New England Plant Conservation Program
Conservation and Research Plan

Hasteola suaveolens (L.) Pojark.
Sweet Indian Plantain

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SUMMARY

There is only one known occurrence of Sweet Indian Plantain *(Hasteola suaveolens)* (L.) Pojark. (Asteraceae) in New England at the present time. It is located along a river floodplain in East Haven, Connecticut. The population consists of approximately 100 individual plants growing in a series of sub-populations. This occurrence was rediscovered in 1996, prior to which the species was considered extirpated from the region. There are at least four historic locations of the taxon in Connecticut. Currently, it does not occur in Rhode Island or Massachusetts, where it may once have grown. In these two states, it is possible that the reported occurrences originated as garden plantings. *Hasteola suaveolens* is listed as endangered in Connecticut.

Sweet Indian Plantain grows on high energy floodplains on the banks of rivers. Historic sites in Connecticut included coastal scour plains, and in other regions it reportedly occurs in calcareous fens or dry banks. It can tolerate light shade and grows at the edges of thickets or open canopy woodlands. Soils at the Connecticut site are composed of rich alluvial material.

At first consideration, the single extant occurrence appears relatively secure. However, there are several significant threats including the presence and spread of invasive species, deer damage and habitat loss. The alteration of flow regimes and river scour events may also have a detrimental impact on this species in New England.

The first conservation objective for this species is to maintain the existing population at a level of no less than 100 plants and to encourage expansion of the occurrence. Another objective is to establish at least two additional population sites of similar size. The ultimate long-term objective is to introduce and/or maintain three to four occurrences of *Hasteola suaveolens* in its historic New England range. The actions recommended to accomplish these objectives are to:

- Continue to monitor the existing population
- Continue to collect seeds for seed bank
- Attempt to acquire a conservation easement for the Farm River floodplain
- Survey for new populations
- Research species biology
- Manage for invasive and competitive species
- Manage for deer damage
- Evaluate sites for re-introduction
- Monitor future land use along Farm River corridor
- Consult with hydrogeologist to provide model of Farm River riverine processes (including hydroperiods) to ensure continued maintenance of *Hasteola suaveolens.*

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.

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

Sweet Indian Plantain, *Hasteola suaveolens* (L.) Pojark., is a member of the Aster Family (Asteraceae, tribe Senecioneae) and is native to North America. It is treated in most references as *Cacalia suaveolens* (L.). The plant is a handsome, tall perennial found primarily along river floodplains. 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 its range and is ranked as rare to uncommon (S1 to S2S3) in many of the states in which it occurs.

Hasteola suaveolens, never a common species in New England, has all but disappeared from the region. In Rhode Island, it is listed as "historic," and the occurrence in Massachusetts is believed to be an introduction. In fact, both the Rhode Island and Massachusetts occurrences may have originated from garden plantings (Anderson 1994).

This plan summarizes the available information on *Hasteola suaveolens* and identifies threats to its continued survival in New England. The threats include potential alteration of the habitat, competition from invasive species, and damage from browsing by deer. The plan outlines a number of conservation objectives and proposes management measures to be taken toward the achievement of the objectives. As an important component of the plan, the report highlights the need for further studies of this taxon. Comprehensive studies are needed regarding the plant's biology and ecology in order to implement effective strategies toward recovery and to ensure its continued presence in New England.

DESCRIPTION

Hasteola suaveolens is a tall, herbaceous perennial that is readily recognized by one of its distinctive characteristics, the strongly triangular or hastate simple leaves. The hastate leaves commonly occur from the middle portion of the stem downwards. They are frequently secondarily lobed and under those circumstances may appear pseudo-palmate. The upper leaves are progressively less hastate and are more likely to be deltoid to lanceolate. The basal and lower cauline leaves (blades and petioles) average 20 to 30 cm long and nearly as wide. Leaves are sharply toothed, petioled, and arranged alternately. The lower leaf blades are decurrent on the petiole. Petioles on the lower leaves are generally longer than the leaf blades, whereas they are shorter on the upper leaves and more prominently winged. Leaf venation is pinnate. During early spring, the plant can be recognized by the hastate basal rosettes (G. Fleming, Virginia Natural Heritage Program, *personal communication*).

The plant is essentially glabrous, and the tall stems average 10 to 12 dm. The stems are green, erect, sometimes round, but more often longitudinally grooved or striate.

Hasteola suaveolens has stout, fleshy, adventitious roots that probably aid in anchoring the plant in its preferred habitat, river floodplains. Under some situations, the plant is known to grow aggressively and spread by rhizomes (Deam 1940).

The inflorescences are compound and more or less freely branched. Heads are in flat corymbs. Flowers are numerous, typically from 20 to 40 per head - and the disk measures approximately 7 to 11 mm in pressed specimens. The creamy white flowers (rarely pinkish) are all tubular and perfect. The corolla is deeply 5-cleft; the lobes are 1.5 to 2 cm long and the throat 2 to 3 mm long.

The involucre is about 1 cm with 12 to 15 principal bracts. Often there are some reduced, yet conspicuous, loose, subulate outer bracts. The receptacle is flat and deeply pitted. The cylindric, ribbed achenes average 5 to 7 mm in length and are pale green to light brown. The pappus consists of white capillary bristles and is 6 to 7 mm long.

Hasteola suaveolens is distinguished from the only other species in the genus, *H. robertorium*, by morphological characters such as greater numbers of flowers and campanulate flower heads in *H. suaveolens* vs. cylindric in *H. robertorium* (Anderson 1994). It is unlikely that the two species would be confused, as *H. robertorium* is known only from Florida, and the range of *H. suaveolens* does not include Florida.

TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY

Hasteola suaveolens is treated in most references as *Cacalia suaveolens* L. and occasionally as *Synosma suaveolens*. The species was named *Cacalia suaveolens* by Linnaeus. According to Fernald (1950), "Cacalia" is "an ancient name of uncertain meaning" and "suaveolens" means "sweet-smelling." The ten original species of Linnaeus's *Cacalia* are now classified in several other genera. In North America both Fernald and Cronquist recognize four species in the genus *Cacalia: Cacalia suaveolens; C. muhlenbergii; C. atriplicifolia; and C. tuberosa*. Rafinesque was the first to divide the genus in America, recognizing the genera *Arnoglossum* and *Synosma* on the basis of differences in plant morphology (Anderson 1994). However, he added to the confusion by renaming his own genera. He renamed *Arnoglossum* as *Mesadenia*, and *Synosma* as *Hasteola* (Anderson 1994). Britton and Brown (1898) used Rafinesque's *Synosma* and provided specific descriptions. Rafinesque, however, referred *C. suaveolens* to his new genus *Hasteola*, but did not associate the final epithet with the name of the genus. *Hasteola* was validated as a genus before *Synosma* was, but the epithet *suaveolens* was not associated with the genus until much later (Anderson 1994). *Hasteola* and *suaveolens* were combined by Pojarkova in 1960 (Anderson 1994).

The most recent treatment of the species confirms the genus as *Hasteola*, a genus of only two species: *H. suaveolens* and *H. robertiorum* (Anderson 1994). The latter species is a Florida endemic. The genus name *Cacalia* was recommended for nomenclatural rejection by the Committee on Spermatophyta because of its history of varied and contradictory usage (The Nature Conservancy and The Association of Biodiversity Information 1999). All plants formerly classified in *Cacalia* must now be re-classified into other genera.

SPECIES BIOLOGY

There is a paucity of published information regarding *Hasteola suaveolens*. Therefore, little is known about the life history and reproductive biology of the plant. Anderson propagated *Hasteola suaveolens* from both seeds and transplants in a garden in Tallahassee, Florida (Anderson 1994), and noted that the species grew aggressively and spread within the garden environment. Based upon this and other accounts, it is likely that *H. suaveolens* reproduces both sexually and vegetatively.

Like many composites, *Hasteola suaveolens* is a late bloomer, flowering from late July into September. In Connecticut, it was observed in flower in mid-September during 1997, 1998, and 1999 (P. Sharp, *personal observation*). In many years, frost may nip the flower heads prior to seed set. If a principal mode of reproduction is by seed, the species may be at a distinct disadvantage in the New England climate.

Climate may be an inhibiting factor to flowering and growth, and *H. suaveolens* may be at the northern limit of its range in Connecticut and New England. However, it grows in Minnesota and Illinois which are at more northerly latitudes than Connecticut.

In *Flora of Missouri*, Steyermark (1963) wrote of his experience growing *H. suaveolens*. He states: "I have had this species growing in the woodland section of my wildflower preserve in northern Illinois where it has become a serious weed, spreading freely from seed as well as vegetatively and forming large colonies." George Yatskievych of the Missouri Botanical Garden confirmed Steyermark's observations as he propagated some plants from seed and found *H. suaveolens* to be "aggressive in the garden" (G. Yatskievych, *personal communication*).

Deam (1940) in *Flora of Indiana* reports that "*H. suaveolens* is local near the dunes around Lake Michigan and then very local." He observes that it is always found on moist or wet grounds, usually near a stream, and it spreads rapidly by rhizomes. Deam further reports that he planted this species along with two other cacalioids *(Cacalia atriplicifolia* and *C. muhlenbergii)* in alluvial soil in bottomland. The latter two species survived for a few years while *H. suaveolens* spread about a foot per year through blue grass sod.

In New England, seed collection of the one extant population has been ongoing since

the species' rediscovery. To date, the seeds that have been collected have not been viable (C. Mattrick, New England Wild Flower Society, *personal communication*). There are several possible explanations for this lack of viability, one being that the seed had not matured prior to collection. Some seeds were noted to be shriveled at time of collection. Perhaps the species requirements include specialized pollination, and the pollinator(s) are scarce or absent. Another possibility is that the species is self-incompatible. These are unknown factors, but ones that bear further investigation and research.

HABITAT/ECOLOGY

The preferred habitat for *Hasteola suaveolens* is dry to moist ground at the edges of rivers or streams. It is relatively tolerant of light shade and grows in rich floodplain forests, thickets or openings. According to the Nature Conservancy, *H. suaveolens* is an obligate wetland species. However, the "National List of Plant Species That Occur in Wetlands, Region 1 – Northeast" (Sabine 1992) lists *H. suaveolens* as FAC- (minus) or facultative wetland, meaning that it is equally likely to occur in wetlands as non-wetlands. The extant population in New England grows on alluvial soils. It is found outside of New England in calcareous fens and occasionally on calcareous bluffs (The Nature Conservancy and The Association of Biodiversity Information 1999).

The species appears to require some disturbance, in that it grows along banks of dynamic riverine habitats that are subject to scour and flooding. *Hasteola suaveolens* may depend upon the bare soil exposed by frequent flooding for seed germination. The species may be declining in part because of the "taming" of rivers (W. Moorhead, Connecticut Natural Heritage Program, *personal communication*). In their work on *Pedicularis furbishiae*, Gawler *et al.* (1997) found that river disturbance was a key element in the life history of *P. furbishiae*. Although disturbance from ice scour and slumping was found to be immediately destructive to established plants, it was important in regenerating suitable habitat. They found that suitable habitat included two opposing forces – conditions that favor the establishment and growth of individuals (river disturbance) and conditions that favor long-term survival of populations (stable conditions). Their studies on *P. furbishiae* may prove useful in the consideration of future studies of *Hasteola suaveolens.*

Dams built for flood control or water supply have dampened the flooding of many Connecticut rivers, thereby creating low-energy floodplains where high energy floodplains once existed. Historic sites in New England include riverbanks of free-flowing rivers and scour plains along the Connecticut coastline which had been maintained by coastal flooding. Many scour plain habitats are now occupied by mono-cultural stands of Common Reed (*Phragmites australis)* and are often protected from flooding by tide gates or other structures. It is also possible that the railroad along the Connecticut shoreline restricted tidal flow, and over time, *H. suaveolens* disappeared from areas where it once grew. Several early specimens of the species were collected near the rail lines. These areas no longer provide suitable habitat for

Hasteola suaveolens.

THREATS TO TAXON

At first consideration, the single site where *Hasteola suaveolens* occurs in New England seems relatively secure, but there are several threats to the extant population, including competition from invasive species and habitat loss. *Rosa multiflora, Eleagnus umbellata, Phragmites australis,* and *Phalaris arundinaceae* are present at the population site. These plants are aggressive and likely to spread along the river floodplain. At the northerly sub-population, *Rosa multiflora* is in close proximity to *Hasteola suaveolens*. If *Rosa multiflora* and other invasive species now growing at the site become dominant within the floodplain, many herbaceous species, including *Hasteola suaveolens*, could become shaded out and eventually eliminated.

White-tailed deer pose an additional threat to this occurrence. In 1996, William Moorhead of the Connecticut Natural Heritage Program noted during an October site visit that all of the 11 plants in one sub-population had been browsed. Deer are likely to remain a threat due to their abundance throughout Connecticut.

Another potentially serious threat to the habitat would be the implementation of a flood control dam upstream on the Farm River. The Natural Resources Conservation Service, in conjunction with the Army Corps of Engineers, has approached the towns of East Haven and North Branford to discuss dam construction along the Farm River to alleviate downstream flooding. Potential projects include construction of a large dam north of Jerz Lane in North Branford or a series of small dams at various locations (as yet to be determined) along the river. There are no immediate design plans, but the concept has existed for twenty years. The dam projects were last discussed in 1997, and a two-town committee was established to weigh both negative and positive aspects of the proposed dam. It is not known with any degree of certainty what effects, if any, such a dam might have on the occurrence of *Hasteola suaveolens*. However, a dam would almost certainly bring about changes in the river flood regimes. This, in turn, will alter the formation of alluvial deposits and terraces necessary for *H. suaveolens* germination and maintenance of the sub-populations.

DISTRIBUTION AND STATUS

General status

Hasteola suaveolens is reported in the United States in 22 states east and 2 states west of the Mississippi River, as indicated in Table 1 (see also Figure 1). The taxon ranges from Rhode Island and Connecticut, west to southeast Minnesota, and south to Maryland, Kentucky, Tennessee, Illinois and in the mountains to Geogia (Gleason and Cronquist 1991).

Table 1. Occurrence and status of *Hasteola suaveolens* 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 UNVERIFIED	HISTORIC (LIKELY EXTIRPATED)
Connecticut (S1): 1 extant and 4 historic occurrences	Kentucky (S?)	Georgia (SRF)	New Jersey (SX)
District of Columbia (S1)	Pennsylvania (S3)	Indiana (SR)	North Carolina (SH)
Minnesota (S1)	Iowa (S3)	Massachusetts (SR)	Rhode Island (SH)
Tennessee (S2)		Delaware (SR)	
West Virginia (S1)		Michigan (SRF)	
Illinois (S2S3) but ranked by state as S1		Missouri (SR)	
Maryland (S1)		Wisconsin (SR)	
New York (S1)		Nova Scotia (SRF)	
Ohio (S2)			
Virginia (S2)			

Many state Natural Heritage programs outside of New England were contacted regarding the status of this taxon in their state. Most of the respondents indicated that *Hasteola suaveolens* was not common in their state and is likely declining. In Missouri, for example, the Heritage Program does not know whether the reported county occurrences contain extant populations (T. Smith, Missouri Natural Heritage Program, *personal communication*). *Hasteola suaveolens* is relatively abundant in Pennsylvania and Ohio (The Nature Conservancy and The Association of Biodiversity Information 1999). One fairly large population of more than 10,000 plants occurs in Virginia along the Potomac River (G. Fleming, *personal communication*). The Nova Scotia record was determined to be false. Occurrences of this *Hasteola suaveolens* in New York are located in the western part of that state, and therefore are of no bearing on the conservation of the species in New England.

The plant has no Federal status under the Endangered Species Act of 1973, as amended, on June 6, 1991 (U.S. Fish and Wildlife Service 1991). However, the Nature Conservancy global ranking assigned to *Hasteola suaveolens* is G3G4. Although widely distributed in the eastern United States, the plant appears to be declining due in part to habitat loss (The Nature Conservancy and The Association of Biodiversity Information 1999). Its United States National Rank is N3N4 and its Canadian National Rank is NRF (See Appendix for explanation of ranks).

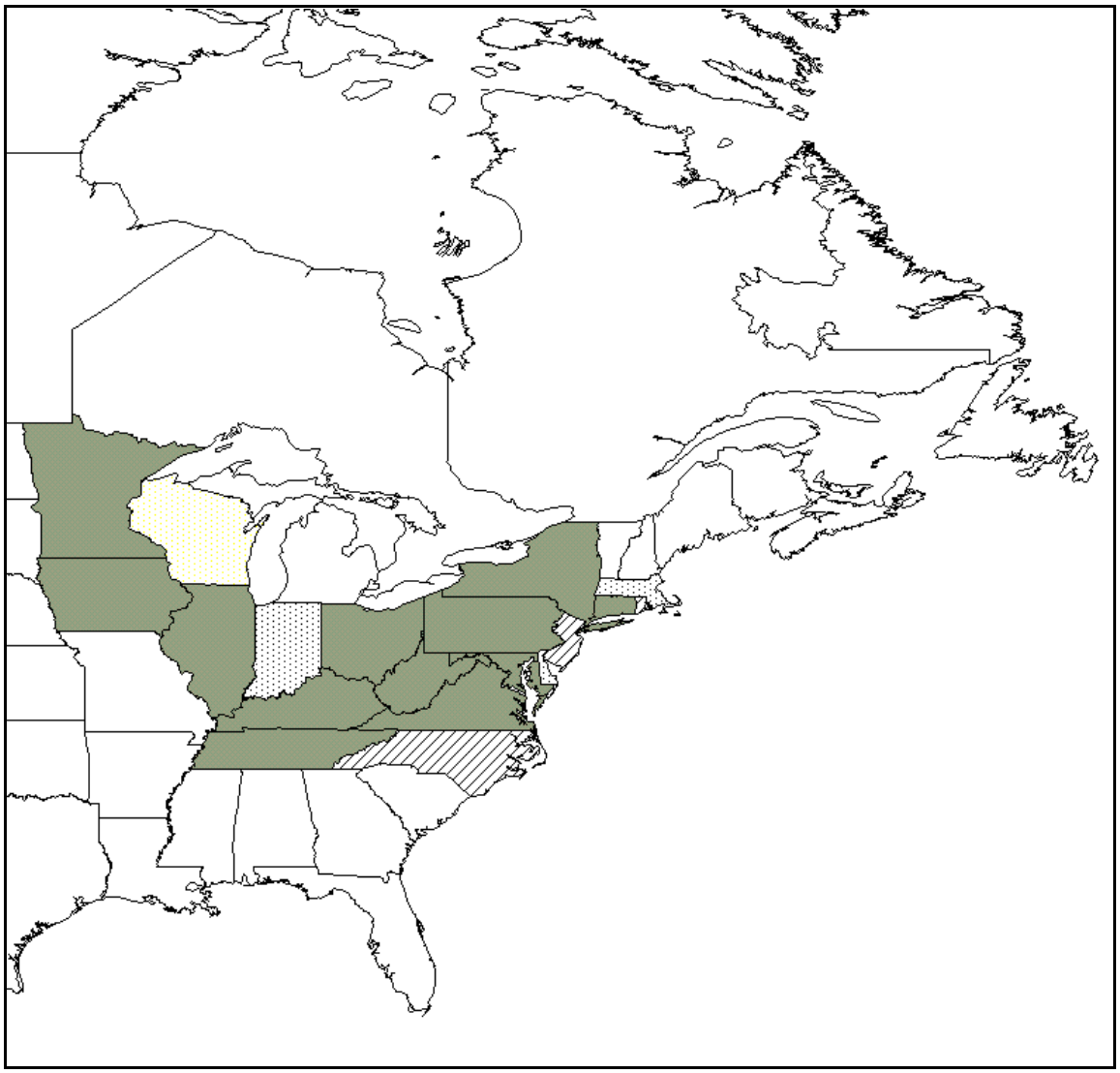

Figure 1. Occurrences of *Hasteola suaveolens* in North America. Shaded states and provinces have 1-5 extant occurrences or are noted simply as occurring. States with the taxon reported as "SR" (see Table 1 and Appendix for explanation of ranks) are shaded with stippling on the map where additional information corroborates their existence. States with diagonal hatching are designated "historic" or "presumed extirpated" (see Table 1), where *Hasteola suaveolens* no longer occurs.

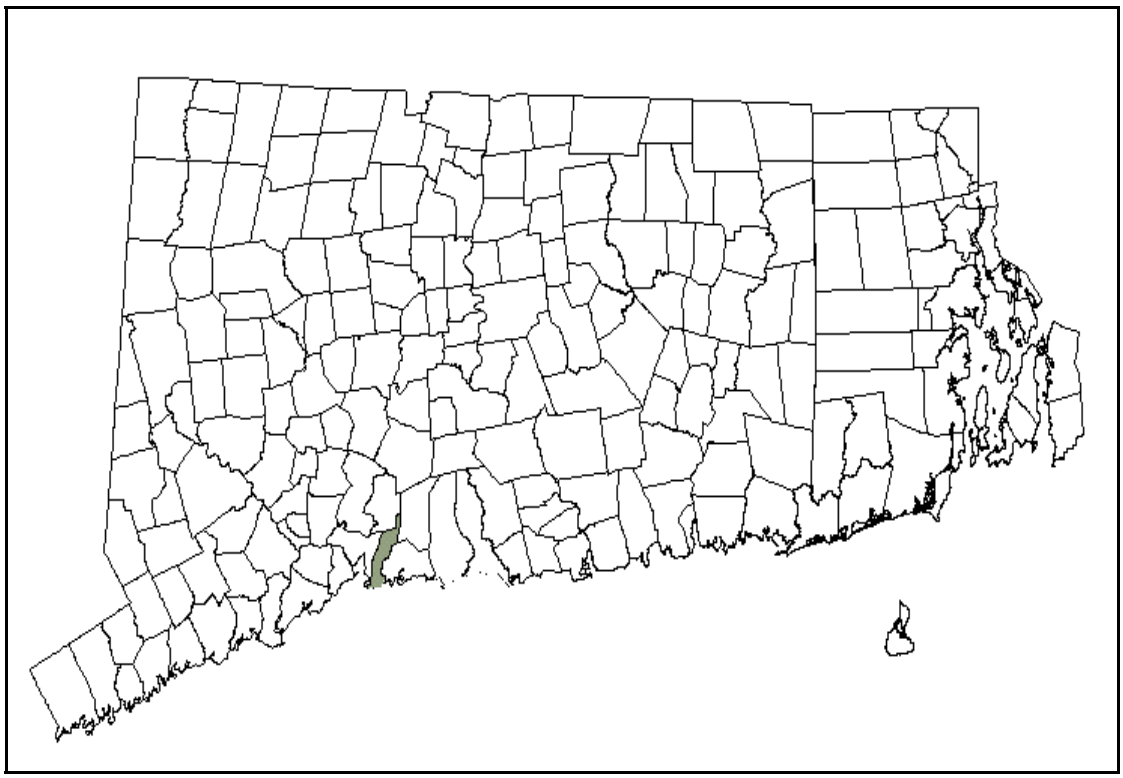

Figure 2. Extant occurrences of *Hasteola suaveolens* in New England. Town boundaries for Connecticut and Rhode Island are shown. The town shaded in gray has one current occurrence.

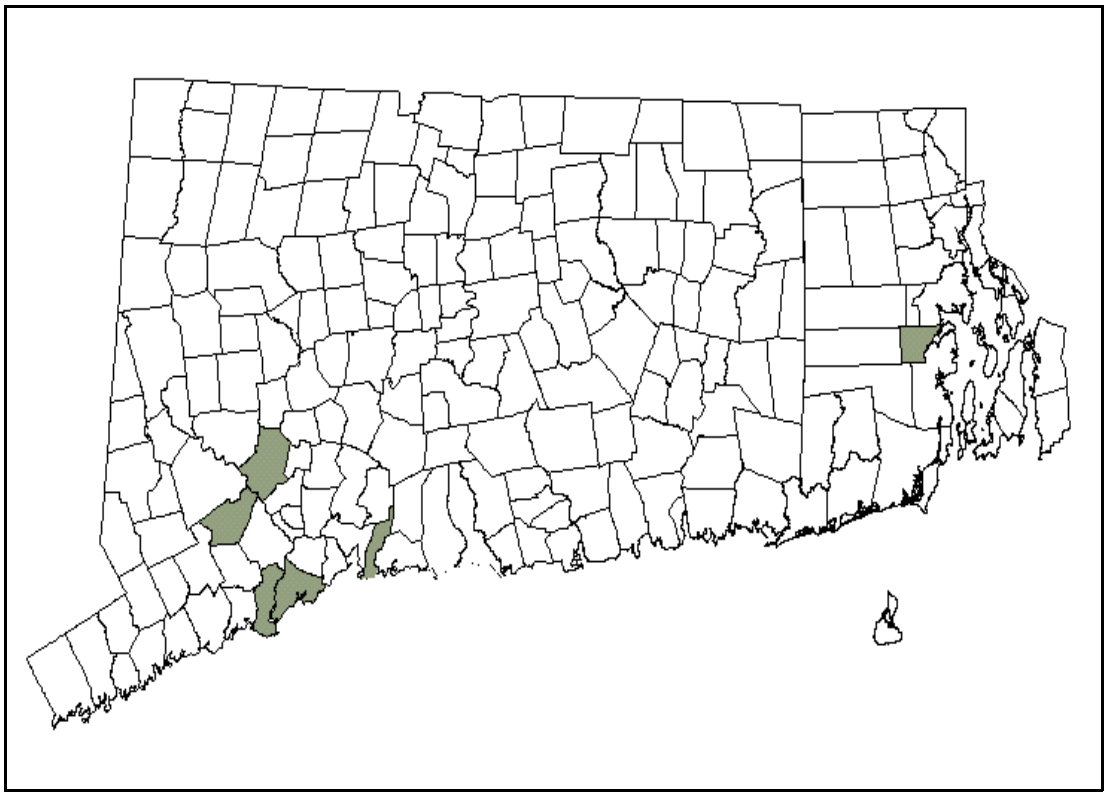

Figure 3. Historic occurrences of *Hasteola suaveolens* in New England. Town boundaries for Connecticut and Rhode Island are shown. Towns shaded in gray have 1-5 historic occurrences.

Table 2. New England Occurrence Records for *Hasteola suaveolens* based on data from State Natural Heritage Programs. Shaded occurrences are considered extant.

State	EO #	County	Town
RI	None	Kent	East Greenwich
CT	.001	New Haven	East Haven
CT	**.002**	**New Haven**	**East Haven**
CT	.003	Fairfield	Stratford
CT	.004	Fairfield/ New Haven	Monroe/ Oxford
CT	.005	New Haven	Milford

II. CONSERVATION

CONSERVATION OBJECTIVES FOR TAXON IN NEW ENGLAND

Hasteola suaveolens was once more widespread in Connecticut and occurred in at least four other locations in the state. It was also present, growing without cultivation, in one location in Rhode Island. Conservation objectives for *H. suaveolens* include the maintenance of the extant population at a minimum level of approximately 100 plants with a goal of promoting population expansion at the extant site in Connecticut. Another objective is the establishment of additional two additional populations in Connecticut. This will require a greater understanding of the biology and ecology of the taxon and the selection of suitable habitat. *Hasteola suaveolens* should be searched for in the East Greenwich environs in Rhode Island. If it is not re-discovered, reintroduction in Rhode Island should be considered. The need for the establishment of additional populations is evident. With only one occurrence in New England, a single catastrophic event could eliminate the species from the regional flora. The New England population is also the northeast-most occurrence of the species in North America, and, therefore, may be of genetic value to the survival of the taxon. The establishment and maintenance of three to four populations in Connecticut and Rhode Island will recreate the approximate historic range and occurrence numbers.

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IV. APPENDICES

1. Herbarium sheets for *Hasteola suaveolens*

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

Appendix 1. Herbarium sheets for *Hasteola suaveolens*			
Herbarium	**Collector**	**Date**	**Location**
University of Connecticut (UConn)	J. J. Neale	September 7, 1941	East Haven, Connecticut
UConn	J. J. Neale	August/ September 1940	East Haven, Connecticut, Farm River
UConn	E. H. Eames	July 31, 1893	Oronoque (Stratford), Connecticut
UConn	E. H. Eames	August 31, 1893	Milford, Connecticut
UConn	E. H. Eames	August 4, 1893	East Haven, Connecticut
UConn	Ruth Griswold Parker	October 5, 1958	Oxford, Connecticut, Eightmile River
UConn	E. H. Eames	August 4, 1893	East Haven, Connecticut
UConn	K. P. Jansson	September 10, 1938	New London, Connecticut
UConn	E. B. Harger	August 5, 1899	East Haven, Connecticut
UConn	S. C. Wadmond	August 30, 1925	Wisconsin
Connecticut College	R. Woodward	September 11, 1914	East Haven, Connecticut
Connecticut College	E. H. Eames	August 16, 1896	Stratford, Connecticut
Connecticut Botanical Society (CBS)	C. H. Bissell	July 24, 1909	East Haven, Connecticut
CBS	J. J. Neale	September 7, 1941	East Haven, Connecticut, east of Farm River
CBS	J. J. Neale	September 7, 1941	East Haven, Connecticut, east of Farm River
CBS	John Souther	October 11, 1997	East Haven, Connecticut, west bank of Farm River
CBS	John Souther and Penni Sharp	September 13, 1998	East Haven, Connecticut, west bank of Farm River
CBS	R. W. Woodward	September 9, 1913	East Haven, Connecticut
CBS	E. B. Harger	September 5, 1911	Oxford, Connecticut
CBS	E. H. Eames	August 16, 1896	Stratford, Connecticut
Yale University	A. W. Evans	August 10, 1887	East Haven, Connecticut

Herbarium	Collector	Date	Location
Yale University	Charles C. Godfrey	August 16, 1896	Stratford, Connecticut
Yale University	J. J. Neale	September 25, 1949	East Haven, Connecticut
Yale University	J. J. Neale	September 25, 1949	East Haven, Connecticut
Yale University	A. B. E.	1859	Milford, Connecticut
Yale University	M. S. Bebb	1860	Missouri
Yale University	D. C. Eaton	1858-9	Illinois
Yale University	A. L. Winton	1884	Virginia
Yale University	D. C. Eaton	No date	East Haven, Connecticut and Augusta, Illinois
Yale University	C. W. Swan	October 2, 1982	Dedham, Massachusetts
Yale University	W. G. Farlow	September 25, 1895	Newton, Massachusetts
Pringle Herbarium, University of Vermont	J. W. Congdon	October 5, 1876	East Greenwich, Rhode Island

Appendix 2. 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 made for more than 20 years. An X rank is utilized for sites that 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.