New England Plant Conservation Program

Carex richardsonii R. Br.
Richardson's Sedge

Conservation and Research Plan for New England

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SUMMARY

Carex richardsonii R. Br. (Cyperaceae), or Richardson's Sedge, is a G4 species and is common in the prairies in the Canadian provinces west of Quebec and in the open montane woodlands east of the Cascades. It is most abundant in the central portion of North America and is a rare plant of alvars, prairie remnants and outcrops in the East. This inconspicuous sedge has a rank of S1 in Indiana, Maryland, North Dakota, Pennsylvania and Wyoming. In New England, it occurs only at one site in Manchester, Vermont, where it is listed as an S1 species.

The major conservation objective for the species in New England is to maintain the one known extant population at its current level or higher. The exact number of stems is not known, but it ranges in the thousands. Long-term threats to the species at this known location are trampling from hikers and picnickers, invasion by woody plants through succession and possibly fire. The Nature Conservancy in Vermont and the Vermont Institute of Natural Science monitor the site and have made efforts to discourage picnickers and to use photo-monitoring to track succession. The New England Wild Flower Society has collected and banked seed from the population and a few plants have been placed *ex situ.* This plan recommends that seed banking and *ex situ* efforts be continued; that a quantitative method to measure abundance be set up to obtain baseline data, and that *de novo* searches be conducted at outcrops in the Taconic Range.

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

Carex richardsonii is a small, perennial sedge in the Cyperaceae that occurs in New England at one site. In Vermont, this species is listed as S1 and occurs at two outcrops in Manchester. These two subpopulations are treated as one occurrence in the Elemental Occurrence Reports from the Vermont Natural Heritage Program due to their close proximity and probable genetic flow. The conservation objective for this species is to maintain this one occurrence (two subpopulations) at or above the current level, which is thousands of individual shoots. Threats to the species are trampling by picnickers and hikers, successional changes to a closed habitat and possibly fire. Through the work of The Nature Conservancy (Vermont Chapter) and the Equinox Preservation Trust, some of the conservation actions have already been addressed (monitoring the successional status and discouraging picnickers). Conservation objectives are in place for the preservation and protection of this species in Vermont. Globally, this species is ranked a G4, as it is secure in the western part of its range.

This Conservation Plan presents information from the literature and Natural Heritage Programs in the United States and Canada on the distribution, taxonomy, biology, and conservation of *Carex richardsonii*. A discussion of the threats, recommended actions and current actions for conservation in New England are included.

DESCRIPTION

Based on descriptions by Gleason and Cronquist (1991) and Voss (1972), *Carex richardsonii* is an inconspicuous, loosely rhizomatous or stoloniferous sedge with thick and stiff basal leaves, 2-4 mm wide. Fertile culms (flowering stalks) are erect and 1-2.5 dm tall and are held above the leaves early in the season but droop over as the season progresses. Fertile culms have a terminal staminate spike and lateral, short peduncled, pistillate spikes below. Subtending the spikes are characteristic reddish-brown sheaths on the culm. These sheaths are characteristic of this species and are a valuable aid in identifying the species after the perigynia have fallen. The scales of the spikes are brown-purple with hyaline margins. The scales are normally wider and longer than the perigynia. Pistillate spikes have 10-25 thinly pubescent, ovoid, perigynia. Perigynia are roundly angled on the back and keeled on the lateral angles. Achenes (fruits inside perigynia) are sharply trigonous (3-sided). Form *exserta*, described by Fernald (1942), does not have the typical pistillate spike bases that are included in or barely exserted from the colored sheaths.

Many authors mention that this species may often be overlooked due to its inconspicuous grass-like form and the ephemeral nature of the culms and spikes. This species flowers early in the spring followed by the withering of the culm and spikes. Without the perigynia, this species is difficult to identify, but one can look for the characteristic reddish-brown sheath on the culm at the base of the spikes. In mixed *Carex* lawns, an experienced caricologist can distinguish it vegetatively by the somewhat thickened and persistent leaves.

When growing in mixed *Carex* lawns, *Carex richardsonii* can be distinguished from *Carex concinna*, which has staminate spikes that are 3-6 mm long, pistillate spikes that are 4-8 mm long and pistillate scales that are shorter than the perigynia. *Carex richardsonii* can also be distinguished from *Carex eburnea*, as the latter has leaves that are less than 0.5 mm wide and has glabrous perigynia. *Carex pennsylvanica* has long- beaked perigynia (Fertig 2000).

TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY

Carex richardsonii is currently placed in the *Carex* section Clandestine (a name that takes priority over the Digitatae). This species was first described in 1823 to acknowledge Sir John Richardson, the constant companion of Sir John Franklin in Arctic exploration (Carol Gill, personal communication). Sir John Richardson collected the type specimen from Cumberland House, Canada (New York specimen ID 11299) (New York Botanical Garden 2002). Fernald (1942) described a minor variant in form, which he described from S. B. Mead's specimen from Hancock County, Illinois. Few botanists recognize forma *exserta.*

The taxonomic history of this species is straightforward and has no problems. A summary of the taxonomic history is as follows:

- *Carex richardsonii* R. Br. Botanical Appendix to Captain Franklin's Narrative 751, 1823 (Brown 1823)

- *Carex richardsonii* R. Br. forma *exserta* Fernald *Rhodora* 44:290 (1942).

SPECIES BIOLOGY

Little is known about the biology of this species. Although it is a sedge of open habitats and abundant in parts of its range, there is little literature on the biology of this species. Like most sedges, it is wind-pollinated. Perigynia fall from the culm when mature. Generally, this sedge is clonal like *Carex pennsylvanica* and presumably, it reproduces from seed. Nothing is known about the genetic structure of populations. This species flowers early (late May) (William Crins, Ontario Ministry of Natural Resources, personal communication) and as the perigynia mature, the culms fall over and wither as in other species of *Carex*.

HABITAT/ECOLOGY

Crins writes, in his treatment for the *Flora of North America* (unpublished), that this species is found in vernally moist habitats. It is a sedge of the Canadian prairies and in open montane woodlands east of the Cascades. In the east, it is a rare plant of alvars, tall-grass prairie remnants, and postglacial shorelines. Around the Great Lakes, it is found on the glacial shorelines of Lake Iroquois (Ontario and New York) and Lake Barlow-Ojibway (Quebec) (Crins, personal communication). In Michigan, Voss (1972) describes this species as occurring on sandy, open ground, bluffs and borders of oak woods in southern Michigan. Comer et. al. (1997) cites *Carex richardsonii* as a noteworthy species that occurs in some of the limestone pavement lakeshores along Lake Michigan and Lake Huron. This species is specifically found in the alvar shrublands (creeping juniper –shrubby cinquefoil alvar pavement) and woodlands (White cedar – jack pine/shrubby cinquefoil alvar savanna) which have limited distribution (Reschke et. al. 1999). *Carex richardsonii* also occurs in prairies in the northwest regions of Ontario. These are disjunct prairies and have floristic similarities to those in the Canadian prairie provinces; however, they support a mix of boreal and western species (Ontario Natural Heritage Information Centre 1995). In the prairie remnants in northwestern Ontario, *Carex richardsonii* occurs with western prairie species like: *Stipa comata*, *Erigeron glabellus*, *Ambrosia psilostachya*, *Artemisia ludoviciana*, *Helianthus rigidus*, and *Carex siccata* (Ontario Natural Heritage Information Centre 1995). In Maryland, this species is reported from serpentine (Chris Frye, Maryland Department of Natural Resources, personal communication).

In the west, this species occurs in low prairies, ditches and on hillsides. Wyoming populations are found in open Ponderosa pine/Bur oak forests on slopes and ridges or on north slopes in paper birch woodlands (Fertig 2000). Larson (1993) reports that this sedge is common in fairly dense to open (Ponderosa) pine and mixed forests in the central Black Hills of South Dakota. It occurs on moist slopes and on level benches of drainage courses. Larson (1993) reports that it is found alone in scattered patches in pine needle litter, but in more open habitats, it occurs with other graminoids and broad-leaved vegetation. This species may occur in high densities in some of these open habitats (Crins, personal communication). In Iowa, it is reported from mesic to dry prairies and is said to be most common on the dry prairies (Mark Leoschke, Iowa Department of Natural Resources, personal communication). In Indiana, *Carex richardsonii* is found in prairie remnants with *Carex aurea*, *Carex crawei*, *Carex eburnea*, *Carex granularis*, *Carex woodii*, *Carex umbellata* and *Pedicularis canadensis* (Ron Hellmich, Indiana Department of Natural Resources, personal communication).

THREATS TO TAXON

This species seems to be fairly stable wherever it grows, except for sites in New York and Ohio. These two states have historical records from the 1800's that have not been relocated. It is not clear in either case whether this is due to its inconspicuous nature or due to other reasons. Factors in its survival may be related to grazing, fire or successional changes to a woodier environment (Cusick 2001). Little is known about these factors. In a species abstract for Wyoming (Fertig 2000), no threats are listed. Larson (1993) mentions that in the Black Hills region of South Dakota, where the species is common in unspecialized habitats, there is no evidence to indicate that timber harvest or grazing would pose a threat to this species.

In Vermont, trampling from hikers and picnickers at the two outcrops is a threat, as well as successional changes that might make these more closed habitats. Fire may be another threat. The two outcrops in Vermont are well-known locations for hikers and picnickers to stop, rest and enjoy the view. Trampling was a concern at these locations and efforts were made by the Mt. Equinox Resort Association and The Nature Conservancy to discourage hikers and picnickers from these outcrops. Since the soils are thin and the slope of the vegetated area are steep, heavy foot traffic can dislodge plants and cause erosion. The impacts from these activities may be less detrimental to *Carex richardsonii* than to the other rare plants as this sedge is rhizomatous and firmly anchored in the thin soils. In addition, this species may benefit from low levels of disturbance. However, the specific impacts from hikers and picnickers in not well understood.

Generally, this species is adapted to open, dry environments and changes in the successional nature of the habitat may be detrimental. Closing in of the open habitat by woody species may be detrimental. Efforts are being made by The Nature Conservancy to monitor successional changes. Additionally, a severe, intense fire could be detrimental to the survival of this species if all propagules are consumed. However, a severe and intense fire is unlikely at this habitat since there is little fuel on the outcrops and in the surrounding forests. On the other hand, since this species is adapted to open habitats in the west, where fires plays a role in suppressing habitat closure, a small fire may actually be beneficial. Thus, the level of threat is dependent on the type of fire.

DISTRIBUTION AND STATUS

General status

Carex richardsonii ranges from Quebec to Alberta, south to Vermont, New York, Pennsylvania and Maryland, and west to Ohio, Indiana and Illinois (Table 1, Kartesz 1994). It is common in Iowa, Michigan, Wisconsin and Minnesota. Westward, it occurs in North and South Dakota and Wyoming and the Canadian provinces. The species is listed as G4

(apparently secure globally) by Natureserve and as Division 2 (Regionally Rare) by the *Flora Conservanda:* New England (Brumback and Mehrhoff et al. 1996).

In eastern Canada, *Carex richardsonii* is known from one Quebec occurrence that was last observed in 1946. This site is on James Bay and probably still extant since it is far from human activity (Jacques Labrecque, Ministere de l'Envrionment du Quebec, personal communication). In Ontario, where the plant is listed as an S4, it is found on limestone, alvars, marble outcrops and also on glacial shorelines (Crins, personal communication). Westward into Saskatchewan and Alberta, it is common. It also occurs in British Columbia. Although Rydberg (1919) lists it as an eastern species that extends into the northern Rockies as far as the Yellowstone District, it really has most occurrences in the mid-west of the United States and in western Canada.

Carex richardsonii is listed as S1 in North Dakota, where there are four documented occurrences. One occurrence in McHenry County was last observed in 1955, one in Cass County was last observed in 1958 and two in Richland County were last observed in 1994 and 1989 (Christine Dirk, North Dakota Natural Heritage Inventory, personal communication). There is only one known occurrence in Wyoming in the Bear Lodge Mountains (Alan Redder, Wyoming Natural Diversity Database, personal communication). This species is reported from Washington in the literature but this was in error (Washington Natural Heritage Program 2001).

Carex richardsonii also occurs in Illinois, Michigan, Minnesota, Wisconsin, Iowa, and South Dakota (USDA, NRCS 2001). In Illinois, this species is listed as S2 and is found in nine counties (Iverson 2001). The USDA database shows six counties (USDA, NRCS 2001). Hermann (1941) mentions that this species is a rare and local species in Michigan, known from only five sites. Currently, twenty-six sites are known (Rebecca Boehm, Michigan Natural Features Inventory, personal communication) occurring in Chippewa and Keeweenaw Counties in the Upper Peninsula and two counties in the southern part of the state (Voss 1972, USDA, NRCS 2001). In Minnesota, it is too common to be tracked (William Smith, Minnesota Department of Natural Resources, personal communication). In Wisconsin, there are about twenty-three sites located mostly in the southern part of the state (Cochrane and Iltis 2000). In Iowa, there are at least forty extant sites (Leoschke, personal communication). In South Dakota, it is listed as S4 with over twenty-eight occurrences. It is found in the Black Hill National Forests, Wind Cave National Park, Jewel Cave National Monument and Custer State Park (Larson and Johnson 1999; David Ode, South Dakota Fish and Parks, personal communication).

In the East, *Carex richardsonii* is listed as a S1 species in Pennsylvania and Maryland. In Pennsylvania, it occurs on wet serpentine barrens at two sites in Chester County, which were found in 1995 (Steve Grund, Western Pennsylvania Conservancy, personal communication). In Maryland, two occurrences are known and last observed in 2000. These sites occur in Cecil and Baltimore counties on serpentine (Chris Frye, Maryland Department of Natural Resources, personal communication). In New York, there is one historical record from Monroe County, collected by Bradley in 1865 (Steve Young, New York Heritage, personal communication and

Gray Herbarium specimen). Bill Crins (personal communication), who is familiar with the habitat in southern Ontario, suggests that searches should be made along the old glacial shoreline in Jefferson County.

In Ohio, one historical site, collected in 1897 from the Castalia Cemetery, Erie County, is presumed extirpated (Cusick 2001). In Indiana, where the plant is listed as an S1, there are about seven sites associated with prairies and sand dunes in Lake County (Ron Hellmich, personal communication). It was first discovered in the late 1800's or early 1900's and still present at these sites in the 1980's and 1990's (Indiana Department of Natural Resources 2001). In New England, there is only one site, which is found in Bennington County, Vermont.

Many authors indicate that collectors may overlook this species. Cusick (2001) notes that it is probably overlooked or misidentified in Ohio. It should be searched for in suitable situations throughout northern Ohio. Larson (1993) writes that its inconspicuous nature, small size and early growth render it easily overlooked by plant collectors in South Dakota. He notes that it is almost impossible to find after its spikes disintegrate by late June (in South Dakota) and when the reddish-brown sheaths are no longer visible. However, in my experience, remnants of the spikes often remain and caricologists can identify it by the conspicuous, thickened, persistent leaves.

Table 1 summarizes the distribution and status of *Carex richardsonii* in North America.

Table 1. Occurrence and status of *Carex richardsonii* 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)**
Indiana (S1): 7 extant occurrences	Illinois (S2): not tracked	Washington (SRF): reported in literature but this is an error	New York (SH): 1 historical occurrence
Maryland (S1): 2 occurrences last observed in 2000	Iowa (S1): but not listed with 40 + occurrences	British Columbia (SR)	Ohio (SH): 1 historical occurrence
North Dakota (S1): 4 occurrences	Michigan (S3S4): listed as Special Concern has 26 extant occurrences	District of Mackenzie (NWT) (SR)	Quebec (S1): 1 historic occurrence (Labrecque, pers. comm.)
Pennsylvania (S1): 2 extant occurrences	Minnesota (SR): not listed as it is too common		
Vermont (S1): 1 extant occurrence	South Dakota (S4): not tracked with 24 + occurrences		
Wyoming (S1): 1 extant occurrence	Wisconsin (S3): about 22 extant occurrences		
	Alberta (S3)		
	Manitoba (S4)		
	Ontario (S4)		
	Saskatchewan (S5?): number of occurrences not known.		

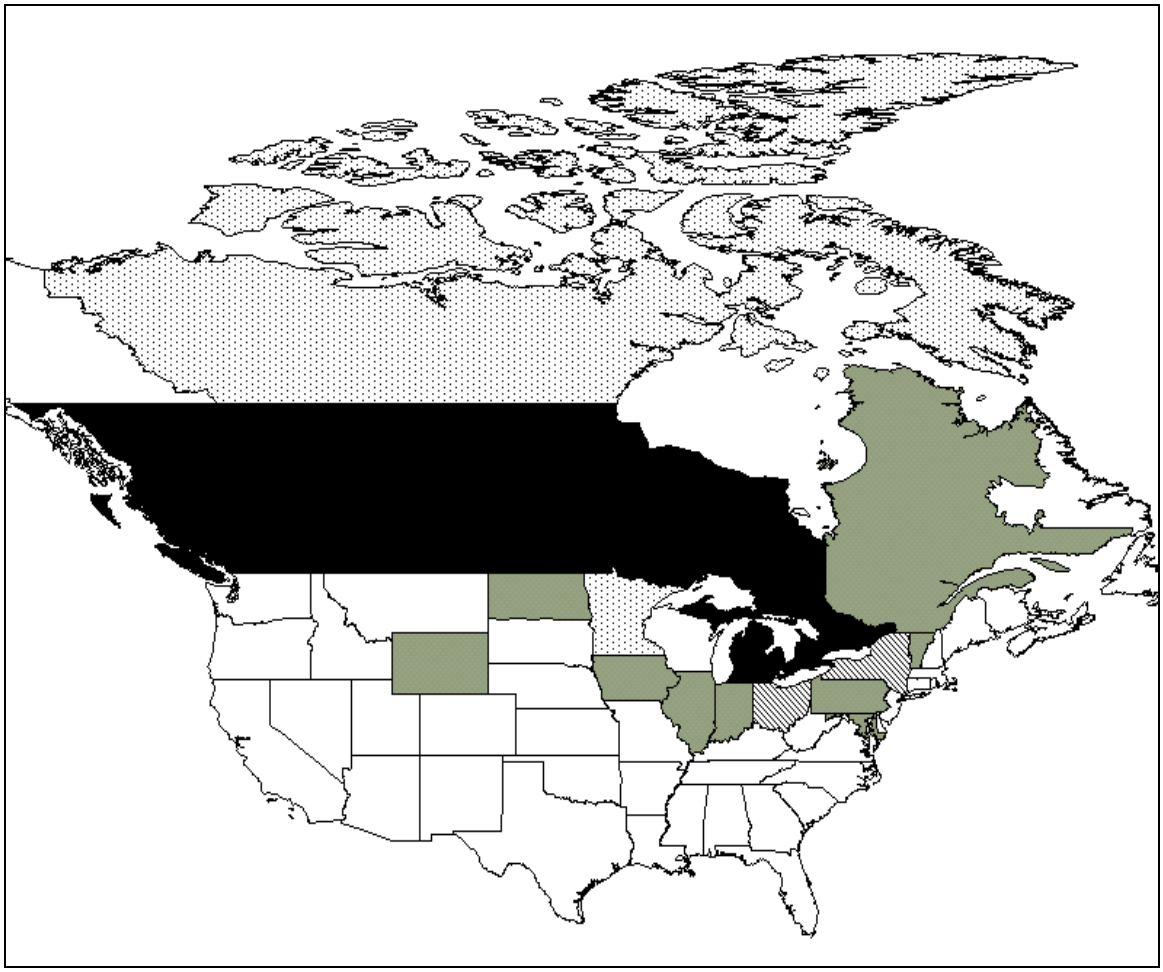

Figure 1. Occurrences of *Carex richardsonii* in North America. States and provinces shaded in gray have one to five current occurrences of the taxon. States shaded in black have more than five confirmed occurrences. States with diagonal hatching are designated "historic" or "presumed extirpated," where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

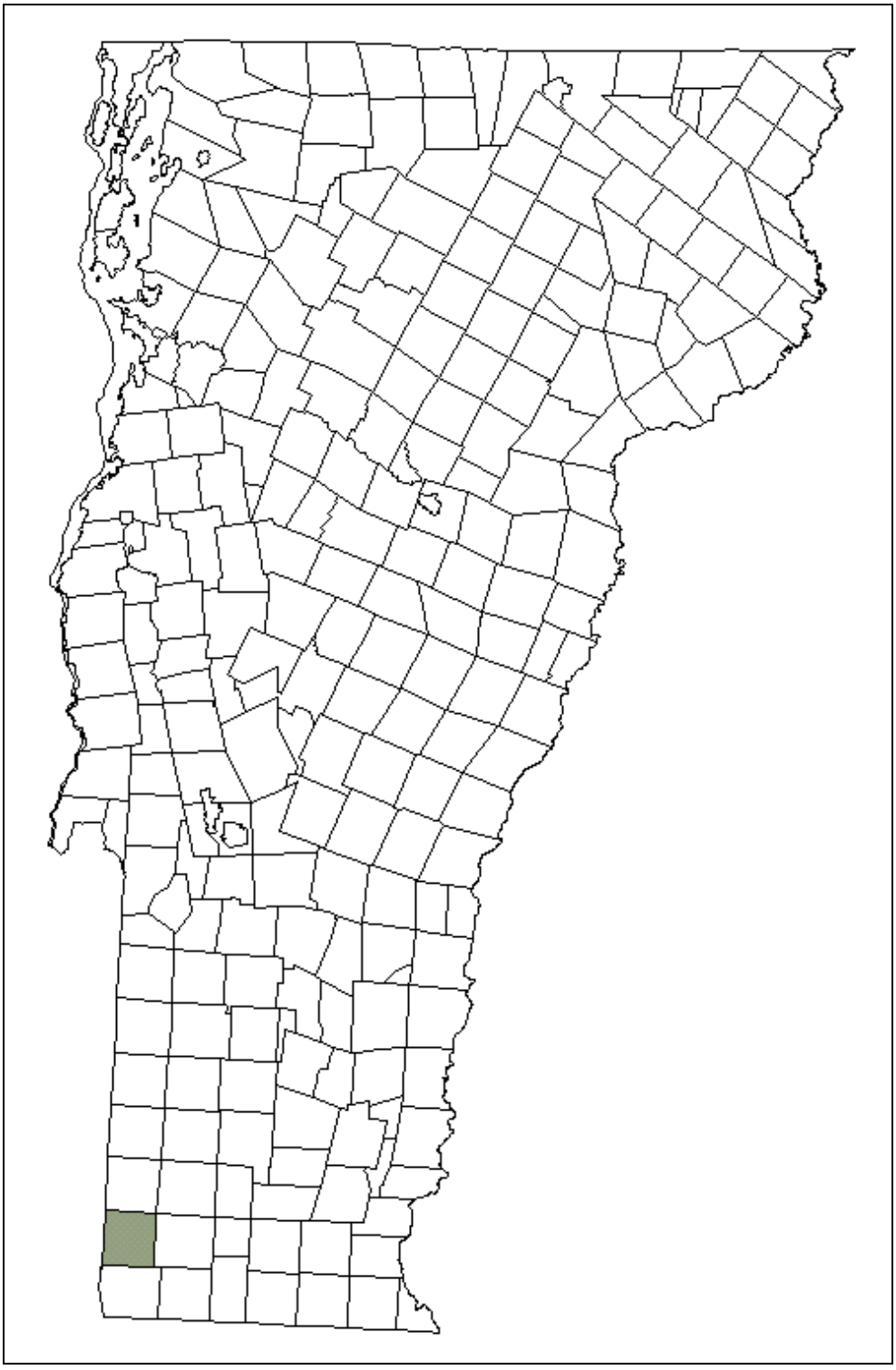

Figure 2. Extant occurrence of *Carex richardsonii* in New England. Town boundaries for Vermont are shown. The town shaded in gray (Manchester) has one confirmed occurrence of the taxon. No historic occurrences are known.

Status of all New England occurrences -- current and historical

In New England, *Carex richardsonii* is found from only one extant occurrence in Vermont (Manchester, Bennington County).

Table 2. New England Occurrence Records for *Carex richardsonii*. The shaded occurrence is considered extant.

State	EO #	County	Town
VT	.001	Bennington	Manchester

CURRENT CONSERVATION MEASURES IN NEW ENGLAND

Historically, these outcrops have been investigated and monitored by botanists, as many rare plants occur at these sites. According to Susan Morgan at Vermont Institute of Natural Science and Ana Ruesink (TNC) (personal communication), The Nature Conservancy in Vermont has worked with the Vermont Heritage Program and the New England Wild Flower Society to address threats. Efforts have been made to discourage hikers and picnickers from approaching the outcrops. The goal is to prevent trampling of the plants because they grow in the open grassy areas where hikers and picnickers might rest. To this end, the sites are no longer published on hiking maps and the trails to the outcrops have been brushed over. In addition, a new overlook has been established to steer people to a different picnic site. I observed in 2001 that they have been successful in hiding the trails to newcomers; however, the location of these two areas within the Manchester community are historically well-known picnic spots. As a result, the outcrops may continue to be used by hikers and picnickers from the local community.

Ana Ruesink (personal communication) also reports that a photo-monitoring effort has been launched with a local volunteer to investigate the vegetation changes over time at the site. For two years, photo points have been visited four times each year. Photos will help to determine whether woody encroachment, visitor over-use or other factors are threatening the various rare plant species here. At present, they have no strong evidence that woody vegetation needs to be controlled here. Affiliated botanists schedule regular visits.

Propagation notes from the New England Wild Flower Society show that seed was collected from the Vermont population by Liz Thompson on 9 June 1992. She collected one to four seeds from twenty culms to make a total of 35 seeds. She notes that it is difficult to obtain seed from fertile culms, as they are so ephemeral. At that time, the seed ranged from a green to light brown to dark brown. Fourteen seeds were sown on 16 June 1992 and ten more were

sown on 7 July 1992 and eleven were placed in a freezer. Notes indicate that 1-3 seeds may have germinated and one plant was planted in the rare plant garden on 26 September 1995. On 2 June 1994, two hundred and ninety-nine seed were collected by Popp, Thompson and Reilly. Most of these seeds were seed banked and some were sown fresh. From these, five plants were planted into the Rare Plant Garden at Garden in the Woods, Framingham, Massachusetts, on 4 July 1996.

In summary, the current conservation efforts are:

- Owners are involved with protection.
- The Nature Conservancy has an easement on the sites.
- Sites are no longer published on new resort maps.
- Trails to each outcrop have been brushed over and disguised.
- New overlook has been established to redirect picnickers
- Photo monitoring is in place to investigate vegetation changes.
- Seed of *Carex richardsonii* was deposited with NEWFS in 1994.
- A few plants are growing in *ex situ* by NEWFS in Framingham, Massachusetts
- Botanist affiliated with Vermont Heritage and the New England Plant Conservation Program (NEPCoP) schedule regular visits.

II. CONSERVATION

CONSERVATION OBJECTIVES FOR THE TAXON IN NEW ENGLAND

The conservation objective for *Carex richardsonii* in New England is to maintain the two subpopulations in their current locations, at or above the current level. Currently, there are thousands of individual shoots at both subpopulations, but it is not known if these represent ramets or genets. This species has survived at this location for at least seventy years. Recent surveys and site visits show that the population appears to be thriving. Due to the high number of rare elements at these outcrops, they have been the focus of numerous investigations and concerns for protection and preservation.

Potential threats to the species in Vermont are:

1. Trampling by picnickers or hikers
2. Succession towards woody vegetation
3. Possibly fire

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IV. APPENDICES

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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 made for more than 20 years. An X rank is utilized for sites that are known to be extirpated. Not all EO's have received such ranks in all states, and ranks are not necessarily consistent among states as yet.