

New England Plant Conservation Program  
Conservation and Research Plan

*Carex barrattii* Schwein. & Torr.  
Barratt's Sedge

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## SUMMARY

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Barratt's sedge (*Carex barrattii*) is a regionally rare plant species that ranges from Alabama northward along the Atlantic coastal states to Connecticut. Primarily a species of the Atlantic Coastal Plain, it has also been documented at a number of disjunct sites in Virginia, Tennessee, North Carolina, South Carolina, Georgia, and Alabama. Its presence in New England is limited to Connecticut where there are seven occurrences, five of which are historic. The two extant sites for *C. barrattii* are in relatively close proximity, and the occurrences may be considered to be sub-populations of a single population. Population size is estimated to exceed 10,000 ramets. The state rank for the species is S1, and it is listed under Connecticut's Endangered Species Act as State Endangered. The occurrence locations are on private property; therefore, *C. barrattii* is vulnerable to a number of potential threats including alteration of wetland hydrology and development activities. Natural succession and canopy closure also threaten the species, which appears to produce few fruiting culms under dense shade.

*Carex barrattii* is an obligate wetland species and, in Connecticut, grows in seasonally saturated, acidic, sandy wetlands. In other parts of its range, it is found in wetland depressions in pine barrens, along the shores of rivers and ponds or in peaty bogs. Although *C. barrattii* will persist under a tree canopy, its vigor, flowering, and fruiting are enhanced by exposure to light. Disturbances, such as fire and clearing, appear to be beneficial. *C. barrattii* reaches its greatest abundance in the pine barrens of New Jersey where fire plays a key role in local ecology.

The primary conservation objective for the taxon is to protect and manage the existing population. The two extant sites are located in South Windsor within an area that has been identified as a "Special Focus Area" by the United States Fish and Wildlife Service (USFWS) Draft Action Plan for the Silvio O. Conte Refuge (United States Fish and Wildlife Service 1995) and as a "Portfolio Site" within the Lower New England Ecoregion by The Nature Conservancy. An action plan, coordinated through the State DEP and these two organizations needs to be established after a thorough inventory is completed. Protection will likely be best achieved by conservation easement or direct acquisition of the property. Biological research on *Carex barrattii* is also recommended and should include study of species reproduction, response to fire, and hydrologic regime. A management plan aimed at maintaining and enhancing the existing population should be developed and implemented. *De novo* searches should be conducted in areas where suitable habitat exists. Finally, seed banking is recommended for research purposes and as insurance against an unforeseen catastrophic loss of the wild population.

## PREFACE

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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) 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

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### INTRODUCTION

Barratt's Sedge, *Carex barrattii* Schwein. & Torr. (Cyperaceae), is a member of the sedge family (Cyperaceae) and is native to North America. The species is a perennial sedge found primarily in wet ground characterized by acidic sandy soils. It frequently grows in pine or oak barrens, and its largest populations occur in the pine barrens of New Jersey. The species is not listed under the provisions of the Endangered Species Act of 1973, as amended, on June 6, 1991 (U.S. Fish and Wildlife Service 1991). However, it is uncommon throughout most of its range, and is ranked in all but one of the states in which it occurs. In South Carolina, where it is not yet ranked, it was only recently discovered (Hill and Horn 1997). It is historic in two states where it once occurred.

In New England, *C. barrattii* is reported only in Connecticut, where it is at the northern limit of its range. It has a state rank of S1. Globally, it is ranked G3/G4 (globally ranging from vulnerable to secure) and is considered rare, local, and as possessing attributes that make it vulnerable to extinction in parts of its range (The Nature Conservancy and the Association for Biodiversity Information 2001). In *Flora Conservanda: New England* (Brumback and Mehrhoff et al. 1996), *C. barrattii* is a Division 2 species. This division includes taxa that reach the limit of their distributional range in the New England region. The New England Plant Conservation Program (NEPCoP) considers it important to conserve these edge-of-range occurrences as part of our regional natural heritage (Brumback and Mehrhoff et al. 1996). At present, the only occurrence is in South Windsor, Connecticut, although there are old herbarium records from East Hartford, East Windsor, Windsor and Stratford. The occurrences in South Windsor may be considered to be one population with several sub-populations.

This plan summarizes the available information on *C. barrattii* and identifies threats to its continued survival in New England. Additionally, the plan proposes specific measures to be taken toward the achievement of recovery objectives.

### DESCRIPTION

The ensuing description of *Carex barrattii* is based upon a compilation of descriptions taken from the following references: (Fernald 1950, MacKenzie 1940, Gleason and Cronquist 1991, and Radford et al 1968).

*Carex barrattii* Schwein. & Torr. was named in honor of Joseph Barratt, 1796 – 1882. It is rhizomatous, spreading by simple, scaly rhizomes that are 4 to 6 mm. thick and 3 to

9 dm. in length. The sedge grows from the rhizomes in loose, leafy tufts, the main leaves of which are 2 to 4 mm wide. Leaves are smooth, pale green or slightly glaucous and taper gradually to a narrow, slender tip. The leaves have a bluish green hue. The few culms are sharply angled, concave-sided and smooth. Culms range from 3 to 9 dm. high.

The terminal spike is staminate and long-peduncled. It is darkish purple in color and ranges in length from 2.5 to 5.5 cm. There are frequently one or two small secondary spikes. The pistillate spikes are linear-cylindric and commonly are staminate at the tips. There can be 2 to 5 pistillate spikes (usually three) that droop from slender peduncles. Pistillate spikes are 2 to 5.5 cm long and 5 to 7 mm thick. The pistillate spikes on the herbaria specimens examined by the author were mostly 1 to 4 cm in length and around 4 mm in width. The pistillate spikes are arranged along the culm so that they are either crowded or well separated.

The perigynia are ovoid and become dark at maturity. They are faintly few-nerved, slightly inflated and obscurely triangular. They range from 2.5 to 3 mm. long, are straw-like or purple-tinged in color, and have a short, entire beak. The scales are a brownish purple with lighter margins. They are blunt at the margins and usually equal to or shorter than the perigynia.

*Carex barrattii* can be distinguished from *C. limosa*, a similar and closely related species, by several characters. *Carex limosa*, in addition to being smaller, has very wide pistillate scales that completely conceal the perigynia, whereas *C. barrattii* has scales that do not quite cover the sides of the perigynia. Additionally, *C. limosa* has elongate vegetative culms that become stoloniferous and *C. barrattii* is colonial by underground rhizomes (A. A. Reznicek, University of Michigan, personal communication).

## **TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY**

*Carex barrattii* was formerly known as *C. littoralis* (Schwein., not Krockner) and was renamed by Schweinitz and Torrey in honor of Joseph Barratt (Fernald 1950). Fernald places *C. barrattii* in the sub-genus *Eucarex* and in the Section *Limosae*, which includes *C. rariflora*, *C. limosa*, and *C. paupercula* (Fernald 1950). The grouping is based upon morphological characteristics that include roots covered with dense, felt-like pubescence and a staminate terminal spike. Perigynia are either beakless or with a minute beak. Cronquist includes *C. barrattii* in the Sub-Genus *Carex* and in the Section *Scitae*. The beak of the perigynium is the primary morphological character for the species in this section. Cronquist recognizes *C. flacca* as the only other species in this section (Gleason and Cronquist 1991). *Limosae* and *Scitae* are closely related sections. Section *Scitae* will be recognized by *Flora North America*, but it will be restricted to those species now placed by North American authors in section *Atratae* with staminate rather than bisexual terminal spikes. *Carex barrattii* will be placed in section *Limosae* (A. Reznicek, personal communication).

## **SPECIES BIOLOGY**

*Carex barrattii*, as all *Carex* species, has unisexual flowers that lack a perianth. Staminate flowers consist of three stamens in the axil of a bract or scale. Staminate flowers are borne in a terminal spike and may also be found at the tips of pistillate spikes. Pistillate flowers have a single pistil with a three-parted style. In fruit, the pistil forms a hard achene enclosed in a sac known as the perigynium. Pollination in the genus *Carex* is described as anemophilous (wind-pollinated) by Gleason and Cronquist (1991). According to Fernald, it flowers between April and July (Fernald 1950). In Connecticut, the flowering time is late May into early June (Graves *et al* 1910). The achenes are shed freely upon maturity. *Carex barrattii* can be grown readily from seed planted in *Sphagnum* sp. moss (R. Snarski, personal communication).

*Carex barrattii* is a clonal species and often forms large patches with few fertile culms (C. Frye, personal communication). In its central range, the Atlantic Coastal plain from New Jersey to Virginia, it forms large swards at the edges of marshes spreading on its chaffy stolons. Once established where conditions are favorable, *C. barrattii* can spread into enormous dense colonies to the exclusion of nearly all other herbaceous species (G. Fleming, personal communication). Sexual reproduction in the wild is probably episodic and is stimulated by disturbance such as fire or clearing (C. Frye, personal communication).

In the wild, seeds may be dispersed by tree sparrows, swamp sparrows, grouse, or seed-eating songbirds, although specific observations regarding dispersal have not been made.

## **HABITAT/ECOLOGY**

In New England (Connecticut), *Carex barrattii* is found in sandy, acidic wetland habitats that are seasonally saturated. In one location, it grows with *Sphagnum* sp. in a few inches of peat over sand deposits. *Carex barrattii* occurs in the openings in an ericaceous shrub community. The shrub species of this community include *Clethra alnifolia*, *Vaccinium corymbosum*, *Chamaedaphne calyculata*, *Aronia melanocarpa*, and *Spirea tomentosa*. Herb species include *Carex stricta*, *C. vesicaria*, and *Scirpus cyperinus*. The other sub-population persists in an *Acer rubrum* / *Vaccinium corymbosum* – *Clethra alnifolia*-dominated swamp in *Sphagnum*-blanketed hollows. In addition to *Acer rubrum*, *Vaccinium corymbosum*, and *Clethra alnifolia*, associated species include *Pinus rigida*, *P. strobus*, *Gaylussacia frondosa*, *Lyonia ligustrina*, *Chamaedaphne calyculata*, *Rubus hispidus*, *Lygodium palmatum*, *Osmunda cinnamomea*, and *O. regalis*. The topography of the sites is generally flat. One of the sub-populations lies within a power line right-of-way. The power line is maintained by periodic clearing. Another sub-populations is within a forested swamp that is surrounded by farmer's fields and nearby residential development.

Elsewhere, *C. barrattii* grows along the Atlantic Coastal Plain and in disjunct inland locations with many Coastal Plain affinities (Fleming and Van Alstine 1999). It grows in greatest abundance in New Jersey. *Carex barrattii* ranges southward to Georgia and

Alabama. Its natural, undisturbed habitats in the mid-Atlantic are wetland depressions in pine or oak barrens, along the shores of rivers and ponds or in peaty bogs or cedar swamp edges. The habitat often occurs as open grassy savannah-like areas with abundant sunshine. *Carex barrattii* prefers acid soils, and the soil pH where the species occurs is less than 5 (J. C. Ludwig, personal communication). In Virginia, there are several disjunct populations in Augusta County that occur in seasonally flooded depression ponds developed by solution and collapse of carbonate rocks underlying acidic alluvial materials that were deposited on the western base of the Blue Ridge Mountains (Fleming and Van Alstine 1999). In these locations, *Bartonia paniculata*, *B. virginica*, *Spirea tomentosa*, and *Triadenum virginicum* are the primary associates. In South Carolina, it was discovered in 1993 (Voucher, Pickens County) in a “rather remarkable plant community that appears relictual from much colder times in the region” (Hill and Horn 1997).

*Carex barrattii* also occurs in a variety of disturbed or artificially maintained habitats such as power line rights-of-way, abandoned cranberry bogs, and railroad embankments. Associated species in open locations outside Connecticut include *Carex buxbaumii*, *C. walteriana*, *C. livida*, *Rhynchospora pallida*, *R. cephalanthe*, *Scleria minor*, *Gentiana autumnalis*, *Xyris fimbriata*, *Asclepias rubra*, and *Platanthera integra*.

## **THREATS TO TAXON**

### ***Canopy Closure***

*Carex barrattii* thrives in open sunlight and, while it may persist for some time under a tree canopy, it seldom flowers in poor light. Botanical observations of the species in other states indicate that it eventually declines under deep shade (C. Frye [Maryland Department of Natural Resources], G. Fleming, and J. C. Ludwig [both from Virginia Natural Heritage Program], personal communications). In Connecticut, with the exception of one sub-population that is located within a power line right-of-way, all sub-populations occur in second-growth, forested wetlands. The population is not reproducing sexually under the tree canopy. As the trees and shrubs within these forests continue to grow, light will become scarcer, and *C. barrattii* will likely show less vigor and perhaps disappear altogether.

### ***Alteration of Hydrologic Regime***

*Carex barrattii* is an obligate wetland species, and, although it grows in wetlands with seasonal fluctuations of the water table, it requires a hydroperiod and is frequently found in the wetter portions of wetlands (W. Moorhead, Consulting Botanist, personal communication). Its exact requirements with respect to hydrology are unknown; however, if wetland hydrology were to be altered dramatically, either by excessive flooding or desiccation of wetland soils, *C. barrattii* would likely be negatively affected. Hydrology can be altered in several ways. Conversion of wetlands to croplands usually requires the draining of wetlands, and this may

account for the disappearance of some of the historic populations. One of the property owners for an extant occurrence has indicated, in the past, his interest in developing a golf course on his property. Golf courses typically entail drastic alterations to both hydrology and habitat due to their need for irrigation water and often large-scale conversion of forestland to turf grass. Development within the watershed can also impact wetland hydrology.

### ***Fire Suppression***

Most botanists familiar with the species believe that *C. barrattii* has been historically maintained by fire (K. Metzler [Connecticut Natural Diversity Data Base], W. Moorhead, A. Reznicek, C. Frye, G. Fleming, J. C. Ludwig, personal communications). Fire removes trees and shrubs and, therefore, reduces the possibility of competition from woody vegetation. Active farming has occurred near the New England population site. Even though the sedge grows in wet habitats, the fire-prone landscape surrounding the wetlands implies that fire would have burned through these wetlands periodically. Historically, many farmers practiced burning for the maintenance of fields. The burning may have been favorable to the populations of *C. barrattii*. Burning rarely occurs today, and the suppression of fire may pose a threat to the reproductive success of the sedge.

### ***Change in Nutrient Regime***

Although no references were found regarding the nutrient regime for *C. barrattii*, its preferred habitat of sandy, acidic soils implies that it grows in nutrient-poor conditions. Changes to the nutrient regime of the wetlands through inputs of fertilizers could impact the population of *C. barrattii*. Urban runoff is exacerbated by development practices. The runoff transports nutrients, automotive products, salt, and other pollutants. Typically, it eventually enters wetland habitats carrying its nutrient load.

### ***Increased Development of Surrounding Area***

Increased development within the immediate vicinity of a population can result in encroachment into wetland habitats. Encroachments from residential development frequently entail activities such as the illegal dumping of brush, lawn clippings, and household debris. The consequences of development and increased urbanization are manifold, and include loss of habitat, increased runoff, introduction of invasive species, and loss of diversity. All of these factors could result in negative impacts to the population of *C. barrattii* in New England.



### *Excavation of Sand and Gravel*

In South Windsor, sand and gravel excavations have taken place within close proximity to *C. barrattii* and may have occurred directly within *C. barrattii* habitat (Kenneth G. Metzler, personal communication). Recent mining activity came within  $80 \pm$  feet of one of the sub-populations, for example. Although it is unlikely that mining activities would occur within wetlands, excavation of sands and gravels, followed by removal of the underlying clay, could alter the local water table and thus cause indirect impacts to the wetlands and the sedge.

## **DISTRIBUTION AND STATUS**

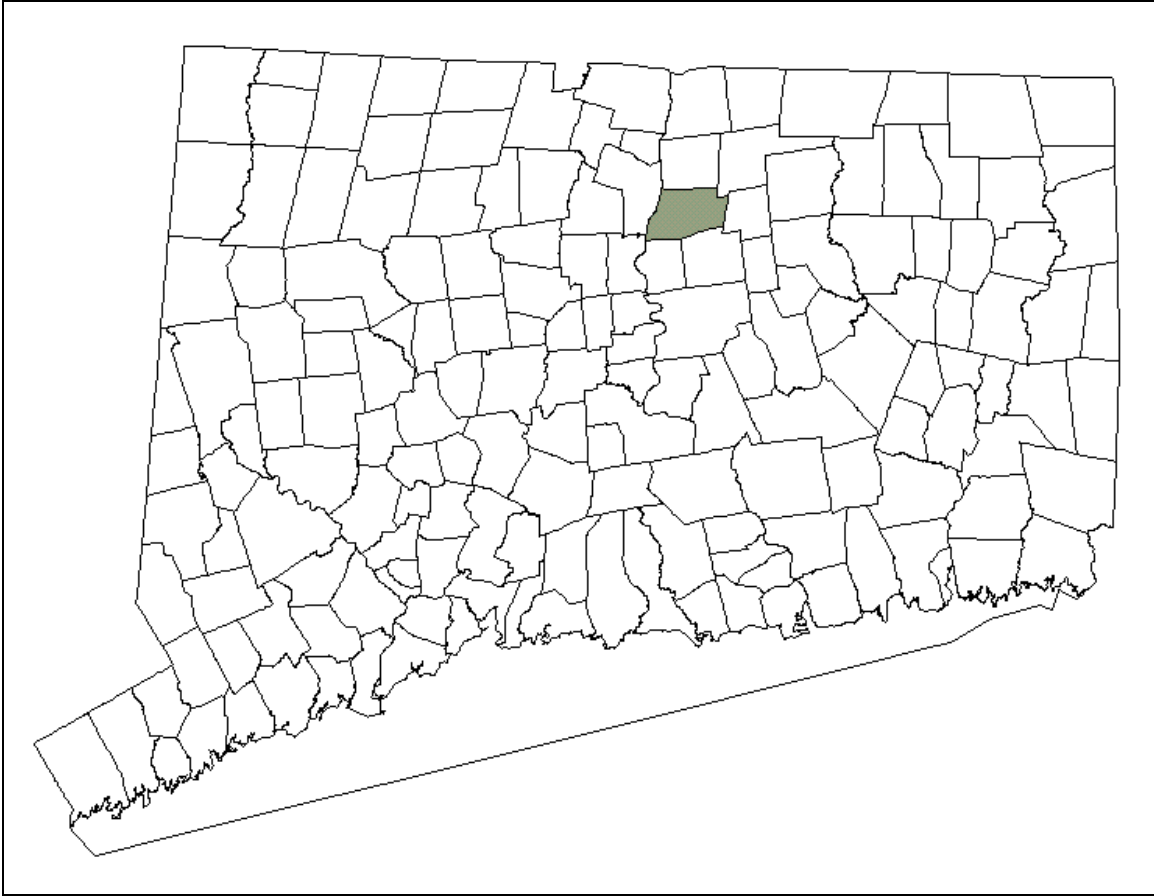
### *General Status*

*Carex barrattii* is a Mid-Atlantic coastal plain endemic. Distribution of the species ranges along the Atlantic coastal states from Georgia north to Long Island, New York and Connecticut. It also occurs in Tennessee and Alabama and is considered extirpated in Pennsylvania. Its only New England occurrence is in Connecticut. The United States and New England distributions of *C. barrattii* are presented in Figures 1, 2, and 3.

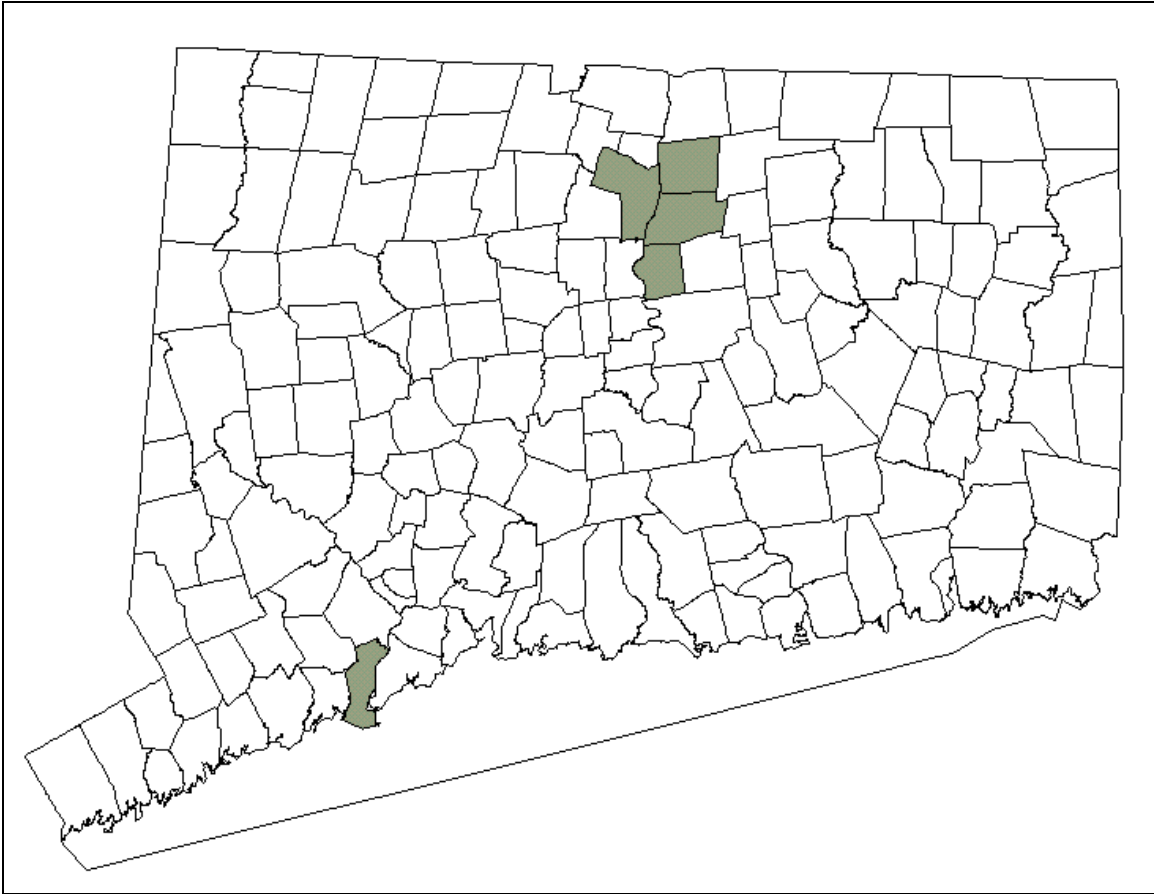
In the United States, the national conservation status rank for *C. barrattii* is N3N4, and its global conservation status rank is G3G4 (globally ranging from vulnerable to secure) and is considered rare, local, and as possessing attributes that make it vulnerable to extinction in parts of its range (TNC/ABI 1999). In *Flora Conservanda: New England* (Brumback and Mehrhoff et al. 1996), *C. barrattii* is a Division 2 species. This division includes taxa that reach the limit of their distributional range in the New England region. Table 1 summarizes the distribution and rankings for *C. barrattii*.

<b>Table 1. Occurrence and status of <i>C. barrattii</i> in the United States and Canada based on Information from Natural Heritage Programs.</b>			
<b>OCCURS &amp; LISTED (AS S1, S2, OR T &amp;E)</b>	<b>OCCURS &amp; NOT LISTED (AS S1, S2, OR T &amp; E)</b>	<b>OCCURRENCE UNVERIFIED</b>	<b>HISTORIC (LIKELY EXTIRPATED)</b>
Alabama (S1)	Delaware (S3)	South Carolina (Reported for South Carolina by Hill and Horn 1997)	North Carolina (SH)
Connecticut (S1): 1 extant and 5 historic occurrences	Georgia (S?)		Pennsylvania (SX) Believed to be extirpated. Last collected in 1914.
New York (S1)	Maryland (S3)		
Tennessee (S2)	New Jersey (S4)		
Virginia (S2)			





**Figure 2. Extant occurrences of *Carex barrattii* in New England.** Town boundaries for Connecticut, the only state in which the taxon occurs, are shown. Shaded town has extant occurrences of *C. barrattii*



**Figure 3. Historic occurrences of *Carex barrattii* in New England.** Town boundaries for Connecticut are shown. Shaded towns have 1-5 historic records of *C. barrattii*.

**Table 2. New England Occurrence Records for *Carex barrattii*. Shaded occurrences are considered extant.**

<b>State</b>	<b>Element Occurrence Number</b>	<b>County</b>	<b>Town</b>
CT	.001	Hartford	East Hartford
CT	.002	Hartford	East Windsor
CT	.003	Hartford	South Windsor
CT	.004	Hartford	Windsor
CT	.005	Fairfield	Stratford
<b>CT</b>	<b>.006</b>	<b>Hartford</b>	<b>South Windsor</b>
<b>CT</b>	<b>.007</b>	<b>Hartford</b>	<b>South Windsor</b>

## II. CONSERVATION

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### **CONSERVATION OBJECTIVES FOR THE TAXON IN NEW ENGLAND**

*Carex barrattii* is a regionally rare Division 2 species in New England (Brumback and Mehrhoff et al. 1996). Globally, this taxon is considered as rare and local throughout its range or found locally (sometimes abundantly) in a restricted range. The primary conservation goal is to provide permanent protection for the species. In Connecticut, the focus will be to fully protect the area that supports the extant population. Of equal importance is the need to ensure either that additional populations are discovered or that the extant population flourishes and expands. At present, the population is at a critical threshold, and its continued presence in Connecticut rests upon a small number of sub-populations.

Conservation objectives for *C. barrattii* are to protect, study, and maintain the species and to manage the associated natural communities. Success of these objectives will be measured through maintenance or possible improvement of the current state rank (CT S1) and by meeting specific conservation plan objectives.

### III. LITERATURE CITED

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## IV. APPENDICES

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1. Herbarium sheets for *Carex barrattii*
2. Additional references useful in preparation of the Conservation and Research Plan
3. An explanation of conservation ranks used by The Nature Conservancy and the Association for Biodiversity Information

### 1. Herbarium Sheets for *Carex barrattii* collected in Connecticut

HERBARIUM	COLLECTOR	DATE	LOCATION	COMMENTS
G. S. Torrey	C. H. Bissell	1900-05-30	East Windsor	Swampy Woods. The only reported station in New England.
G. S. Torrey	C. H. Bissell	1900-05-30	East Windsor	Swampy Woods
G. S. Torrey	E. H. Eames	1904-05-22	So. Windsor	
G. S. Torrey	C.A. Weatherby	1904-06-11	East Hartford	Park Ave. woods
G. S. Torrey	E.B. Harger	1906-05-18	Stratford	In moist woods
G. S. Torrey	E. H. Eames, M.D.	1908-06-12	Stratford	Low thicket on coast. Rare.
G. S. Torrey	E. H. Eames, M.D.	1910-05-21	Stratford	Rare
G. S. Torrey	A. W. Driggs	1913-05-12	So. Windsor	Pleasant Valley District wood road, N. to E. W. Hill Rd. to Wapping
G. S. Torrey	W.H. Moorhead	1993-08-02	So. Windsor	Growing in swards with <i>Sphagnum</i> in ericaceous shrub thickets in power line ROW, west of Foster Road.
G. S. Torrey	W. H. Moorhead	1996-07-11	So. Windsor	Frequent in several meter square patches in seasonally inundated <i>Acer rubrum</i> / <i>vaccinium corymbosum</i> dominated swamp. Few fertile plants.
CT Botanical Society	C.H. Bissell	1899-05-30	East Windsor	Swampy woods
CT Botanical Society	C.H. Bissell	1904-05-22	So. Windsor	Sandy bog
CT Botanical Society	E.B. Harger	1906-05-18	Stratford	Open, moist woods
CT Botanical Society	A.E. Blewitt	1908-07-10	So. Windsor	Swampy woods, sandy soil
CT Botanical Society	R.W. Woodward	1909-06-20	So. Windsor	
CT Botanical Society	C. H. Bissell	1910-05-21	Stratford	Swampy woods
CT Botanical Society	R.W. Woodward	1910-07-21	Stratford	Sandy swamp
Yale University	C.H. Bissell	1904-05-22	East Windsor	
Yale University	R.W. Woodward	1909-06-28	So. Windsor	

## **2. Additional references useful in the preparation of the Conservation and Research Plan.**

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### **3. An explanation of conservation ranks used by The Nature Conservancy and the Association for Biodiversity Information**

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.