genus *Hieracium* has a reproductive strategy that is somewhat atypical. Members appear to be facultative or obligate apomicts (Rich and Motley 2001). Apomictic plants are those which can form viable seeds without pollination or fertilization occurring. Seeds formed through apomixis are genetically identical to their parent plants. Facultative apomicts have asexual seed set but can also allow for sexual genetic recombination if they are pollinated (Koltunow et al. 2000). Apomixis ensures that viable seed will be formed even without the presence of pollinators, though there is no genetic recombination so populations may have very little genetic diversity. Apomixis may be necessary for some species of *Hieracium* to reproduce at all, since the majority of species appear to be triploids (Schuhwerk and Lippert 1999). Diploid and tetraploid chromosome counts have also been recorded for the genus; no count is available for *Hieracium robinsonii*. Lepage (1960) reported that *Hieracium ungavense* was triploid with a chromosome count of $2n = 27$, which would make it an obligate apomict.

Seed set in *Hieracium robinsonii* appears to be very high, which is somewhat typical of apomicts. Herbarium specimens at Harvard University had very few aborted fruits on mature specimens. Fruits are typical of the genus and consist of an achene with a long pappus. Since the fruits have a pappus, it would seem that they are wind dispersed, but that might not entirely be the case. *Hieracium robinsonii* has a specific river shore habitat and in many locations that habitat is not easy to colonize. If seeds were primarily wind-dispersed, existing populations could disappear if seeds failed to land in crevices or on ledges, and since suitable habitat is limited, the chances of colonizing new habitat would be low. In a paper by Frey et al. (1995), this same issue is addressed for *Hieracium humile*, a cliff-dwelling species in the Schwäbische Alb in southern Germany. The authors found that some seeds were wind-dispersed, but others remained in the involucre, lost most of their pappus hairs, and then fell in a clump as a diaspore. The life history strategy employed by *Hieracium humile* was that of a perennial "stayer" with drought tolerance, a high germination rate, high sexual reproduction rate, and a short-range dispersal method. It seems quite possible that *Hieracium robinsonii* shares many of the same traits. If some of its seeds fall as a diaspore, they would be likely to fall close to the parent plant, in suitable habitat, and perhaps be moved into a crevice by water, where they could successfully germinate and establish new plants. This same strategy appears to be used by *Hieracium linguans*, a very rare English species that occurs in gorges by waterfalls (Rich and Motley 2001). Despite *Hieracium linguans*' rarity and limited habitat, it germinates readily and does not appear to be directly threatened. Further research may show that cliff-dwelling species of *Hieracium* have similar survival and reproductive strategies. It is also possible that *Hieracium robinsonii* seeds that fall singly or as a diaspore could be carried downstream and become established in a new location.

Other species of *Hieracium* germinate readily from seed. Germination rates and dormancy requirements are not known for *Hieracium robinsonii*, though the New England

Wild Flower Society collected 696 seeds in 2002 from the New Hampshire population and is conducting germination trials in addition to storing the majority of the seeds in their seed bank (Christopher Mattrick, New England Wild Flower Society, personal communication). Scarification may be necessary for germination since the species grows along rivers where it is subjected to periodic ice scouring in the winter.

Hieracium robinsonii does not appear to be affected by herbivory. Herbarium specimens and plants seen in New Hampshire in 2002 had no evidence of insect or fungal predation. It is likely that its latex and surficial hairs make it unappetizing to insect predators. There is no literature that discusses relationships between *Hieracium robinsonii* and any insects or mycorrhizae. The species appears to be drought-resistant, since plants surveyed during a drought in 2002 were reproducing successfully with no signs of desiccation. Plants may also be resistant to ice scouring, since a number of occurrences are documented from ledges that are scoured on a regular basis.

HABITAT/ECOLOGY

Hieracium robinsonii usually occurs in crevices of cliffs and ledges on river shores. Fernald described its habitat as "chiefly slaty river-banks" (Fernald 1943: 317), and all the specimens he cited were from ledges, rocks, cliffs, or gravel along rivers, with some sites noted as argillaceous or calcareous. Some locations where *Hieracium robinsonii* has been found may not be obviously calcareous, but either have bedrock that provides a source of calcium or have nutrient-rich water seeping through cracks in the rock. Recently discovered occurrences from New Brunswick's Fundy National Park are located on mildly calcareous slivers of andesite and basalt that are surrounded by more acidic rhyolites, dacite, and minor tuffs (Gart Bishop, New Brunswick Federation of Naturalists, personal communication). Bedrock type alone is not enough to determine whether habitat is appropriate for *Hieracium robinsonii*. In Nova Scotia, Hounsell and Smith (1968) found cliffs that were composed of schist, gneiss, and quartzite, with a soil pH of 5.6. However, many plants that are regarded as calciphiles were found on the cliffs, indicating that there was another source of nutrients present. The cliffs were seepy, so it is likely that the water dripping down the cliffs carried dissolved minerals that enabled the calciphiles to grow.

The majority of the rivers where *Hieracium robinsonii* has been found are in ravines or gorges. According to Sean Blaney (Atlantic Canada Conservation Data Centre, personal communication), most of the Nova Scotia and New Brunswick occurrences are in remote ravines, and there is abundant potential habitat in Cape Breton and along the Cobequid Mountains on mainland Nova Scotia. Hounsell and Smith (1968) surveyed several sites along rivers where *Hieracium robinsonii* has occurred, and reported cliffs that ranged from 30 to 60 meters in height lining the rivers. Many of the occurrences are from rivers in Canada that are fairly long and are large order and high-energy streams. In New Brunswick, extant occurrences are from rivers in deep gorges, where the rivers range from 30 to 50 meters wide and have

frequent gravel strands and bars (Bishop, personal communication). There is little detailed information from sites in Québec, but six occurrences are from ledges by waterfalls, and another eight are from rocky outcrops along rivers.

Elevation does not seem to be an important habitat factor for *Hieracium robinsonii*. Elevations are not available for most occurrences, but Hounsell and Smith (1968) surveyed rivers where *Hieracium robinsonii* has been known to occur; the river stations they examined were at 15 meters and 305 meters above sea level. The New Hampshire occurrence is approximately 384 meters above sea level. In southern Nova Scotia, *Hieracium robinsonii* has been found from sea islands that do not reach an elevation of more than 30 meters above sea level.

In New England, the habitat appears to be similar to many of the Canadian occurrences, although there is no detailed occurrence information from Maine, since all records there are historic and no survey forms are available from relocation efforts. However, there is some information available on the behaviors of the rivers where *Hieracium robinsonii* was once found. Further research into historical uses of the rivers, such as log driving, and visits to the rivers to examine hydrological changes and any existing suitable habitat, may provide a better understanding of *Hieracium robinsonii*'s New England habitat.

The historic Sangerville, Maine occurrence was located on the Piscataquis River, not far from a United States Geological Survey gauging station in Dover-Foxcroft. *Hieracium robinsonii* was reported from calcareous slate cliffs along the river in 1895 and 1900. The Dover-Foxcroft gauging station started collecting data in 1903, so it is not possible to determine from stream flow data whether long-term changes have occurred on the river since the *Hieracium robinsonii* was last seen. At the gauging station, stream flow above 10,000 ft^3/s occurs every three years on average. Floods above 15,000 ft^3/s have occurred nine times since 1903, and a record flood of 37,300 ft^3/s occurred in 1987. The Piscataquis River has had stream flow above 10,000 ft^3/s in every month except July and August (USGS 2002a). The river appears to have a high volume of water, and does not seem to have a seasonal pattern of flood events.

The Carrabassett River, former site of ME .001 (Anson), has a gauging station in North Anson, Maine, and like the Piscataquis, it is a large river. Data have been gathered since 1926, so stream flow statistics are not of much use in estimating what the river's behavior was like in 1885 without knowing if hydrological changes occurred along the river. The Carrabassett's behavior has been similar to that of the Piscataquis since 1926, though it has higher floods and had a record flood of 50,700 ft^3/s in 1987 (USGS 2002a). There is no gauging station located near the historic Island Falls occurrence on the Mattawamkeag River (ME .002 [Island Falls]), so it is not possible to compare data from that location or estimate the size of the river. There is also no gauging station on the Meduxnekeag River near ME .003 (Monticello), though the gauging station in Houlton, which is south of Monticello, indicates that at least in Houlton, the Meduxnekeag is a small river, with peak stream flows of less than 7000 ft^3/s (USGS 2003).

The New Hampshire occurrence of *Hieracium robinsonii* occurs in rock crevices of a very small gorge on the west and east banks of a river. The bedrock ledges are composed of amphibolite (metamorphosed basalt), a common source of calcium-rich habitat in New Hampshire (Scott Bailey, Hubbard Brook Experimental Forest, personal communication). While not a metamorphic sedimentary rock like those cited by Fernald, it does fit in with the typical description of calcareous habitat.

The plants grow in rock crevices with no apparent soil and have little competition. There is no tree canopy directly above, but the plants are shaded during large parts of the day by trees and shrubs further up the river bank. Associated species growing on or above the ledges include: *Betula alleghaniensis, Abies balsamea*, *Picea rubens*, *Tsuga canadensis, Acer rubrum*, *Sorbus americana*, *Spiraea alba*, *Diervilla lonicera*, *Woodsia ilvensis*, *Rubus idaeus*, *Campanula rotundifolia*, *Fragaria virginiensis*, *Viola* sp., *Houstonia caerulea*, *Populus tremuloides*, *Eupatorium* sp., *Onoclea sensibilis*, *Thalictrum pubescens*, *Euthamia graminifolia*, *Achillea millefolium*, *Alnus incana*, *Polypodium virginianum*, *Vaccinium myrtilloides*, *Osmunda claytonii*, *Carex stricta*, *Chrysanthemum leucanthemum*, *Doellingeria umbellata*, *Clematis virginiana*, *Triadenum virginicum*, *Taraxacum officinale*, *Prenanthes* sp., *Lycopus* sp., *Solidago* sp., *Antennaria* sp., *Vaccinium caespitosum*, *Prunella vulgaris*, *Amelanchier* sp., *Salix* sp., *Juncus* sp., grasses, and mosses. No plants were in direct competition with the *Hieracium*, and only a few occupied adjacent rock crevices (*Vaccinium*, *Campanula*, *Woodsia*, and *Houstonia*).

The only other location with detailed information on associated species is from the Nova Scotia occurrence found by Sean Blaney in 2001. The species are somewhat different from those found in New Hampshire, but they include mostly herbaceous species. Blaney found *Hieracium robinsonii* growing on a moss-covered seepy outcrop along with species like *Luzula parviflora*, *Hieracium canadense*, *Sanicula marilandica*, *Phleum alpinum*, *Viburnum edule*, *Sphenopholis intermedia*, *Epilobium hornemannii*, *Trichophorum alpinum*, *Schizachne purpurascens*, and *Muhlenbergia glomerata.* At sites with slightly more calcareous bedrock, associated species could include *Carex atratiformis*, *Arnica lanceolata*, *Gentianella amarella* ssp. *acuta*, *Vaccinium caespitosum*, *Erigeron hyssopifolia*, and *Trisetum melicoides* (Blaney, personal communication).

When the New Hampshire occurrence was surveyed in 2002, the plants appeared to grow well above the level of the river, but water levels were unusually low. During the summer of 2002, the river dropped to a record low stream flow of slightly below 20 ft^3/s. Average values for the months of July and August are closer to 150 ft^3/s. In the spring, during late April and early May, average stream flow can reach above 1500 ft^3/s. The river has nine-year floods at values near 8000 ft^3/s. In 2000, flood stream flow reached its highest recorded level, at 12,800 ft^3/s (USGS 2002b). According to Kevin Evans (Director of Woodland Operations, personal communication), big spring floods on the river follow a certain pattern. Over the winter, the ice on the river becomes about one meter thick. The ice usually breaks up in one big

event. Since the river makes a sharp turn downstream of the occurrence, the ice cannot travel downstream and jams into layers that are two to three meters thick. River levels then rise two to three meters, depositing ice along the banks of the river and scouring the ledges. At this point, water flow rates are typically around 8000 ft^3/s. In drier and warmer winters, the flooding and scouring are less dramatic.

Since the river flooded at record levels in 2000, and at nine-year flood levels in 1998 and 1996, it seems likely that any competing vegetation on the ledges was scoured away in those flood events. Ice scouring is almost certainly a habitat requirement for *Hieracium robinsonii*. There are no indications that it can tolerate competition, and the scouring at the New Hampshire occurrence appears to be the only factor that prevents woody vegetation from occupying the crevices where it grows. Some of the cliffs in Nova Scotia that were studied by Hounsell and Smith (1968) may be steep enough that woody vegetation cannot become established on them. The extant occurrences in New Brunswick are located along rivers that have treeless ice-scoured margins that vary from 5 to 30 meters. The *Hieracium robinsonii* grows at the upper levels of the scoured edges (Bishop, personal communication). Sean Blaney (personal communication) discovered a new occurrence of *Hieracium robinsonii* in Nova Scotia in 2001, which was on a seasonally-scoured outcrop on the shore of a river. There is little detailed information from Québec, but the rocky outcrops and ledges by waterfalls where it occurs are likely to be scoured by ice on a regular basis as well. Two anomalous Québec occurrences are from roadsides, where grading, mowing, and ditching are likely to provide adequate disturbance and minimize competition.

The New Hampshire occurrence is somewhat atypical when compared to Canadian occurrences. It is considerably south of the main population center of the species, and there are no other occurrences near it. It is not clear how the plant became established in New Hampshire. It is not connected to any other rivers where *Hieracium robinsonii* has been known to occur. New Hampshire does not have an abundance of riverine outcrops that provide calcareous habitat, and what is particularly puzzling is that there is so little habitat available at the New Hampshire occurrence. The gorge is not very long or high, and is probably better described as rocky outcrops above a pool. It is by no means like the deep gorges and ravines found in Nova Scotia or New Brunswick, and there appears to be no suitable habitat upstream or downstream of the population. The river that flows through the gorge is a smaller river than most of those in Canada where *Hieracium robinsonii* has been found (Blaney, personal communication), and it is smaller than at least two of the rivers associated with the historic Maine occurrences. However, the species appears to be doing quite well with the substrate and scouring regime that it has in New Hampshire.

THREATS TO TAXON

The reasons for the rarity of *Hieracium robinsonii* are not known. Hydrological changes seem to be the most likely cause of extirpations in Maine and Canada. Threats at the

NH .001 (Second College Grant) site include minimal trampling by visitors (observed during visit). There is no evidence that trampling is occurring, but people walk right through the habitat, so trampling is definitely a potential threat.

Hydrological changes in this river due to hydropower projects are not a concern in New Hampshire, since the river is small and a dam would severely impact the only road in the area, as well as possibly destroy the primary recreational values of the area. If any Maine populations are relocated or discovered, hydropower may be a threat to them. There is a gauging station adjacent to the New Hampshire occurrence, but it has been there for many years and is unlikely to have any impact on the species.

Invasive species do not currently pose a threat to *Hieracium robinsonii*. A few non-native species are present, but they are not considered invasives and are scoured periodically along with all the other vegetation at the site. No woody vegetation larger than dwarf *Vaccinium caespitosum* is present on the ledges at NH .001.

Lack of genetic diversity may pose a threat, but without molecular studies to confirm that *Hieracium robinsonii* is an apomict and/or undergoing inbreeding, it is difficult to consider this a likely threat. In other species, isolated populations that experience inbreeding may eventually die out if there is no new gene flow (Lutz et al. 2000). New Hampshire is at the southern edge of the species' range, so it is possible that global warming will have a negative impact on this population. A long-term threat to the species would be a reduction in precipitation that led to fewer, less intense floods that failed to keep its habitat open. Drought does not seem a likely threat since the plants thrive in an area that can become extremely dry in the summer. In 2002, the river below the plants reached record low levels yet the plants bloomed and fruited successfully.

In Canada, there are no clear threats to the species. Several occurrences are in national parks, where they enjoy legal protection. Many of the Nova Scotia populations are in remote areas that are difficult to access, so they are unlikely to be threatened by human activities (Blaney, personal communication). Hydropower projects may be a future threat to some populations, but there is no indication that this is the case.

DISTRIBUTION AND STATUS

General Status

Hieracium robinsonii has a very limited range (Table 2). It has a global rank of G1G2 (NatureServe 2001) with 10 extant occurrences and is ranked Division 1 (globally rare) in *Flora Conservanda* (Brumback and Mehrhoff et al. 1996). It occurs in: New Hampshire (S1, E); Québec (S2); New Brunswick (S1); and Nova Scotia (S2). It is historic (SH) in Maine and Newfoundland. It may form large populations, but occurrences are few and scattered and it is

considered rare in every part of its range. Québec has the most known extant occurrences, though the total number of occurrences includes specimens that have been considered to be *Hieracium ungavense*. There are few accurate data available for most of the Québec occurrences, so the actual number and distribution of valid occurrences is not clear. In New Brunswick, *Hieracium robinsonii* is primarily known from Fundy National Park. More occurrences may be found there in the future. In Nova Scotia, only one occurrence is known to be extant. However, habitat is abundant and there is no indication that older records are not still extant (Blaney, personal communication). Populations have been noted recently but data have not been collected because the surveyors did not realize that the species was especially rare (Bishop, personal communication). Future surveys may verify all Nova Scotia occurrences and locate new ones.

Table 2. Occurrence and status of *Hieracium robinsonii* in the United States and Canada based on information from Natural Heritage Programs.

OCCURS & LISTED (AS S1, S2, OR T &E)	OCCURS & NOT LISTED (AS S1, S2, OR T & E)	OCCURRENCE REPORTED OR UNVERIFIED	HISTORIC (LIKELY EXTIRPATED)
New Hampshire (S1, E): 1 extant occurrence			Maine (SH): 4 historic occurrences
New Brunswick (S1): 3 extant and one presumed historic occurrence			Newfoundland (SH): 2 historic occurrences
Québec (S2): 5 extant and 9 historic occurrences			
Nova Scotia (S2): 13 occurrences, 1 extant and 12 status unknown			

NB Québec may have up to 7 additional historic occurrences that are supported by herbarium specimens but not in a Natural Heritage database. See Appendix 2 for these occurrences.

Figure 1. Occurrences of *Hieracium robinsonii* in North America. States and provinces shaded in gray have one to five (or an unspecified number of) current occurrences of the taxon. Areas shaded in black have more than five confirmed occurrences. States and provinces with diagonal hatching are designated "historic," where the taxon no longer occurs. See Appendix for an explanation of state ranks.

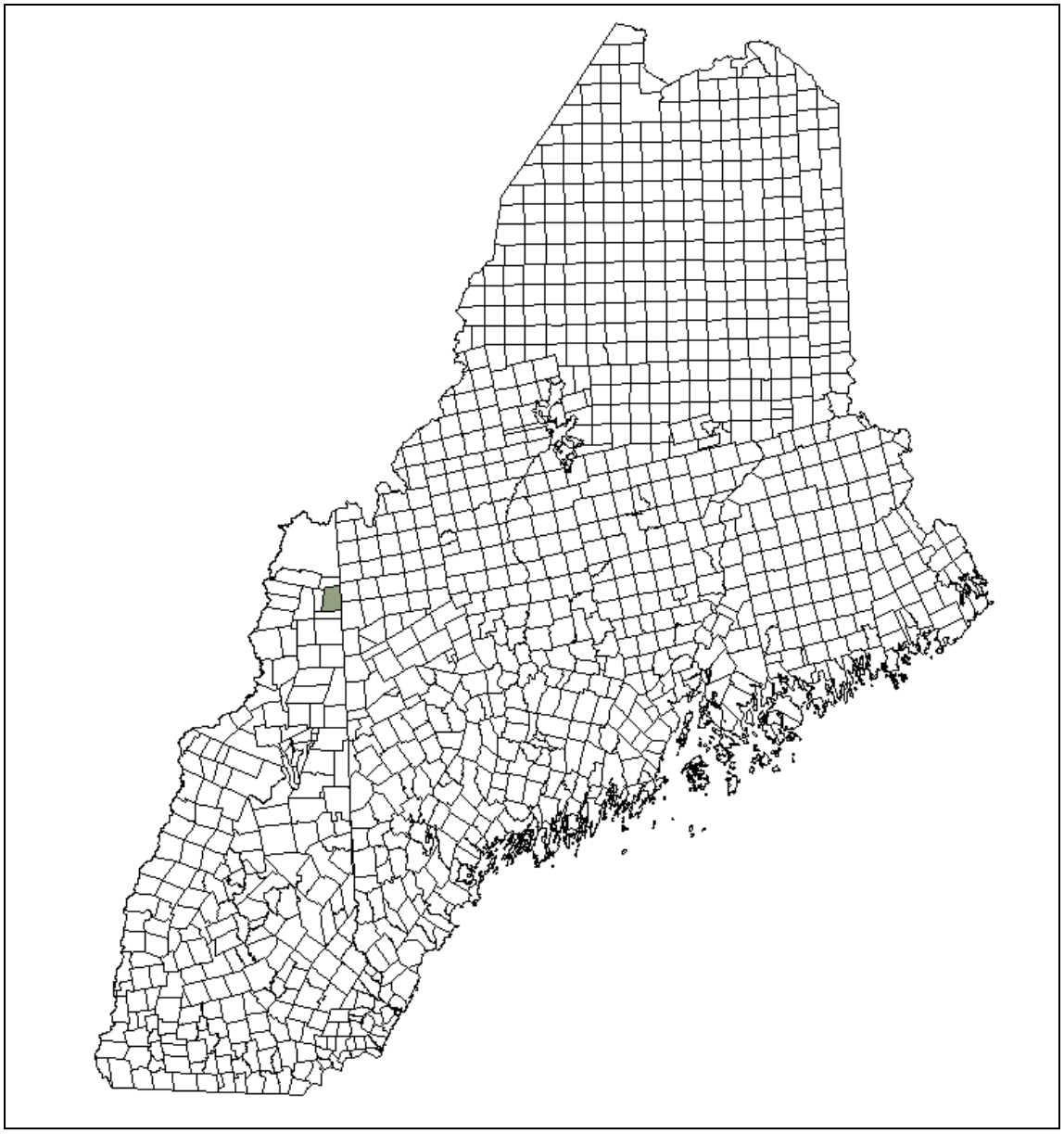

Figure 2. Extant occurrences of *Hieracium robinsonii* in New England. Town boundaries for New Hampshire and Maine are shown. Towns shaded in gray have one to five extant occurrences of the taxon.

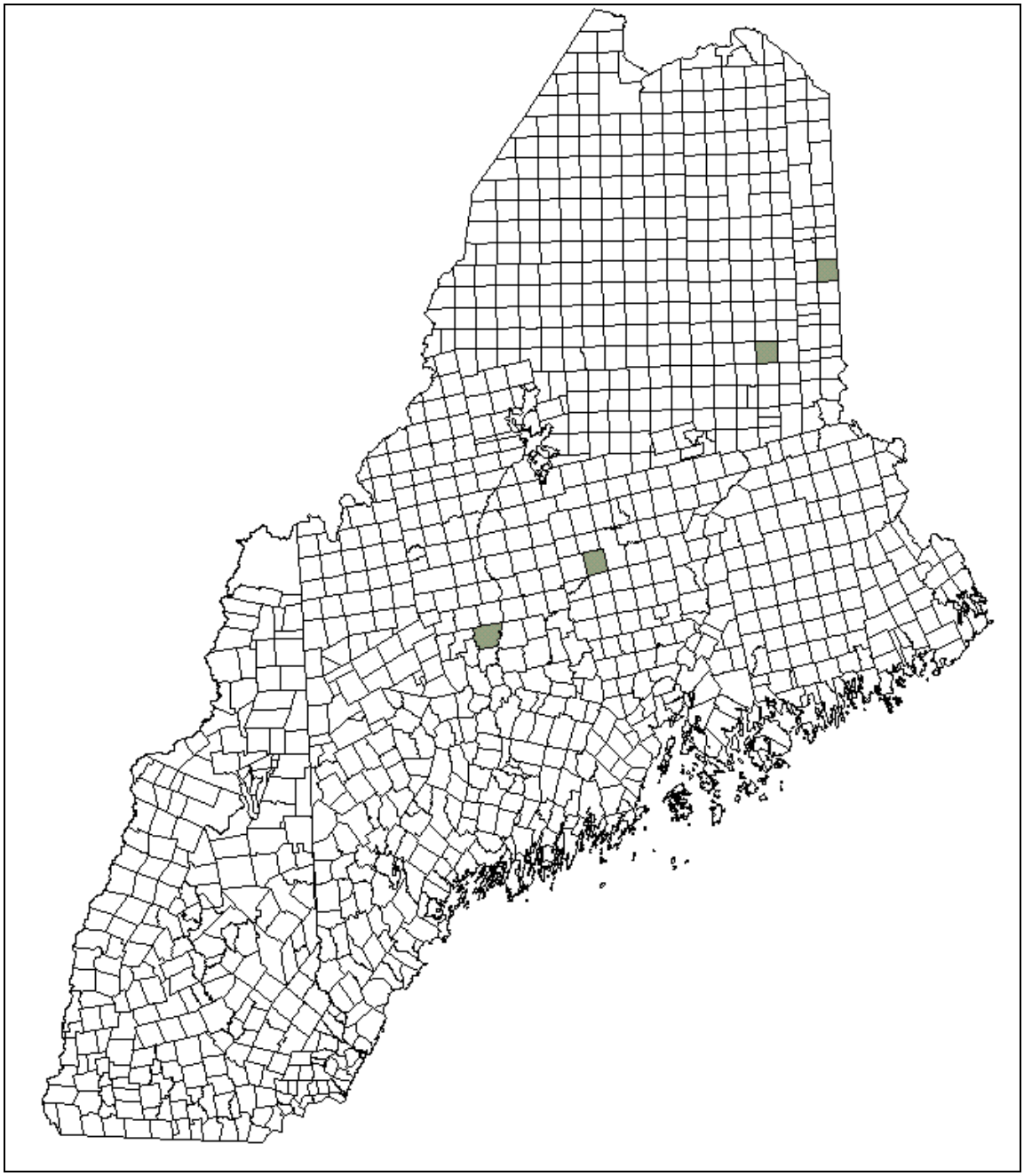

Figure 3. Historical occurrences of *Hieracium robinsonii* in New England. Towns shaded in gray have one to five historical records of the taxon.

Table 3. New England Occurrence Records for *Hieracium robinsonii.* Shaded occurrences are considered extant.

State	EO Number	County	Town
ME	.001	Somerset	Anson
ME	.002	Aroostook	Island Falls
ME	.003	Aroostook	Monticello
ME	.004	Piscataquis	Sangerville
NH	**.001**	**Coos**	**Second College Grant**

II. CONSERVATION

CONSERVATION OBJECTIVES FOR THE TAXON IN NEW ENGLAND

The primary conservation objective for *Hieracium robinsonii* in New England is to maintain a healthy population of approximately 350 individuals, with one-third of them reproducing each year, at the New Hampshire occurrence. This is the current population size at the only extant New England occurrence, and while it would be good to increase population size, the limited available habitat will probably prevent any significant increase. The population has been known for 95 years and is likely to persist. Any additional New England populations will be revealed by *de novo* searches in appropriate habitat in Maine, New Hampshire, and Vermont. Vermont may be west of the range but it has more of the appropriate bedrock types. If additional populations are found, they should be monitored and be added to NEWFS' seed banking efforts.

If hydrological changes at historic Maine populations are responsible for extirpation, there is probably no chance for reintroduction or rediscovery unless hydrologic restoration occurs. If Maine sites are not damaged, reintroduction is still of questionable value, since *Hieracium* is apomictic – genetic variation may be very low in populations if plants are clones of only a few original colonists. Over time, low genetic variation may lead to population death in some species (Lutz et al. 2000). Any attempted reintroduction would have to take the form of seed dispersal at the appropriate time of year. Reintroduction may currently be considered unfeasible due to the difficulty of establishing plants on river ledges and the lack of species biology information. Research is needed to better understand the species' biology and specific habitat requirements.

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IV. APPENDICES

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1. **Current and Historic Canadian Occurrences**

2. **Herbarium Specimens of *Hieracium robinsonii***

3. **An Explanation of Conservation Ranks Used by The Nature Conservancy and NatureServe**

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii.* Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Newfoundland		Avalon	Holyrood (Harbour Main)	Unknown	1849	1849	Crevices of rocks, infrequent on South Arm River, and cataracts of Rocky River	H	from herbarium specimen, coll. B. L. Robinson & H. Schrenk. Type location for the species. Specimens at CAN, GH.
Newfoundland		Avalon	St. John's South	Unknown	August 2, 1911	August 2, 1911	Ledges and gravel along Waterford River between Waterford Bridge and St. John's, on slate, sand, or quartzite	H	from herbarium specimen at GH, coll. M. L. Fernald & K. M. Wiegand.
Nova Scotia	1	Victoria	South Harbor	Probably in Cape Breton Highlands National Park	July 16, 1956	July 16, 1956	Effies Brook, cracks in rock		Coordinates: N 46° 51' 03.2", W 60° 28' 05.6" (accurate to within 2 km). Specimen at NSPM.
Nova Scotia	2	Inverness or Victoria	Big Intervale Cape North		No data	No data	North Aspy River		Coordinates: N 46° 50' 33.8", W 60° 36' 8.6 " (accurate to within 5 km). No specimen found to support this record. If no specimen is at NSAC, it can be assumed that this record is a mis-mapped version of either 2a (Big Intervale, Margaree) or 2b (Aspy Trail, Buelach Ban – in an adjacent square and unmapped).

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii*. Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Nova Scotia	2a	Inverness	Big Intervale, Margaree		July 18, 1898	July 18, 1898	Gravel in river bottoms		Coordinates: N 46° 27' 59.8", W 60° 54' 56.8" (accurate to within 2 km). Specimens at GH, CAN. There are two locations called Big Intervale; unless specimens are found that say "North Aspy River," this is the correct Big Intervale record.
Nova Scotia	2b	Victoria		Cape Breton Highlands NP	July 28, 1950	July 28, 1950	Aspy trail near Buelach Ban, Victoria		Coordinates: N 46° 48' 51.2", W 60° 37' 32.7" (accurate to within 1 km). Specimen at NSPM.
Nova Scotia	3	Inverness		Cape Breton Highlands National Park	July 17, 1952	July 9, 1954	Big Southwest Brook		Coordinates: N 46° 45' 45.8", W 60° 40' 48.7" (accurate to within ~3 km). Rock crevices. Specimens at NSPM, ACAD, DAO, CAN.
Nova Scotia	4	Victoria		Cape Breton Highlands National Park	July 10, 1951	July 10, 1951	Slaty Point, Clyburn River		Coordinates: N 46° 42' 10.1", W 60° 34' 48.5" (accurate to within 5 km). Occasional in rock crevices. Specimens at ACAD, MT, DAO.
Nova Scotia	5	Victoria	South Ingonish Harbour	Could be crown land or private land – no protection	August 23, 1956	August 23, 1956	Path End Brook		Coordinates: N 46° 34' 59.8", W 60° 22'56.8" (accurate to within ~2 km). Occasional, bare granite cliff. Specimen at NSPM, ACAD, CAN.

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii*. Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Nova Scotia	6	Inverness	Grand Etang (or Forest Glen?)		No data	No data	Possibly Farm Brook or Grand Etang Brook		Coordinates: N 46° 32' 5.7 ", W 60° 58' 33.1" (accurate to within 5 km). No specimen found to support this record (and specimen found for adjacent unmapped record). Unless a specimen in NSAC supports this record, it can be assumed to be a mis-mapped version of 6a.
Nova Scotia	6a	Inverness	Forest Glen	Private – no protection	July 26, 1949	July 26, 1949	Forest Glen		Coordinates: N 46° 28' 10.7", W 60° 55' 8.3 " (accurate to within 2 km). Cobble river beach. Specimens at ACAD, MT. This may be the actual location of #6. Forest Glen is immediately south of Grand Etang.
Nova Scotia	7	Inverness	West Tarbot		No data	No data	Possibly Barachois River		Coordinates: N 46° 20' 39.1", W 60° 35' 47.5" (accurate to within 5 km). No specimen found to support this record. Unless a specimen in NSAC supports this record, it can be assumed to be a mis-mapped version of 7a.

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii*. Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Nova Scotia	7a	Victoria		Could be private, crown or French River Provincial Wilderness Area	September 2, 1955	September 2, 1955	Indian Brook		Coordinates: N 46° 22' 59.8", W 60° 32' 18.1" (probably accurate to within ~5km). Specimens at NSPM, ACAD, CAN. This is probably the correct location for number 7.
Nova Scotia	8	Inverness	Goose Cove		No data	No data	One of numerous small streams flowing into St. Ann's Harbour		Coordinates: N 46° 15' 20.3", W 60° 35' 43.9" (accurate to within 5 km). No specimen found to support this record. Unless a specimen in NSAC supports this record, it can be assumed to be a mis-mapped version of 8a.
Nova Scotia	8a	Victoria	St. Anne	Could be private land or North River Provincial Wilderness Area	July 19, 1958	July 19, 1958	North River		Coordinates: N 46° 19' 1.2 ", W 60° 39' 28.2" (accurate to within ~5 km). Specimens at ACAD, DAO. This is almost certainly the correct location for number 8.
Nova Scotia	9	Colchester	Truro	Municipal – City of Truro	July 27, 1949	July 27, 1949	Victoria Park, Truro		Coordinates: N 45° 21' 9.5 ", W 63° 16' 7.1 " (accurate to within 1 km). Bank of stream in park. Specimen at ACAD.
Nova Scotia	10	Colchester	Earltown		No data	No data	West Branch River John		Coordinates: N 45° 33' 35 ", W 63° 3 ' 38.6" (accurate to within 5 km).

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii*. Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Nova Scotia	11	Yarmouth	Big Tusket Island		August 17, 1954	August 17, 1954	Owl Head, Big Tusket Island		Coordinates: N 43° 39' 17.3", W 66° 0 ' 47.9" (accurate to within 1.5 km). Open centre of island, Owl Head. Specimen at ACAD.
Nova Scotia	12	Yarmouth	Seal Island		July 26, 1954	July 26, 1954	Seal Island		Coordinates: N 43° 25' 0.8 ", W 66° 0 ' 42.7" (accurate to within 2 km). On boulders and turf, SE; local. Specimen at ACAD, DAO.
Nova Scotia	**13**				**2001**	**2001**	**Northeast Margaree River, rare on rocky shore**	**E**	**E indicates population is extant.**
Nova Scotia	14	Inverness		Probably Cape Breton Highlands National Park	July 10, 1953	July 10, 1953	Rock crevices, common. Cheticamp River		Coordinates: N 46.63738°, W 60.8818° (accurate to within 6 km). Specimen at MT.
Québec			**Mont-Tremblant Provincial Park**		**August 9, 1961**	**July 27, 2002**	**Rivière du Diable, Croches Falls**	**B**	**Crevices of granitic outcrops, receded pebble shore; flowering the 2nd week of July and the 2nd week of August; fruiting the 2nd week of August. Specimens at DAO, MT.**
Québec		James Bay			July 31, 1957	July 31, 1957	Rivière Bell, Cold Spring rapid	H	Granite outcrops at a river rapid; fruiting the 4th week of July (N 49° 39' 13", W 77° 32' 06"). Specimens at MT, QFA. Specimen cited in Lepage (1960).

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii.* Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Québec		L'Anse-Saint-Jean			July 20, 1973	July 20, 1973	Bras a Pierre, Saint-Jean river valley	H	Outcrops at the base of small waterfalls; flowering the 3rd week of July (N 48° 09' 35", W 70° 24' 36") . Specimens at QFA, CAN.
Québec		**Duplessis**	**Rivière-au-Tonnerre**		**July 29, 1979**	**July 31, 1990**	**Rivière aux Graines, north of the junction with Route 138. On rocks next to a waterfall; rare (1979); cracks of rocks with *Kalmia augustifolia, Vaccinium angustifolium, Calamagrostis canadensis, Danthonia spicata* and *Solidago macrophylla.***	**C**	**Specimen at QFA.**
Québec		**Chisasibi**	**Route Chisasibi-Radisson, 13 km**		**No data**	**August 14, 1986**	**In the gravel at the edge of the road with *Epilobium angustifolium, Achillea borealis* and *Alnus viridis.***	**E**	

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii.* Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Québec		**James Bay**			**No data**	**August 7, 1986**	**Route Matagami-Radisson, 528 km. Sand and gravel close to a ditch at the edge of the road, common.**	**E**	
Québec		**Hudson Bay**	**Kuujjuarapik**		**No data**	**1991**	**Edges of brooks.**	**E**	
Québec		James Bay	Baie aux Oies		August 7, 1950	September 1, 1950	Dry sandy terrace on top of the grève. In full flower the first week of August.	H	(N 53° 55' 17", W 79° 01' 42") 53° 54' N., 79° W. as *H. ungavense*, cited in Lepage (1958). Specimens at MT, QFA.
Québec					August 3, 1955		Rocky bank of the Eastmain River		as *H. ungavense*, cited in Lepage (1958). Specimen at QFA. Not in Québec database.
Québec		James Bay			August 21, 1956	August 21, 1956	Granitic rocks along the Opinaca River (confluence with the Eastmain River)		52° 21' N., 77° 29' W. as *H. ungavense*, cited in Lepage (1958). Specimens at QFA, CAN. Not in Québec database.
Québec		James Bay			August 12, 1950	August 21, 1950	Granitic bank of the Fort George River, ca. 17 miles from its mouth.		as *H. ungavense*, cited in Lepage (1958). Specimen at QFA. Not in Québec database.
Québec		James Bay			August 3, 1956	August 3, 1956	Eastern slope of James Bay, side of a stone moraine, between the 2nd and the 3rd lake, to the south of the Fort George River		53° 43' N., 77° 52' W. Type of *H. ungavense*, cited in Lepage (1958). Specimens at QFA, CAN. Not in Québec database.

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii*. Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Québec		Denis-Riverin or La Côte-de-Gaspé			August 5, 1882	August 5, 1882	Madeline River, Gaspé Co.		Cited in Lepage (1960) as at CAN, no label sent from CAN. Not in Québec database.
Québec		Le Domaine-du-Roy, Saguenay-Lac-Saint-Jean region			July 25, 1958	July 25, 1958	Ashuapmouchouan River, 10 mi. from the mouth.		as *H. ungavense*? Cited in Lepage (1960) as at CAN, no label sent from CAN. Not in Québec database. The Ashuapmushuan is a large river that feeds into Lac Saint-Jean.
Québec					1792	1792	Lac Mistassini		Cited in Lepage (1960) as at P. Not in Québec database.
Québec		James Bay			August 28, 1944	August 2, 1954	Rocky bank of the Vieux-Comptoir River. Argillaceous bank, in full fruit the fourth week of August.	H	(N 52° 35' 50", W 78° 41' 20") 52° 37' N., 78° 42' W. as *H. ungavense*, cited in Lepage (1958). Specimens at MT, QFA.
Québec		Mont-Valin	Rivière Bras de l'Enfer, route du Syndicat, waterfall.		July 18, 1974	August 1, 1974	Granitic rocks at the edge of a waterfall. In full flower the third week of July.	H	(Parc québécois des Monts-Valin (parc de conservation)). (N 48° 34' 22", W 70° 46' 55"). Specimens at QFA.
Québec		James Bay	Rivière Conn, ca. 100 km west of lac Low.		no data	July 24, 1974	Open *Pinus banksiana* woods with lichens on a very dry granitic rock, shallow soil. In full flower the fourth week of July.	H	(N 52° 29' 35", W 77° 58' 14")

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii.* Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Québec		Rivière-du-Loup	Rivière-du-Loup		July 10, 1903	July 13, 1904	Ledges below Fraser Falls.	H	(N 47° 49' 44", W 69° 30' 18") Also a specimen from rocks by Lower Fall, Rivière du Loup. Specimens at GH.
Québec		Le Domaine-du-Roy, Lac-St.-Jean-Est, or Le Fjord-du-Saguenay	Roberval		July 18, 1892	July 18, 1892	Saguenay River, Roberval	H	(N 48° 30' 53", W 72° 14' 13") The Saguenay River flows from Lac Saint-Jean. Roberval is on the west coast of the lake, not near the river. Roberval was also a county name once. Specimen at GH.
Québec		Gaspé	Rivière Sainte-Anne.		August 1905	August 1905	Ledges along Rivière Sainte-Anne des Monts.	H	Specimen at GH.
Québec		**Territoire-du-Nouveau-Québec**			**August 8, 1991**	**August 8, 1991**	**Haut Rivage. Baie Boatswain.**	**E**	**Same as Hudson Bay, Kuujjuarapik record? Specimen at MT. Not in Québec database.**
Québec		James Bay			July 31, 1975	July 31, 1975	Affleurement rocheux, entre les interstices. Lac au Castor, tributaire.		Specimen at MT. Originally determined as *Hieracium kalmii*, annotated to cf. *robinsonii*. Not in Québec database.
Québec		Montcalm, Rolland, Parc du Mont Tremblant	Rolland		July 10, 1959	July 10, 1959	La Diable: rivage caillouteux exondé, 500 pieds en amont du lac Monroe.		Specimen at MT. Same occurrence as others from Riv. Diable? Incompletely cited in Lepage. Not in Québec database.

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii.* Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
Québec		Côte Nord			August 5, 1960	August 5, 1960	Dans les crevasses des rochers. Riv. Nabisipi, grand chute.		Specimen at QFA. Not in Québec database.
Québec		James Bay			July 13, 1975	July 13, 1975	Lieux secs et sablonneus. Lac Hélène.		Specimen at QFA. Originally determined as *Hieracium kalmii*, annotated to *Hieracium ungavense.* Not in Québec database.
Québec		James Bay			July 24, 1974	July 24, 1974	Lande sèche à pin gris, épinettes noire, *Rhacomytrium*.		Specimen at QFA. Originally determined as *Hieracium ungavense.* Not in Québec database.
New Brunswick		**Saint John**		**Fundy National Park**	**July 9, 1982**	**July 9, 1982**	**Confluence of East Point Wolfe River and Main Point Wolfe River. Above confluence, ledge crevices near water.**	**E**	**Herbarium specimen with flowers, Hinds #5729, at UNB. Bishop & Bagnell (2000) found fewer than 15 plants at the mouth of Keyhole Brook on the Point Wolfe River near Hind's collection.**
New Brunswick		**Albert**		**Fundy National Park**	**June 28 2000**	**June 28 2000**	**Mouth of Third Vault Brook. On a small ledge of dry, exposed riverside outcrop.**	**E**	**Herbarium specimen with flowers, Bishop & Bagnell #3026, at UNB. 15 plants, plus a few more downstream (2000)**
New Brunswick		**Albert**	**Alma**	**Fundy National Park**	**July 12, 1982**	**July 12, 1982**	**Salmon River, above confluence with Kinnie Brook. Rock crevices near shore of river.**	**E**	**Herbarium specimen with flowers, Hinds #5280, at UNB.**

1. Current and Historical Canadian Occurrence Records for *Hieracium robinsonii.* Shaded occurrences are considered extant.

Province	EO #	County	Town	Site Ownership	First Obs.	Last Obs.	Description	EO Rank	Comments
New Brunswick		Victoria		Grand Falls Gorge					In NB database, but no specimen.

NB Coordinates for historic occurrences are based on locality information, habitat preference, and an understanding of local geography. Nova Scotia occurrences have a precision value (x) that is equal to 10 to the x meters. Coordinates that are accurate to within 1 km have a precision value of 3 (10^3 m), and are based on a grid system (Blaney, personal communication).

2. Herbarium Specimens of *Hieracium robinsonii*

Many plants were originally identified as *Hieracium vulgatum* var. *irriguum*, *Hieracium canadense*, or *Hieracium smolandicum*. One specimen (Pease 36590) was incorrectly identified as *Hieracium robinsonii*; it is in fact *Hieracium lachenalii*. Specimens from Harvard were examined for authenticity; all other records are from photocopied labels or citations from Lepage (1958, 1960) and were not seen.

Harvard University, Cambridge, Massachusetts, USA (GH, NEBC)
Gray Herbarium:

Collins & Fernald *s.n.* July 12 & 13, 1904. Ledges below Fraser Falls. Rivière du Loup, Temiscouata County, Québec.

Collins & Fernald *s.n.* August 3-17, 1905. Ledges 5 miles from mouth. River Ste. Anne Des Monts, Gaspé County, Québec.

Fernald *s.n.* September 8, 1897. Abundant in calcareous ledges & cliffs at foot of island. Island Falls, Valley of Mattawamkeag River, Aroostook County, Maine.

Fernald 236. June 26, 1895. Cliffs along the river. Sangerville, Valley of the Piscataquis River, Piscataquis County, Maine. Two sheets.

Fernald & Long 14923. July 12, 1916. Argillaceous ledges by river. Monticello, Valley of Meduxnakeag River, Aroostook County, Maine.

Fernald & Wiegand 6439. August 2, 1911. Ledges and gravel along Waterford River between Waterford Bridge and St. John's. Eastern Avalon Peninsula, Newfoundland. Two sheets.

Kennedy *s.n.* July 18, 1892. Roberval, Saguenay, Québec.

Macoun 19699. July 18, 1898. Big Intervale, Margaree. Cape Breton Island, Nova Scotia.

Macoun 16699. July 18, 1898. Gravel in river bottoms. Big Intervale, Cape Breton Island, Nova Scotia. (The collection number should be 19699 but is miswritten on the label).

Pease 2477. July 10, 1903. Rocks by Lower Fall. Rivière du Loup, Québec.

Robinson & Schrenk 227. August 23-25, 1894. Crevices of rocks, infrequent. South Arm River, Holyrood, and Cataracts of Rocky River, Newfoundland. Type specimen.

New England Botanical Club Herbarium:

Collins *s.n.* July 4, 1885. Rocky soil about ledges. Carrabassett River, N. Anson, Maine.

Fernald *s.n.* September 8, 1897. Abundant in calcareous ledges & cliffs at foot of island. Island Falls, Valley of Mattawamkeag River, Aroostook County, Maine. Two sheets.

Fernald 236. June 26, 1895. Cliffs along the river. Sangerville, Valley of the Piscataquis River, Piscataquis County, Maine.

Park *s.n.* July 15 & 29, 1900. Sangerville, Piscataquis County, Maine.

Pease 10513. August 15, 1907. Ledges, gorge of Diamond River. Dartmouth College Grant, Coos County, New Hampshire.

Nova Scotia Museum of Natural History, Halifax, Nova Scotia, Canada (NSPM)
Erskine 52441. July 17, 1952. Rock crevices. Big SW Aspy, Inverness County, Nova Scotia.

Erskine 56179. July 16, 1956. Cracks in rock. Effie's Brook, Victoria County, Nova Scotia.

Schofield, Smith, Webster, & Bentley 13871. September 2, 1955. Crevices in rock shelf. Indian Brook, Victoria County, Nova Scotia.

Smith & Party, Erskine 50589a. July 28, 1950. Beside trail, Aspy Trail. Near Burloch Ban, Victoria, Nova Scotia.

Smith, Schofield, Taylor, Webster, Slipp, & Bentley 11104. July 9, 1954. Rock crevices. Big Southwest Brook, Inverness County, Nova Scotia.

Webster 600. August 23, 1956. Bare granite cliffs. Path End Brook, Victoria County, Nova Scotia.

Acadia University, Wolfville, Nova Scotia, Canada (ACAD)
E. C. Smith Herbarium:

Erskine 541097. July 26, 1954. On boulders and turf, SE; local. Seal Island, Yarmouth County, Nova Scotia.

Erskine 541369. August 17, 1954. Open centre of island. Owl Head, Tusket Islands, Yarmouth County, Nova Scotia.

Palfrey & McFadden 299. July 27, 1949. Bank of stream in park. Truro, Colchester County, Nova Scotia.

Smith, Collins, Bruce, & Sampson 2813. July 26, 1949. Cobble river beach. Forest Glen, Inverness County, Nova Scotia.

Smith, Curry, Clattenburg, & MacDonald 17905. July 19, 1958. Common, rock crevices, by falls. North River, St. Anne, Victoria County, Nova Scotia.

Smith, Schofield, Sampson, & Bent 4375. July 10, 1951. Occasional in rock crevices. Slaty Point, Clyburn Brook, Victoria County, Nova Scotia.

Smith, Schofield, Taylor, Webster, Slipp, & Bentley 11104. July 9, 1954. Rock crevices. Big Southwest Brook, Inverness County, Nova Scotia.

Smith, Schofield, Webster, & Bentley 13871. September 2, 1955. Crevices in rock shelf. Indian Brook, Victoria County, Nova Scotia.

Webster 600. August 23, 1956. Occasional, bare granite cliff. Path End Brook, Victoria County, Nova Scotia.

University of New Brunswick, Fredericton, New Brunswick, Canada (UNB)
Connell Memorial Herbarium:

Bishop & Bagnell 3026. June 28, 2000. Uncommon, on a small ledge of dry, exposed riverside outcrop. Mouth of Third Vault Brook, Fundy National Park, Albert County, New Brunswick.

Hinds 5280. July 12, 1982. Rare, rock crevices near shore of river. Alma River, above confluence with Kinnie Brook, Albert County, New Brunswick.

Hinds 5729. July 9, 1982. Rare, above confluence, ledge crevices near water. Confluence of East Point Wolfe River and Main Point Wolfe River, St. John County, New Brunswick.

Institut de Recherche en Biologie Végétale, Université de Montréal, Québec, Canada (MT)
Herbier Marie-Victorin:

Deshaye 91-728. August 8, 1991. Haut rivage. Baie Boatswain, Territoire-du-Nouveau-Québec. (*Hieracium ungavense*).

Dutilly & Lepage 13442. August 28, 1944. Berge argileuse. Vieux Comptoir (Old Factory), East Coast of Hudson's Bay, Ungava, Québec.

Dutilly & Lepage 35135. July 31, 1957. Rochers granitiques. Riv. Bell, rapide Cold Spring, Versand sud de la baie James. Québec. (*Hieracium ungavense*).

Gagnon & Hay 75051. July 31, 1975. Affleurement rocheux, entre les interstices. Lac au Castor, tributaire, Territoire de la baie James, Québec. (As *Hieracium kalmii*, annotated to cf. *robinsonii*).

Lepage 12604. August 7, 1950. Sable sec. Baie aux Oies, Baie James, Québec. (*Hieracium groenlandicum*).

Robert 168-107-11 (1728). July 10, 1959. La Diable: rivage caillouteux exondé, 500 pieds en amont du lac Monroe. Parc du Mont Tremblant, comté de Montcalm, canton Rolland, Province de Québec, Canada.

Rolland-Germain 3223. August 9, 1961. Chutes Croches: crevasses des rochers granitiques. Parc du Mont Tremblant, comté de Montcalm, canton Rolland, Province de Québec, Canada.

Rolland-Germain 3224. August 9, 1961. Chutes Croches: anfractuosités des rochers le long des chûtes. Parc du Mont Tremblant, comté de Montcalm, canton Rolland, Province de Québec, Canada.

Smith, Collins, Bruce, & Sampson 2813. July 26, 1949. Cobble river beach. Margaree River, Forest Glen, Inverness County, Nova Scotia.

Smith, Schofield, Sampson, & Bent 4375. July 10, 1951. Occasional in rock crevices. Slaty Point, Clyburn Brook, Victoria County, Nova Scotia.

Smith, Schofield, Taylor, Webster, & Slipp 7814. July 10, 1953. Rock crevices, common. Cheticamp River, Inverness County, Nova Scotia.

Université Laval, Québec, Canada (QFA)
Herbier Louis-Marie:

Cayouette 73-596. July 20, 1973. Sur les rochers, au pied de petites chutes. Vallée de la Rivière St-Jean, Bras á Pierre, cté Chicoutimi, P. Québec.

Cayouette 74-266. July 18, 1974. Rochers granitiques au bord d'une chute. Riv. Bras de l'Enfer, Canton Gagné, comté de Dubuc, Lac-St-Jean, Québec.

Cayouette & Dubé J79-261. July 29, 1979. Rochers de la rivière, près de chutes. Duplessis Co., Rivère aux Graines, près de la route 138, Québec.

Cayouette & Guimond 74-266. July 18, 1974. Route de "Syndicat". Sur les rochers granitiques au bord d'une chute. Rivière Bras de l'Enfer, Cté Dubuc, P. Québec.

Cayouette & Guimond 74-318. August 1, 1974. Rochers dénudés au bord d'une chute. Rivière Bras de l'Enfer, route du Syndicat, Canton Gagné, P. Québec.

Desmarais 2010. August 5, 1960. Dans les crevasses des rochers. Riv. Nabisipi, grande chute, Côte Nord, Québec.

Dutilly & Lepage 34067. August 3, 1956. Flanc d'une moraine de cailloux, au sud du 2e lac, sud de la riv. Fort George. Versant Oriental de la baie James, Québec. (*Hieracium ungavense*, Isotype).

Dutilly & Lepage 34070. August 3, 1956. Crevasses des rochers granitiques, au sud du 2e lac au sud de la riv. Fort George. Versant Oriental de la Baie James, Québec. (*Hieracium ungavense*).

Dutilly & Lepage 34314. August 21, 1956. Rocher granitique, riv. Opinaca. Versant Oriental de la Baie James, Québec. (*Hieracium ungavense*).

Dutilly & Lepage 35135. July 31, 1957. Rochers granitiques. Riv. Bell, rapide Cold Spring, Versant sud de la baie James, Québec. (*Hieracium ungavense*).

Ganman 16. July 13, 1975. Lieux secs et sablonneus. Lac Hélène, Baie James, Québec. (As *Hieracium kalmii*, annotated to *H. ungavense*). The collector's name is not quite legible on the label and may be misspelled here.

Lecthiecq QFB-E 6738 (74-161-2). July 24, 1974. Lande sèche à pin gris, épinettes noire, *Rhacomytrium*. Territoire de la Baie de James, Québec. (*Hieracium ungavense*).

Lepage 12604. August 7, 1950. Sable sec. Baie aux Oies, Baie James, Québec. (*Hieracium groenlandicum, ungavense*).

Lepage 12651. August 12, 1950. Berge granitique de la riv. Fort George, env. 17 milles de son embouchure. Ungava, Québec. (*Hieracium groenlandicum, ungavense*).

Lepage 12903. September 1, 1950. Sable sec. Baie aux Oies, Baie James, Québec. (*Hieracium groenlandicum, ungavense*).

Lepage 32147. August 2, 1954. Rock bank of Old Factory River, 3 mi. above the post. East coast of James Bay, Québec. (*Hieracium groenlandicum, ungavense*).

Lepage 33385. August 3, 1955. Berge rocheuse, 14 mi. en haut du poste. Rivière Eastmain, Cote Orientale de la Baie James, Québec. (*Hieracium ungavense*).

Agriculture and Agri-Food Canada, Eastern Cereal and Oilseed Research Centre, Ottawa, Ontario, Canada (DAO)

Erskine 541097. July 26, 1954. On boulders and turf; local SE. Seal Island, Yarmouth County, Nova Scotia.

Rolland-Germain 322. August 9, 1961. Chutes-Croches: anfractuosités dans les gneiss. Parc du Mont Tremblant, comté de Montcalm, canton Rolland, Province de Québec.

Smith, Curry, Clattenburg, & MacDonald 17905. July 19, 1958. Common, rock crevices, by falls. North River, St. Anne, Victoria County, Nova Scotia.

Smith, Schofield, Sampson, & Bent 4375. July 10, 1951. Occasional in rock crevices. Slaty Point, Clyburn Brook, Victoria County, Nova Scotia.

Smith, Schofield, Taylor, Webster, Slipp, & Bentley 11104. July 9, 1954. Rock crevices. Big Southwest Brook, Inverness County, Nova Scotia.

National Herbarium, Canadian Museum of Nature, Ottawa, Canada (CAN)

Cayouette 73-596. July 20, 1973. Sur les rochers, au pied de petites chutes. Vallée de la Rivière St-Jean, Bras á Pierre, cté Chicoutimi, P. Québec.

Dutilly & Lepage 34067. August 3, 1956. Flanc d'une moraine de cailoux, au sud du 2e lac sud de la riv. Fort George. Versant Oriental de la baie James, Québec. (*Hieracium ungavense*, Holotype).

Dutilly & Lepage 34314. August 21, 1956. Rocher granitique, riv. Opinaca. Versant Oriental de la Baie James, Québec. (*Hieracium ungavense*).

Macoun 19699. July 18, 1898. Big Intervale, Margaree. Cape Breton Island, Nova Scotia.

Robinson & Schrenk 227. August 23-25, 1894. Crevices of rocks, infrequent. South Arm River, Holyrood, and Cataracts of Rocky River, Newfoundland. Isotype.

Smith, Schofield, Taylor, Webster, Slipp, & Bentley 11104. July 9, 1954. Rock crevices. Big Southwest Brook, Inverness County, Nova Scotia.

Smith, Schofield, Webster, & Bentley 13871. September 2, 1955. Crevices in rock shelf. Indian Brook, Victoria County, Nova Scotia.

Webster 600. August 23, 1956. Occasional, bare granite cliff. Path End Brook, Victoria County, Nova Scotia.

Specimens cited by Lepage (1958, 1960)
(Specimens identified as *Hieracium ungavense* below were at CAN and LCU. LCU has been transferred to CAN, CM, DOV, F, HUDC, NA, TEX, US, and WIS.)

Baldwin *s.n*. 1953. Riv. Bell, Québec. Cited as at CAN, not among labels sent by CAN.

Dutilly & Lepage 35136. Riv. Bell, Québec. At LCU and RIM.

Landry 343. July 25, 1958. Riv. Ashuapmouchouan, 10 mi. de son embouchure. Québec. Cited as at CAN, not among labels sent by CAN.

Lepage 12604. August 7, 1950. Baie aux Oies, terrasse sablonneuse en haut de la grève. Québec. (*Hieracium ungavense*).

Macoun 15040. August 5, 1882. Madeline River, Gaspé County, Québec. Cited as at CAN, not among labels sent by CAN.

Michaux *s.n*. 1792. Lac Mistassini, Québec. At P (Paris, France).

Riv. du Diable, chutes Croches, parc du Mont Tremblant (Legault!). Québec.

3. An explanation of conservation ranks used by The Nature Conservancy and NatureServe

The conservation rank of an element known or assumed to exist within a jurisdiction is designated by a whole number from 1 to 5, preceded by a G (Global), N (National), or S (Subnational) as appropriate. The numbers have the following meaning:

1 = critically imperiled
2 = imperiled
3 = vulnerable to extirpation or extinction
4 = apparently secure
5 = demonstrably widespread, abundant, and secure.

G1, for example, indicates critical imperilment on a range-wide basis -- that is, a great risk of extinction. S1 indicates critical imperilment within a particular state, province, or other subnational jurisdiction -- i.e., a great risk of extirpation of the element from that subnation, regardless of its status elsewhere. Species known in an area only from historical records are ranked as either H (possibly extirpated/possibly extinct) or X (presumed extirpated/presumed extinct). Certain other codes, rank variants, and qualifiers are also allowed in order to add information about the element or indicate uncertainty.

Elements that are imperiled or vulnerable everywhere they occur will have a global rank of G1, G2, or G3 and equally high or higher national and subnational ranks (the lower the number, the "higher" the rank, and therefore the conservation priority). On the other hand, it is possible for an element to be rarer or more vulnerable in a given nation or subnation than it is range-wide. In that case, it might be ranked N1, N2, or N3, or S1, S2, or S3 even though its global rank is G4 or G5. The three levels of the ranking system give a more complete picture of the conservation status of a species or community than either a range-wide or local rank by itself. They also make it easier to set appropriate conservation priorities in different places and at different geographic levels. In an effort to balance global and local conservation concerns, global as well as national and subnational (provincial or state) ranks are used to select the elements that should receive priority for research and conservation in a jurisdiction.

Use of standard ranking criteria and definitions makes Natural Heritage ranks comparable across element groups; thus, G1 has the same basic meaning whether applied to a salamander, a moss, or a forest community. Standardization also makes ranks comparable across jurisdictions, which in turn allows scientists to use the national and subnational ranks assigned by local data centers to determine and refine or reaffirm global ranks.

Ranking is a qualitative process: it takes into account several factors, including total number, range, and condition of element occurrences, population size, range extent and area of occupancy, short- and long-term trends in the foregoing factors, threats, environmental specificity, and fragility. These factors function as guidelines rather than arithmetic rules, and the relative weight given to the factors may differ among taxa. In some states, the taxon may receive a rank of SR (where the element is reported but has not yet been reviewed locally) or SRF (where a false, erroneous report exists and persists in the literature). A rank of S? denotes an uncertain or inexact numeric rank for the taxon at the state level.

Within states, individual occurrences of a taxon are sometimes assigned element occurrence ranks. Element occurrence (EO) ranks, which are an average of four separate evaluations of quality (size and productivity), condition, viability, and defensibility, are included in site descriptions to provide a general indication of site quality. Ranks range from: A (excellent) to D (poor); a rank of E is provided for element occurrences that are extant, but for which information is inadequate to provide a qualitative score. An EO rank of H is provided for sites for which no observations have made for more than 20 years. An X rank is utilized for sites that are known to be extirpated. Not all EOs have received such ranks in all states, and ranks are not necessarily consistent among states as yet.