

New England Plant Conservation Program

Draba reptans (Lam.) Fern.
Carolina whitlow-grass

Conservation and Research Plan
for New England

Prepared by:
Robert E. Zaremba
Botanist/Ecologist

For:

New England Wild Flower Society
180 Hemenway Road
Framingham, Massachusetts 01701 USA
508/877-7630
e-mail: conserve@newfs.org • website: www.newfs.org

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SUMMARY

Draba reptans (Lam.) Fern., Carolina whitlow-grass, is an annual in the mustard family (Brassicaceae). It is widespread, occurring across the United States and southern Canada. It has been reported from 38 states and five Canadian provinces. It is rare in four states and four Canadian provinces and known only from historical records in five other states. In New England, *Draba reptans* is known only from Massachusetts and Rhode Island, where there are no extant populations, and from Connecticut, where there are nine populations in four different parts of the state. *Draba reptans* is listed as a Division 2 species in *Flora Conservanda*: globally secure, but regionally rare.

Population sizes range from only a few plants to over 1000 plants. Most populations have not been visited more than once or twice. Eighteen sites in Connecticut have supported *D. reptans*. All nine of the currently known populations have been located since 1988 and are near locations with historical records. Most historical locations in Connecticut have been revisited. *Draba reptans* has generally not been a target for inventories in Massachusetts, where there are three historical occurrences, or Rhode Island, where there are two historical occurrences.

Draba reptans occurs in Midwestern prairies and in sandy soils on limestone ledges and bluffs. In the Appalachians, it is found in sandy disturbance features often described as sterile or waste places. In the Northeast, *D. reptans* occurs in cedar glades that have been subject to grazing, in sand around limestone and marble outcrops, and in a range of other disturbed sites, including sand pits, old fields, roadsides, and power line rights-of-way. At most of these sites, there is some human activity that has maintained habitat by keeping areas of exposed mineral soil.

Draba reptans is one of the first plants to flower and is difficult to find after mid-June, even in large populations. Plants may have gone unseen at many sites because plant surveys are often too late in the growing season to locate *D. reptans*, which is usually not a target species. *Draba reptans* is taxonomically distinct, although highly variable in appearance throughout its range. Like other members of the Brassicaceae, many populations of *D. reptans* include polyploids. The species is self-compatible, but protandrous, and typically outcrosses. The species may also be apomictic. *Draba reptans* is purported to be a winter annual, but there are no known observations of early phases of growth for the species in New England. Many of the other life history details for *D. reptans* are also unknown.

The main conservation objective for *Draba reptans* in New England is to protect and manage ten sites in Connecticut and two populations in both Massachusetts and Rhode Island. This objective will require that new populations be located. Other objectives include: the development of an improved understanding of habitat use by *D. reptans*; the investigation of life history events; and the development of an *ex situ* conservation seed bank. A recommended monitoring protocol is presented. Introductions/reintroductions are not recommended at this time.

PREFACE

This document is an excerpt of a New England Plant Conservation Program (NEPCoP) Conservation and Research Plan. Because they contain sensitive information, full plans 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.

NEPCoP 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. If you require additional information on the distribution of this rare plant species in your town, please contact your state’s Natural Heritage Program.

This document should be cited as follows:

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I. BACKGROUND

INTRODUCTION

Draba reptans (Lam.) Fern., Carolina whitlow-grass, is an annual in the Brassicaceae. It is widely distributed in the United States and southern Canada. It is globally secure, G5, but rare in four states and four Canadian provinces and known only from historical records in five other states (NatureServe 2004). It is at its northeastern range limit in New England and has occurred in Massachusetts, Rhode Island, and Connecticut. It is known from historical records only in Massachusetts and Rhode Island and from 18 locations in Connecticut, nine of which currently support plants. Six of the nine populations in Connecticut are clustered in one small geographic area that is subject to rapid suburbanization. *Draba reptans* is listed in *Flora Conservanda* as a Division 2 species, globally secure, but regionally rare (Brumback and Mehrhoff et al. 1996).

Draba reptans is geographically limited within New England. This conservation plan is developed to assemble the current information on the species in New England, to review the biology, ecology, and habitat needs of *D. reptans* from throughout its range, to assess the reasons for its rarity in New England, and to inform the development of a conservation strategy for its protection.

Draba reptans is taxonomically distinct, one of two annuals in the genus in the Northeast. It can co-occur with both *D. verna* and *Arabidopsis thaliana*, both of which it superficially resembles. It can, however, be easily differentiated from these species and other mustards. In New England, it occurs in open, sunny sites with sandy soil derived from alkaline bedrock. Sites are usually maintained by disturbances, including grazing, mowing, bulldozer use, and road and power line maintenance. It is threatened by direct loss of habitat, the loss of processes maintaining habitat, and invasive species. The specific reasons for the loss of historic sites in New England are unknown. *Draba reptans* may have occurred at many of these sites as an adventive species associated with sandy disturbances. Some of these populations may not have persisted for very long.

Draba reptans is insect-pollinated, but is self-compatible and may be apomictic. Many of the life cycle events for *D. reptans* are poorly understood.

The conservation objectives for *Draba reptans* in New England include the protection and management of ten populations in Connecticut and two populations in both Massachusetts and Rhode Island. New populations will need to be located to meet this goal. Each population should support at least 500 plants in two or more distinct patches. All populations should be monitored for at least ten years and subsequently assessed at an interval that can evaluate habitat changes and management needs. It is likely that long-term management will be needed at all sites to maintain populations. A monitoring protocol is presented. Additional information should be collected to describe life history events related to the rarity of the species in New England and its management

needs. An *ex situ* seed bank should be established. Introductions or reintroductions are not recommended at this time.

DESCRIPTION

Draba reptans (Lam.) Fern. descriptions are adapted from Fernald (1934) and Gleason and Cronquist (1991). Nomenclature follows Mitchell and Tucker (1997). *Draba reptans* is a simple or basally-branched annual or winter annual. It is described as being 5-20 cm tall, but in New England, plants are typically 2-10 cm tall (personal observation). The basal leaves of *D. reptans* are oblanceolate or obovate, 1-3 cm long, blunt-tipped, entire, and pubescent with simple hairs above and stellate hairs below. Near the base of the plant are two or three cauline leaves, which are diagnostic for the plant in the Northeast. Petals are white and up to 5 mm long. Occasionally, flowers are apetalous. The raceme is dense, 5-20 mm long, with a hairless axis. Fruits are ascending on pedicels 1/3 to 1/2 as long as the fruit, which ranges from 1-2 cm long and 1.8- 2.0 mm wide.

Populations of *Draba reptans* are usually large and dense and are best surveyed during only the few weeks between late-April and mid-June. Most populations occur as scattered patches in open sun on sandy, often white, substrate.

Draba reptans can co-occur with *D. verna* and *Arabidopsis thaliana* in New England, but also occurs without any similar-appearing plants. Both *D. verna* and *Arabidopsis thaliana* are small, non-native annuals that appear in large numbers in early to mid spring. They also occupy disturbed, sandy habitats. *Draba reptans* can be differentiated from *D. verna* by the two or three cauline leaves and petals that are not bifid (Fernald 1934). The fruits of *D. reptans* are also very different. The silique of *D. reptans* is approximately 1/4 to 1/3 as wide as long and slightly curved, while the fruit of *D. verna* is approximately 1/2 as wide as long. The fruit of *D. reptans* is shaped a little like a bratwurst (personal observation). The main difference between *D. reptans* and *Arabidopsis thaliana* is that *A. thaliana* is a much taller plant, with more branches and stem leaves. It has a winter rosette similar to *D. reptans*, but in the spring *A. thaliana* bolts and the basal leaves fall off, while the rosette in *D. reptans* persists during flowering and fruiting.

Common names for *Draba reptans* include: Carolina whitlow-grass, creeping whitlow-grass, white whitlowort, and whitlow grass. The genus name, "*Draba*," is Greek for "sharp" or "acid" and refers to the bitter taste of the leaves which supposedly had a medicinal value (United States Department of Agriculture 2004). The specific name, "*reptans*," refers to the creeping nature of the plant that can have a main central axis and one or more smaller offshoots. *Draba reptans* appears in the *Peterson Field Guide to Wildflowers* (Peterson and McKenny 1968), but not in *Newcomb's Wildflower Guide* (Newcomb 1977), probably because it is not present in Massachusetts and rare in New England.

TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY

Of the 99 genera in the Brassicaceae, *Draba* is the largest genus in the family with 350 species in the Northern Hemisphere and 93 species in the United States (Brochmann et al. 1992). *Draba reptans* is in the Section Tomostima with two other annuals: *D. cuneifolia* and *D. platycarpa* (Schultz 1936). There still remains confusion concerning whether *Draba* and *Arabis* should be segregated into two different genera (Koch and Al-Shehbaz 2002).

Polyploidy is common in the Brassicaceae and is well documented in *Draba* (Brochmann et al. 1992). The chromosome number for *Draba reptans* varies from $2n=16$ to $2n=32$. There are also populations of *D. reptans* documented with $2n=30$. The basic chromosomal unit in *Draba* is 8, and polyploid populations are common. One of the complexities in *Draba reptans* is that there is minor morphological variation in the species over its range, partly due to local adaptations and partly due to the formation of polyploids. The frequent migrations of plants, coupled with environmental change, have led to numerous different forms within the species that have at various times been recognized by botanists as different species, varieties, or forms (Mulligan and Findlay 1970). There are no described hybrids involving *D. reptans*. *Draba verna*, another annual with which *D. reptans* occasionally occurs in New England and New York, has a chromosome number of $2n=14-64$.

Synonyms for *Draba reptans* (Kartesz and Kartesz 1994) include:

D. caroliniana Walter

D. caroliniana Walter f. *stellifera* O. E. Schulz

D. micrantha Nutt.

D. reptans (Lam.) Fernald f. *micrantha* (Nutt.) C. L. Hitchc.

D. reptans (Lam.) Fernald f. *reptans*

D. reptans (Lam.) Fernald ssp. *stellifera* (O. E. Schulz) Abrams

D. reptans (Lam.) Fernald var. *micrantha* (Nutt.) Fernald

D. reptans (Lam.) Fernald var. *reptans*

D. reptans (Lam.) Fernald var. *stellifera* (O. E. Schulz) C. L. Hitchc.

D. reptans (Lam.) Fernald var. *typica* C. L. Hitchc.

SPECIES BIOLOGY

Draba reptans is described as a winter annual, but early growth in New England has not been documented. It is not known when seeds germinate in New England in the field or if most seedlings survive to bear fruit. *Draba reptans* is also described as being the first plant to flower in the Carolinas (Kochmer and Handel 1986) and the most abundant prevernal species in the Oklahoma prairie (McCoy 1958). In New England, *D. reptans* has been collected between April 11 and June 12 in flower or fruit. Most collections have been made between April 21 and May 5. Fruits have been noted from

April 18 and May 19. Plants identified as *D. reptans* have been seen during surveys in August and September (W. Moorhead, Consulting Botanist, personal communication) and even November (K. Metzler, Connecticut Natural Diversity Data Base, personal communication).

Draba reptans is known to form soil seed banks. In one study of soil seed banks in the northern mixed-grass prairie, *D. reptans* had the highest density of all species among seedlings grown out from soil samples, but had overall low biomass (Karl et al. 1999).

All members of the genus *Draba* are insect-pollinated, although there is no information on what insects pollinate *D. reptans*. In one study that did not include *D. reptans* (Mulligan and Findlay 1970), all the species of *Draba* had effective pollen transfer within a single plant with the production of viable seed. *Draba reptans* can produce cleistogamous flowers and is self-compatible (Cruden 1977).

Most populations of *Draba reptans* in New York and Connecticut occur in a series of small, sandy openings at scattered locations. The number of plants at a site is known to vary over time, probably in relation to moisture and temperature conditions as well as habitat quality (personal observation). Populations of individual patches in New York have been documented to range from one plant to over 8000 plants. In Connecticut, populations for a site have varied from eleven to over 1000 plants, with a typical population consisting of two to five subpopulations with 300 to 500 plants. In New York, some patches that have been observed with hundreds of plants one year and no plants the following year (personal observation). Individual populations in New England or New York have not been observed under variable conditions over many years to be able to characterize population size in relation to disturbances or different weather conditions.

HABITAT/ECOLOGY

The general habitat for *Draba reptans* is open, sunny, sandy soil, usually with a circumneutral or high pH. In Illinois, *D. reptans* occurs in sandy openings of prairies and on limestone ridges (Mohlenbrock 1980). In Missouri, *D. reptans* is found in: rocky, open glades; on ledges often of sandstone and chert; sandy and fallow fields; pastures and roadsides; and waste ground (Steyermark 1975). Palmer and Steyermark (1935) refer to *D. reptans* as a characteristic plant of the unglaciated prairies. In Indiana, *D. reptans* occurs in dry, sandy soil in woodland pastures and fallow fields, waste places, and along roadsides and open wooded dunes (Deam 1940).

In New York, there are eight currently documented populations in the vicinity of the known Western Connecticut populations. These New York populations occur primarily in old cow pastures associated with successional cedar glades. The most common associated species are *Schizachyrium scoparium*, *Juniperus virginiana*, *Draba verna*, *Saxifraga virginiana*, *Veronica serpyllifolia*, *Minuartia stricta*, *Centaurea*

maculosa, *Hedeoma hispidum*, *H. pulegioides*, *Galium mollugo*, *Daucus carota*, *Hieracium* spp., and *Aquilegia canadensis*.

In New England, common associates, apart from those mentioned in New York, include: *Sporobolus asper*, *S. cryptandrus*, *Arabidopsis thaliana*, *Antennaria* spp., *Monarda fistulosa*, *Achillea millefolium*, *Prunus virginiana*, *Arabis lyrata*, *Asplenium platyneuron*, and *Cerastium* sp.

Draba reptans often occurs with other rare species in New England. It should be useful to look for new populations of *D. reptans* at sites with known populations of rare associated species. These species include *Bouteloua curtipendula*, *Linum sulcatum*, *Asclepias viridiflora*, *Onosmodium virginianum*, *Hedeoma hispidum*, *Carex bicknellii*, *Potentilla arguta*, and *Liatris scariosa* var. *novae-angliae*. In New York, *D. reptans* also occurs with *Pycnanthemum torrei* and *P. clinopodioides*.

Species associated with *Draba reptans* are often considered to be calciphiles. These species include, but are not limited to: *Saxifraga virginiensis*, *Bouteloua curtipendula*, *Arabis lyrata*, and *Carex eburnea*. It may be useful to look for new populations of *D. reptans* at any site in southern New England that has sandy soil and any collection of species thought of as calciphiles.

Bill Moorhead (personal communication) interpreted habitat for collections of *Draba reptans* at two Connecticut sites as possibly occurring on trap rock. He searched for *D. reptans* at locations on trap rock and at other rocky upland sites. His searches have been unsuccessful in this habitat. There is no direct evidence that *D. reptans* is found in sandy soil associated with trap rock.

Draba reptans has also been collected in sandy soil near lakeshore marshes in Ontario (Riley and Varga 1984) and coastal marshes in New York. The Ontario sites may have occurred on alkaline sands. It is possible that the New York sites were influenced by either heavy salt spray or occasional salt water flooding that may raise soil pH and establish suitable habitat for *D. reptans*. Some of the Connecticut historical sites near the Long Island sound may have been in this type of location.

Draba reptans can survive limited levels of grazing (Herbel and Anderson 1959). In one grazed area, *D. reptans* was considered to be an invading weed of the prairie. *Draba reptans* is, in Oklahoma, described as occurring in sandy openings between cespitose grasses (McCoy 1958).

Draba reptans is a fugitive species that requires regular disturbances to maintain open, sunny habitat (Marks 1983). In the past, natural disturbances maintaining habitat for *D. reptans* have probably included: periodic severe floods; grazing; fires; and freezing and thawing around rock outcrops on hilltops and steep slopes. It is likely that some of these disturbance occurred along the Housatonic River and other rivers in Southern New England, in Western Connecticut, and along coastal areas. It is also likely that agricultural and other 19th century and early 20th century activities greatly increased

the rate and severity of disturbances that may have created and expanded *D. reptans* habitat in the Northeast. It has been observed that many species now considered rare in New England may have been associated with the late 19th Century agricultural landscape and have become rarer in New England as a result of agricultural abandonment (Foster et al. 2002). Many changing land uses have maintained some of these open, sunny sites that have continued to support *D. reptans* or have created new sites that have been available for colonization.

THREATS TO TAXON

Direct Loss of Habitat

The greatest threat to *Draba reptans* in New England is the conversion of appropriate habitat to residential and commercial uses, as well as landscaping or other management of roadsides and railroad track borders. There appear to be three types of habitat used by *D. reptans* in the Northeast: cedar glades, roadsides/railroad borders through limestone areas, and disturbed features (probably with alkaline sands). It is unclear if *D. reptans* occurs in sandy areas near the coast in New England. Many sites that previously supported *D. reptans* or could support new populations have been developed into housing or are now a part of transportation corridors. A few sites have been converted to businesses or to agricultural uses (CT .010 and CT #1 [both Brookfield]). To occupy these areas, *D. reptans* must be able to either survive in a seed bank or be able to colonize from nearby areas. In Northwestern Connecticut, appropriate habitat has persisted with disturbances that have allowed *D. reptans* to survive on-site or move to newly-opened appropriate habitat. It is likely that *D. reptans* has been lost from many of the smaller, more isolated sites when development has engulfed occupied habitat without creating new habitat.

Succession

Many of these sites revert to inappropriate habitat for *D. reptans* as shrubs and trees invaded following disturbances (e.g., CT .003 [Salisbury]). If sites are disturbed again, *D. reptans* seedlings from the soil seed bank may reoccupy the site. In many cases, particularly in Northwestern Connecticut, the loss of agricultural land uses has been displaced by other types of disturbances that provide habitat for *D. reptans*.

Habitat Fragmentation

During the peak of agriculture in New England during the 19th Century, habitat for *Draba reptans* may have been continuous in the northwestern part of Connecticut. Many of the early documented occurrences of *D. reptans* were located along or near the Housatonic River, which flows through a valley with alkaline bedrock. Large deposits of glacially-moved and weathered limestone and marble sands were appropriate habitat, as well as smaller patches of sands associated with rock outcrops along slopes or at hill summits. The Housatonic River may have been a dispersal corridor for seeds of *D. reptans*. At the time of the early collections of *D. reptans* between 1878 and 1925, western Connecticut was still in extensive agricultural use. Sites with alkaline soils were tilled, if possible, or grazed, if too rocky. These land uses would have maintained an open, sunny landscape in which *D. reptans* would have flourished. As agricultural land uses have been reduced to only a few areas and intervening development has created barriers to dispersal, available habitat and *D. reptans* populations have declined. In recent years, it is likely that development along the Route 7 Corridor, where six of the nine currently known populations are located, has enhanced habitat for *D. reptans* through soil disturbance and may have even aided in distributing seed. It is likely that after these disturbances become less frequent, *D. reptans* will continue to persist only at sites where recurring disturbances maintain habitat and that the natural colonization of new sites will be more difficult.

Severe Disturbances

Not all disturbances will result in habitat for *D. reptans*. Excessive herbicide use could eliminate entire populations, including the seed bank. Physical disturbances such as bulldozing could destroy habitat and the seed bank, as easily as create it, such that even appropriate habitat after disturbance is not colonized. It is not enough to rely on ongoing disturbances and changes in disturbance regimes to maintain *D. reptans* in the long term. Some sites will need to be maintained with focused management on the needs of *D. reptans*, if populations are to be conserved effectively over time.

Invasive Species

Several of the populations of *Draba reptans* in both New York and Connecticut occur at disturbed sites with concentrations of invasive species. Often-mentioned invasive species include: *Lonicera morrowii*, *Elaeagnus umbellata*, and *Centaurea maculosa* (CT .003 [Salisbury], CT .012 [New Milford], and CT .014 [Brookfield]). It is likely that *D. reptans* is a poor competitor, because it is small, requires full sun, and has a limited root system, and not able to thrive or even persist at sites with dense concentrations of invasive species.

DISTRIBUTION AND STATUS

General Status

Draba reptans occurs from Massachusetts west to British Columbia south to Georgia and California. Within this range, there are no records from Delaware, Maryland, West Virginia, Virginia, Kentucky, Tennessee, Mississippi, and Louisiana. It is rare at the northern borders of its range and historical in the Mid-Atlantic sections of its distribution, including Pennsylvania, New Jersey and North Carolina. It is ranked SR or S? in the Midwest and western part of the country and in South Carolina, Georgia, and Alabama. In Wyoming, it is ranked S3, and in Iowa, it is ranked S4. It is listed as rare in four Canadian provinces and four states, including Connecticut. It is considered historical in Rhode Island and extirpated from Massachusetts. It is globally ranked G5 and nationally ranked as N3N4 in the United States and N2N3 in Canada. Data on the distribution and rarity of *D. reptans* are available from NatureServe (2004) and data are summarized in Table 1. Data concerning county distribution within states were obtained from the PLANTS National Database (United States Department of Agriculture 2004).

Status of All New England Occurrences — Current and Historical

In New England, *Draba reptans* is known only from Massachusetts and Rhode Island, where there are no extant populations, and from Connecticut, where there are nine populations in four different parts of the state. *Draba reptans* is listed as a Division 2 species in *Flora Conservanda*, globally secure, but regionally rare (Brumback and Mehrhoff et al. 1996). Table 2 and Figures 2 and 3 below summarize the distribution of extant and historical New England occurrences.

Table 1. Occurrence and status of <i>Draba reptans</i> 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)
Ohio (S1, T)	Wyoming (S3)	Georgia (SR)	Massachusetts (SX): 1 county, 3 historical occurrences
Michigan (S1, T): 7 counties	Iowa (S4): 5 counties	Alabama (SR)	North Carolina (SH)
British Columbia (S1)	South Carolina (S?): 1 county	California (SR): 1 county	Rhode Island (SH-H): 2 counties, 2 historical occurrences
Alberta (S1)	Illinois (S?): 44 counties	Oregon (SR)	Pennsylvania (SH-X)
Connecticut (S2): 4 counties, 7 extant populations, 9 historical occurrences	Manitoba (SU)	Washington (SR)	New Jersey (SH-E)
New York (S2, T): 4 counties, 8 extant populations		Idaho (SR)	
Ontario (S2)		Utah (SR): 11 counties	
Saskatchewan (S2)		New Mexico (SR)	
		Arizona (SR)	
		Oklahoma (SR)	
		Nebraska (SR)	
		Kansas (SR): 59 counties	
		South Dakota (SR): 18 counties	
		North Dakota (SR): 10 counties	
		Minnesota (SR)	
		Wisconsin (SR): 25 counties	
		Missouri (SR): 32 counties	
		Texas (SR)	
		Arkansas (SR): 4 counties	

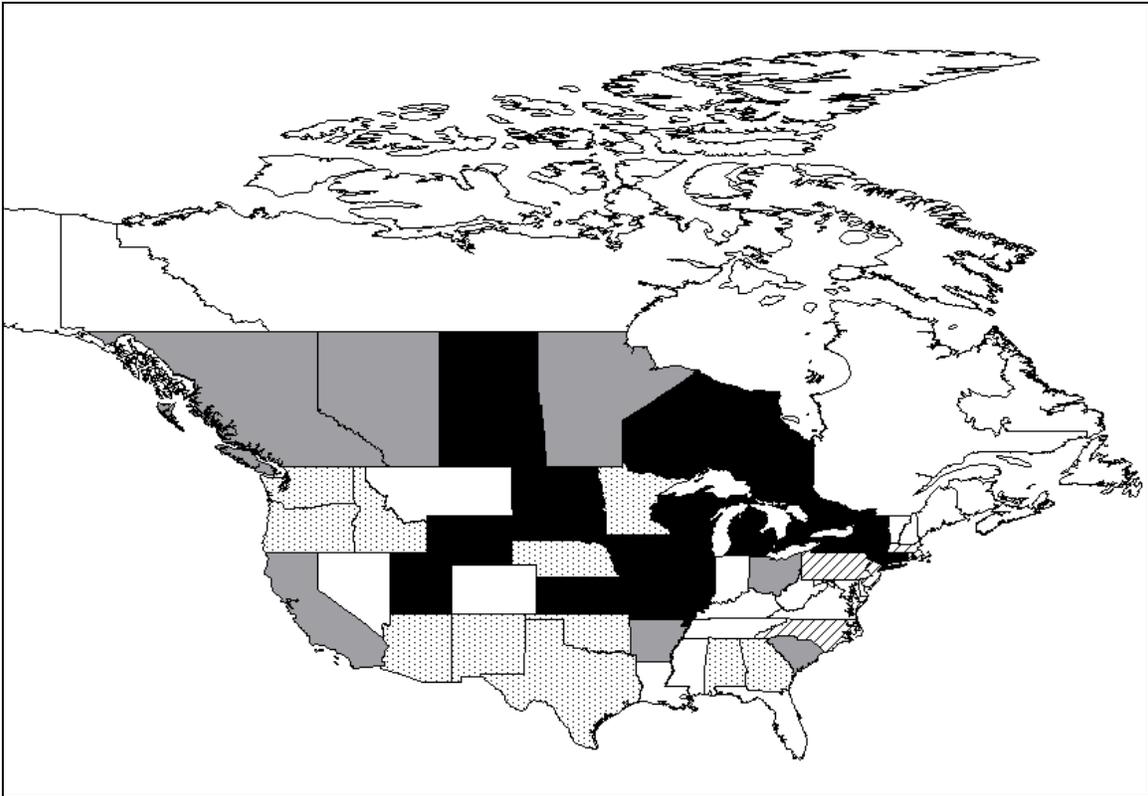


Figure 1. Occurrences of *Draba reptans* in North America. States and provinces shaded in gray have one to five (or an unspecified number of) current occurrences of the taxon. Areas shaded in black have more than five confirmed occurrences. The states with diagonal hatching are designated "historic," where the taxon no longer occurs. States with stippling are ranked "SR" (status "reported" but not necessarily verified). See Appendix for explanation of state ranks.

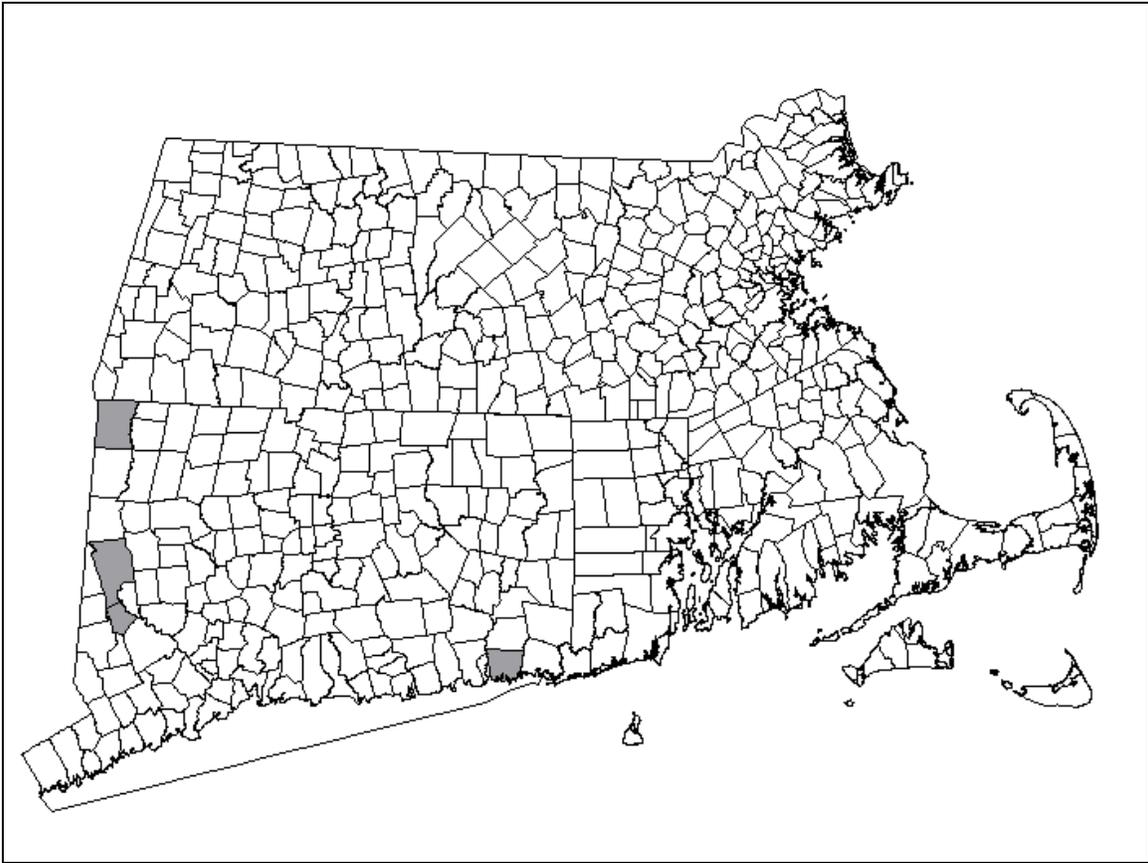


Figure 2. Extant occurrences of *Draba reptans* in New England. Town boundaries for southern New England states are shown. Towns shaded in gray have one to five extant occurrences of the taxon.

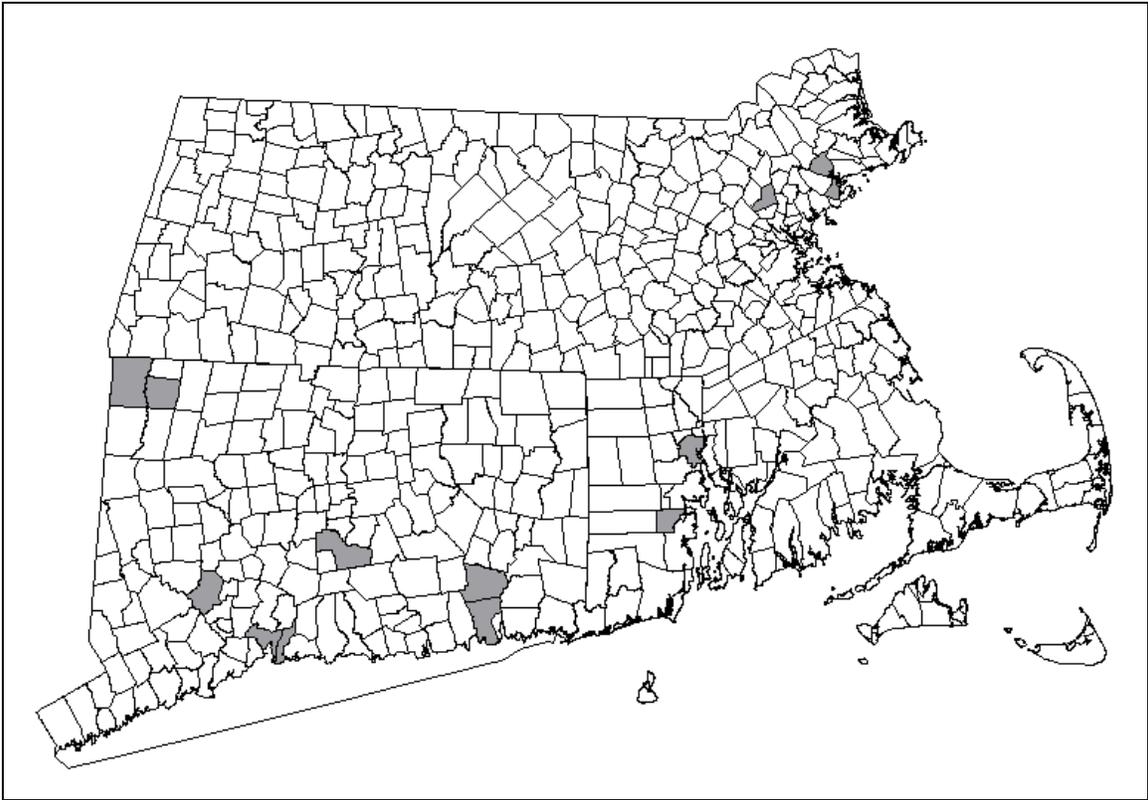


Figure 3. Historical occurrences of *Draba reptans* in New England. Towns shaded in gray have one to five historical records of the taxon.

Table 2. New England Occurrence Records for <i>Draba reptans</i>. Shaded occurrences are considered extant.			
State	EO #	County	Town
MA	.001	Essex	Salem
MA	.002	Essex	Danvers
MA	.003	Middlesex	Woburn
RI	.001	Providence	Providence
RI	.002	Kent	East Greenwich
CT	.001	New Haven	New Haven
CT	.002	New Haven	East Haven
CT	.003	Litchfield	Salisbury
CT	.004	New Haven	Oxford
CT	.005	Litchfield	Canaan
CT	.006	Litchfield	Salisbury
CT	.007	Middlesex	Middletown
CT	.008	New London	Montville
CT	.009	New Haven	New Haven
CT	.010	Fairfield	Brookfield
CT	.011	Litchfield	New Milford
CT	.012	Litchfield	New Milford
CT	.013	New London	Waterford
CT	.014	Fairfield	Brookfield
CT	.015	Fairfield	Brookfield
CT	.016	New London	Groton
CT	#1	Fairfield	Brookfield
CT	#2	Litchfield	New Milford

II. CONSERVATION

CONSERVATION OBJECTIVES FOR *DRABA REPTANS* IN NEW ENGLAND

The primary conservation objective for *Draba reptans* is to protect ten populations in Connecticut and, if natural populations can be found in Massachusetts and Rhode Island, to protect two populations in each of those states. There are currently nine extant populations in Connecticut and significant amounts of potential habitat that have not been surveyed for *D. reptans* at the appropriate time of year to find plants. The best opportunity for the conservation of *D. reptans* in New England is in northwestern Connecticut, where eight currently known populations are located. There is potential habitat at other Connecticut locations, in western Massachusetts, and at locations in Rhode Island, and possibly southeastern Massachusetts. It will be necessary to locate additional populations of *D. reptans* in all three states to achieve this objective. If populations are not found in Massachusetts and Rhode Island, the conservation objectives for *D. reptans* should be revised to focus only on Connecticut.

Each occurrence should be managed to maintain a population of at least 500 plants annually in two or more patches. The minimum viable population size for *Draba reptans* in New England, or anywhere in its range, is not known. One Connecticut population (CT .003 [Salisbury]) has persisted for 77 years and supported approximately 500 plants in 1988. Another Connecticut population (CT .011 [New Milford]) supported 700-1200 plants in 1997. All extant populations in New York and three of the nine Connecticut populations supported over 100 plants during each year they were monitored. Five of these populations have been described as supporting in excess of 1000 plants. A minimum viable population size is set at 500, based on these surveys, and should be revised after assessment of additional survey data. Most *D. reptans* populations occur as a series of patches or openings over an area of several hectares. In a few cases, patches within a site are not all occupied each year. Since *D. reptans* appears to be a fugitive species that occurs in small disturbance patches, it is desirable that a healthy population be scattered at multiple locations within a site.

A second objective is to understand the rarity and conservation needs of *Draba reptans* better, by conducting site and population monitoring and population biology studies. A clear understanding of the biological and ecological limitations of *D. reptans* in New England will inform conservation actions over time.

A third conservation objective is to establish an *ex situ* seed bank to preserve the genome of *Draba reptans* in New England. If all natural populations are lost at some point in the future, seeds will be needed to supply material for additional studies and reintroduction efforts, if called for in future iterations of this plan. Seed from New England populations has not been collected and stored for long-term use. With only nine currently known populations in New England, all but one within a small geographic area, it is desirable to retain New England seed in an *ex situ* seed bank.

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IV. APPENDICES

1. An Explanation of Conservation Ranks used by The Nature Conservancy and NatureServe

1. 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 been 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.