

New England Plant Conservation Program

Verbena simplex Lehm.
Narrow-leaved Vervain

Conservation and Research Plan
for New England

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SUMMARY

Verbena simplex Lehm., narrow-leaved vervain, is found throughout southeastern Canada and the eastern half of the United States. Due to the regional rarity of *Verbena simplex* and its century-long decline in New England, NEPCoP listed the species as a Division 2 (Regionally Rare) taxon in 1997. Three populations are currently known in New England, one in an abandoned marble quarry in Berkshire County, Massachusetts, and two on grassy balds above the Connecticut River Valley in Hampden and Hampshire Counties, Massachusetts. Between the 1850's and 1950, approximately 40 populations of *Verbena simplex* were documented in New England: 27 in Connecticut, 9 in Massachusetts, 2 or 3 in Vermont, and 1 or 2 in New Hampshire.

Verbena simplex grows in open, dry conditions on circumneutral soils. In New England, where the plant is at the northeastern limit of its range, *Verbena simplex* populations have typically been associated with disturbed sites such as quarries, railroad beds, roadsides, and dry agricultural fields. Most populations have been documented in: 1) the limestone and marble regions of Litchfield County, Connecticut and Berkshire County, Massachusetts; and 2) the basaltic ridges from New Haven County, Connecticut to Hampshire County, Massachusetts. *Verbena simplex* does not tolerate shading, moisture, or direct competition with other plants, and has vanished in locations where natural succession has reforested disturbed habitats.

The marginal viability of *Verbena simplex* in New England presents challenges for its regional conservation. Reintroduction strategies must take into account its affinity for disturbed, dry calcareous sites on bare rock or mineral soil and its intolerance of shade, moisture, and competition. Population studies from regions where *Verbena simplex* is more abundant (in states such as Kansas, Kentucky, or Missouri), could clarify questions about its regeneration patterns and long-term viability at specific locations.

The conservation objective for this species in New England is to maintain the three extant populations in western Massachusetts and to establish five new populations in close proximity to the locations of former populations (two in Massachusetts, and three in Connecticut). The sites for these new populations should be in protected open habitats in traprock ridges in both states and also in upland limestone/marble regions of Berkshire and Litchfield Counties. The following steps should be implemented to ensure the preservation of this taxon in New England:

- 1) Annually monitor and protect the three existing sites in western Massachusetts.
- 2) Resurvey historic sites and conduct *de novo* searches in suitable habitat in Connecticut to determine if the taxon may still exist in that state.
- 3) Collect seed from plants at existing sites for *ex situ* seed banking.
- 4) Introduce or reintroduce new populations in viable habitat in Connecticut and Massachusetts.

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) 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 individuals and 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

Verbena simplex Lehm. is a perennial member of the vervain family (Verbenaceae) distributed throughout the eastern United States and southern Quebec and Ontario. In the United States, *Verbena simplex* ranges from New England west to Minnesota and south to Florida, Georgia, Alabama, Mississippi, Louisiana, and Texas. The plant's characteristic habitats are early successional fields, wood edges, rock outcrops, and grassy summits on dry, calcareous soils. *Verbena simplex* colonizes disturbed sites such as roadsides, railroad cuts, and rock quarries.

In New England, where the species is at the northeastern edge of its range, populations have been documented on open, calcareous sites on basalt, limestone, or marble bedrock. The majority of these sites are located: 1) on the traprock ridges ranging from New Haven, Connecticut to Holyoke, Massachusetts; and 2) in the limestone and marble uplands in the northwestern regions of these two states (Sorrie 1987, Sorrie and Somers 1999). There are three vouchered historic locations in Vermont and New Hampshire, but little habitat information exists for these sites. In total, there are approximately 40 documented past and present occurrences of *Verbena simplex* in New England: Connecticut (27), Massachusetts (9); Vermont (2 or 3) and New Hampshire (1 or 2). It has never been documented in Maine or Rhode Island.

Most of the New England voucher specimens were collected between the 1850's and 1920, the earliest being a Connecticut specimen collected in New Haven in 1814. The region has three extant populations, all of which are in western Massachusetts.

The current Massachusetts populations include one site with several hundred plants in a former marble quarry in Berkshire County, and two sites with small populations on dry grassy openings on basaltic ridges above the Connecticut River Valley. One of these sites is in Hampden County and the other is in Hampshire County.

Botanists should continue to search historic locations and should conduct new surveys in similar habitats, particularly in the fields, balds, and open woodlands along the traprock ridges and the calcareous uplands in western Connecticut and Massachusetts. The plant is not always distinctive in the field, especially when it is small and vegetative, and a small population growing in a rock crevice or a grassy bald could be overlooked.

Finally, and keeping in mind the fact that the species has always been rare in the region, the plant should be reintroduced to several sites within its historic New England range. Examples of such sites are abandoned marble quarries and other calcareous upland habitats in Litchfield County, Connecticut and Berkshire County, Massachusetts; and grassy traprock balds in the basaltic ridges extending from New Haven County,

Connecticut to Hampshire and Hampden Counties, Massachusetts. Reintroduction sites must provide optimal growing conditions for the plant: exposed locations in an early stage of natural succession on dry, circumneutral soils. Since *Verbena simplex* appears to be intolerant of shade and vulnerable to competition from native and invasive field species, site management requires the maintenance of open conditions and the suppression of competing species.

This plan reviews the current and historic *Verbena simplex* occurrences in New England, and recommends conservation actions to insure the taxon's regional preservation.

DESCRIPTION

Narrow-leaved vervain (*Verbena simplex* Lehm) is an erect, sparsely branching, herbaceous perennial plant 1 to 7 decimeters in height with smooth or slightly hairy stems (Barber 1982, Gleason and Cronquist 1991). It has opposite, narrowly lanceolate leaves 3-10 centimeters in length by 3-15 millimeters in width. The leaves, which taper to a very short petiole or sessile base at the stem, are hairy on both surfaces, coarsely toothed, and rounded at the tip. The plant's tube-shaped, purple or lavender five-lobed flowers are arranged in one to several narrow, densely clustered spikes that bloom from May to September. The 4-6 millimeter-wide corolla barely extends above the calyx, which at maturity is 4-5 millimeters in length, with five acuminate lobes subtended by a sharply tapering bract. Narrow-leaved vervain bears fruit from July through September. Its linear, one-seeded nutlets are 2.5 millimeters in length and wrinkled at the top (Fernald 1950). The plant's characteristic habitats are dry fields, rock crevices, roadsides, and other disturbed, early successional sites with a circumneutral soil base.

Blue vervain (*Verbena hastata*) and hoary vervain (*Verbena stricta*), two purple-flowered members of the vervain family (*Verbenaceae*) that occur in New England, are similar in appearance to *Verbena simplex*. Blue vervain is a taller plant (4 to 15 decimeters in height) with longer, petiolate leaves and branching inflorescences in terminal panicles. Blue vervain typically grows in moist or wet soil. Hoary vervain is a prairie species that has been introduced to the northeast (Gleason and Cronquist 1991). Hoary vervain has densely hairy stems; thick, compact panicles; and ovate, sharply toothed leaves 1.5- 5 centimeters in width. *Verbena stricta* flowers are larger than those of *V. simplex*, having a corolla width of seven to nine millimeters (Fernald 1950, Brown and Brown 1984).

TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY

The following discussion of taxonomic relationships and reproductive biology is essentially a condensation of Barber (1982). *Verbena* is primarily a New World genus with approximately 380 taxa, including hybrids. The genus is divided into two sections, *Verbena* and *Glandularia*. Section *Verbena*, of which *Verbena simplex* is a member, is

further divided into series *Leptostachyae* and *Pachystachyae*. Section *Leptostachyae* has 24 species in North America, including the nine species of the *Verbena stricta* complex: *V. bracteata*, *V. hastata*, *V. lasiostachys*, *V. neomexicana*, *V. officinalis*, *V. robusta*, *V. simplex*, *V. stricta*, and *V. urticifolia*.

Barber's research at the University of Oklahoma indicated that hybridization among members of the *Verbena stricta* complex occurs, but that hybrids are unusual in nature. Self-fertilization is typical of many members of the group, although *Verbena stricta*, which of the nine species has the largest and most densely aggregated flower clusters, is primarily a cross-fertilizing species (Perkins et al. 1975). Perkins' examination of hybrids within the *Verbena stricta* complex indicates that, in the majority of cases, *V. stricta* is one of the parent taxa. Voss (1996) mentions that six of the seven *Verbena* species in Michigan, including *Verbena simplex*, are "known to hybridize with one or more other species, but with us only *V. hastata* x *V. urticifolia* is at all frequent." A hybrid between *V. stricta* and *V. simplex* is classified as *V. x moechina* Moldenke (Gleason and Cronquist 1991).

Verbena angustifolia Michx. is an obsolete synonym for *Verbena simplex* (Moldenke 1958).

SPECIES BIOLOGY

Published information on the life history of *Verbena simplex* is scant, and there is little in general for closely related members in the *Verbena* genus. While questions of nomenclature and hybridization within *Verbena* have been examined (Moldenke 1958, Perkins et al. 1975, Barber 1982), many aspects of its biology seem to have received little research attention. I found no mention, for example, of seed dispersal mechanisms.

All members of *Verbena* are insect-pollinated (Moldenke 1958). Pollination studies of four members of the *Verbena stricta* complex in southern Oklahoma (*V. bracteata*, *V. halei*, *V. stricta*, and *V. urticifolia*) demonstrated that bees, wasps, flies, and butterflies are the primary pollinators for these species (Perkins et al. 1975). *Verbena simplex* is not treated in this study, but the similarity of its flowers to those of closely related species suggests that its pollinators come from the same insect groups.

HABITAT/ECOLOGY

Throughout its range, *Verbena simplex* inhabits dry, sandy fields; dry, open woodlands and balds; limestone pavements; rock crevices; marble quarries; railroad cuts; roadsides; and other disturbed areas. Upland fields, rock crevices, and open woodlands with a circumneutral soil base derived from limestone, marble, or basalt comprise the plant's present and former habitats in New England. The New England populations typically occur in exposed sites with thin soils and sparse vegetation. In this region, the taxon does not appear to be tolerant of shade or competition with other plants.

THREATS TO THE TAXON IN NEW ENGLAND

Verbena simplex is in danger of extirpation in New England. The taxon has been in regional decline for over a century, and it now consists of only three populations, two of which contain fewer than five mature plants. A slight shift in light and moisture regimes or species composition at these sites could tip the balance against the viability of these fragile populations.

At MA .001 (Sheffield), which is privately owned, the population consists of several hundred plants. However, a change in ownership or usage could damage this occurrence. The other Massachusetts populations are extremely small, each consisting of fewer than five plants.

DISTRIBUTION AND STATUS

General Status

The natural distribution of *Verbena simplex* covers most of the eastern half of the United States, southwestern Quebec, and southern Ontario. In the United States, narrow-leaved vervain ranges from New England south to the Florida Panhandle, and west to Minnesota, Nebraska, Oklahoma, and northern Texas. Narrow-leaved vervain is common in the central parts of its range (states including Kansas, Kentucky, Maryland, Missouri, and Oklahoma), but rare or extirpated in states at the margins of its natural distribution.

Narrow-leaved vervain has a global rank of G5, meaning the species is globally secure. The U.S. Fish and Wildlife Service does not list the plant as an Endangered, Threatened, or Candidate species. The *Flora Conservanda* list for New England ranks *Verbena simplex* as a Division 2 or Regionally Rare species, with historical (SH) rankings in Connecticut and Vermont and an endangered classification (S1) in Massachusetts (Brumback and Mehrhoff et al.1996). Although New Hampshire is not shown on the *Flora Conservanda* list, there is an 1894 specimen from Hanover, New Hampshire located in the Gray Herbarium. *Verbena simplex* has never been documented in Maine or Rhode Island.

Verbena simplex is rare in Minnesota (S3), Nebraska (S1), New Jersey (S1), and North Carolina (S2S3), and has been extirpated from Delaware and the Province of Quebec (The Nature Conservancy and the Association for Biodiversity Information 1999). In New York State, where *Verbena simplex* occurs in scattered locations in disturbed, calcareous habitats, the plant is uncommon but it is not listed as a rare species by the New York Natural Heritage Program (Richard Mitchell, New York State Museum, personal communication). See Table 1 and Figure 1 for summaries of the taxon's distribution, and Appendix 1 for an explanation of conservation ranks.

Table 1. Occurrence and status of *Verbena simplex* 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)
Massachusetts (S1): 3 extant and 6 historic occurrences	District of Columbia (S?)	Alabama (SR)	Connecticut (SH): 28 historic occurrences
Nebraska (S1)	Illinois (S?)	Arkansas (SR)	Delaware (SH)
New Jersey (S1)	Iowa (S4)	Florida (SR)	Vermont (SH): 2 historic occurrences
Wisconsin (S1)	Kentucky (S?)	Georgia (SR)	
Quebec (S1)	Minnesota (S3)	Indiana (SR)	
	North Carolina (S2S3)	Kansas (SR)	
	Pennsylvania (S?)	Maryland (SR)	
	South Carolina (S?)	Mississippi (SR)	
	West Virginia (S?)	Missouri (SR)	
	Ontario (S4)	New Hampshire (SR)	
		New York (SR)	
		Ohio (SR)	
		Oklahoma (SR)	
		Tennessee (SR)	
		Texas (SR)	
		Virginia (SR)	

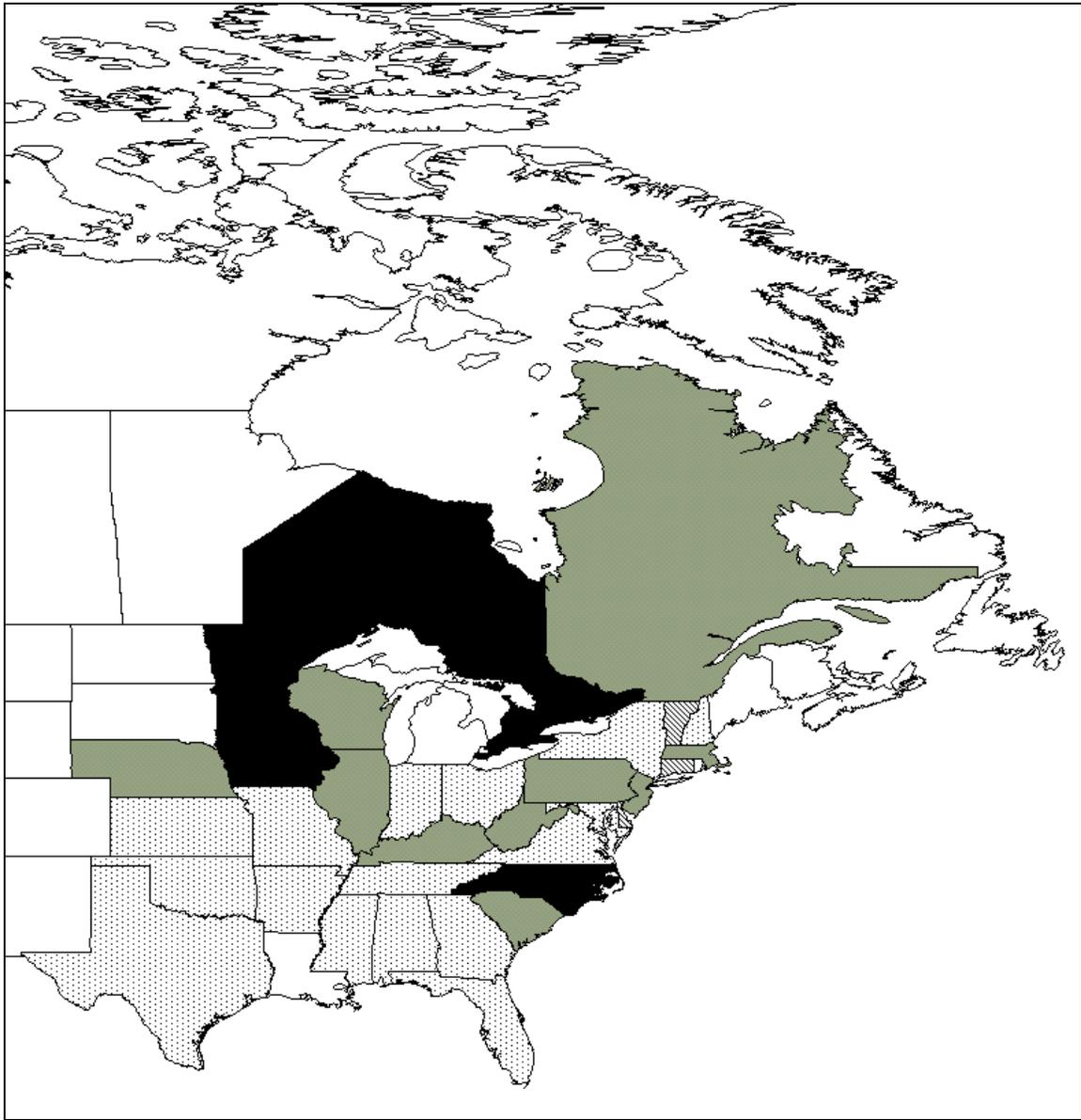


Figure 1. Occurrences of *Verbena simplex* in North America. States and provinces shaded in gray have one to five (or an unspecified number of) extant occurrences of the taxon. Areas shaded in black have more than five current occurrences. States with diagonal hatching are considered "historic," where the taxon no longer occurs. States with stippling are ranked "SR" ("Status Reported;" see Appendix 1 for an explanation of state ranks).

Table 2. New England Occurrence Records for <i>Verbena simplex</i>. Shaded occurrences are considered extant.			
State	EO #	County	Town
NH	None	Grafton	No data
NH	None	Grafton	Hanover
VT	None	No data	No data
VT	None	Bennington	Arlington
VT	None	Windsor	Woodstock
MA	.001	Berkshire	Sheffield
MA	.002	Hampshire	South Hadley
MA	.003	Hampshire	Granby
MA	.004	Hampshire	South Hadley
MA	.005	Hampshire	South Hadley
MA	.006	Hampden	Springfield
MA	.007	Hampden	Holyoke
MA	.008	Berkshire	Egremont
MA	.009	Norfolk	Wellesley
CT	.001	Middlesex	East Haddam
CT	.002	New Haven	Southbury
CT	.003	New Haven	West Haven
CT	.004	New Haven	Meriden
CT	.005	Litchfield	Sharon
CT	.006	New Haven	New Haven
CT	.007	Litchfield	Salisbury

Table 2. New England Occurrence Records for <i>Verbena simplex</i>. Shaded occurrences are considered extant.			
State	EO #	County	Town
CT	.008	Litchfield	Salisbury
CT	.009	Litchfield	Kent
CT	.010	Hartford	Southington
CT	.011	Middlesex	Cromwell
CT	.012	New Haven	Fair Haven
CT	.013	New Haven	Wallingford
CT	.014	New Haven	New Haven
CT	.015	Middlesex	East Haddam
CT	.016	Litchfield	Kent
CT	.017	New London	Montville
CT	.018	New Haven	New Haven
CT	.019	New Haven	New Haven
CT	.020	New Haven	North Branford
CT	.021	New Haven	Orange
CT	.022	Litchfield	Salisbury
CT	.024	New Haven	New Haven
CT	.025	New Haven	New Haven
CT	.026	New Haven	New Haven
CT	.027	New Haven	Hamden
CT	None	New Haven	New Haven
CT	None	New Haven	West Haven

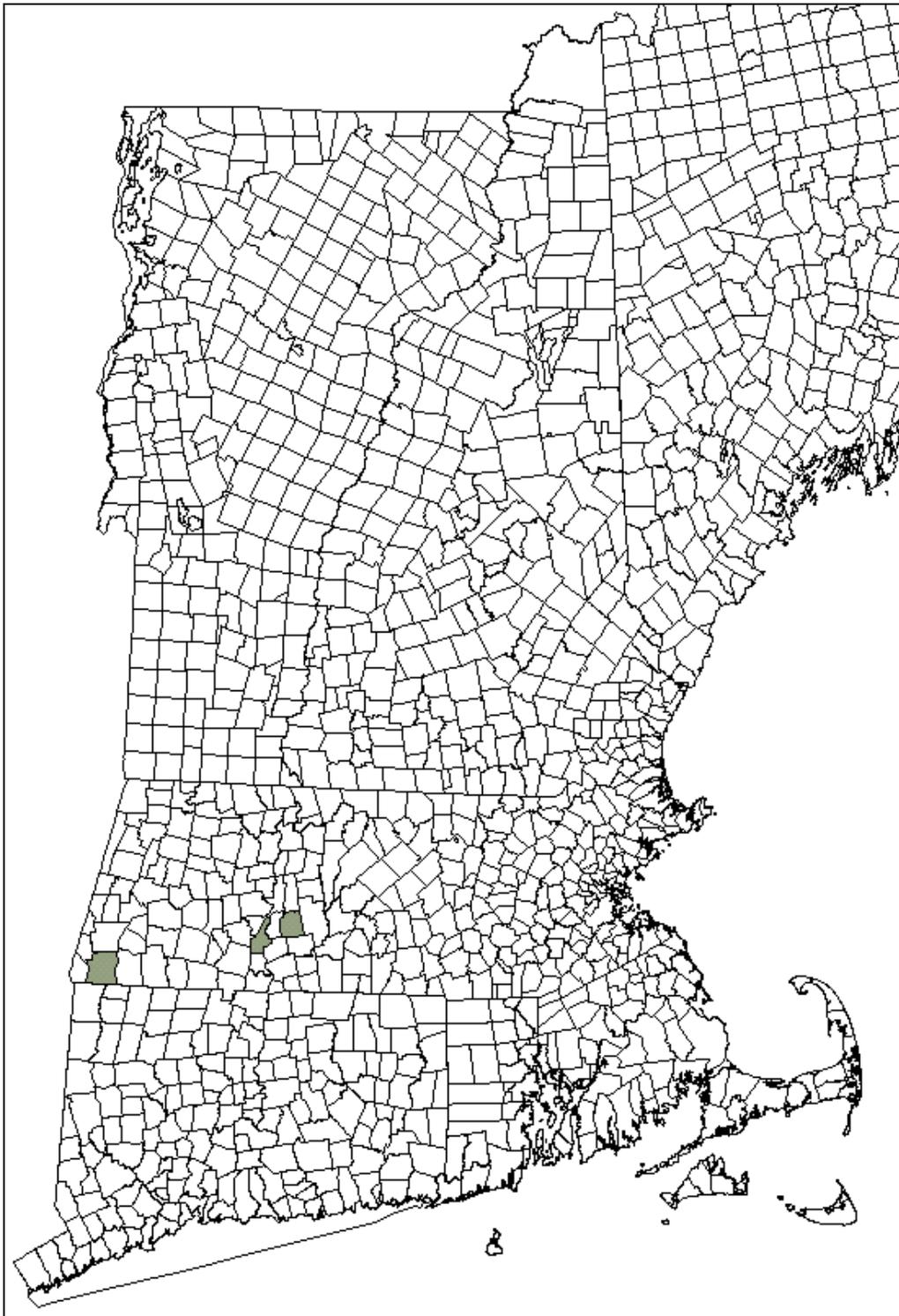


Figure 2. Extant occurrences of *Verbena simplex* in New England. Town boundaries are shown. Towns shaded in gray have 1 to 5 confirmed, extant occurrences of the taxon.

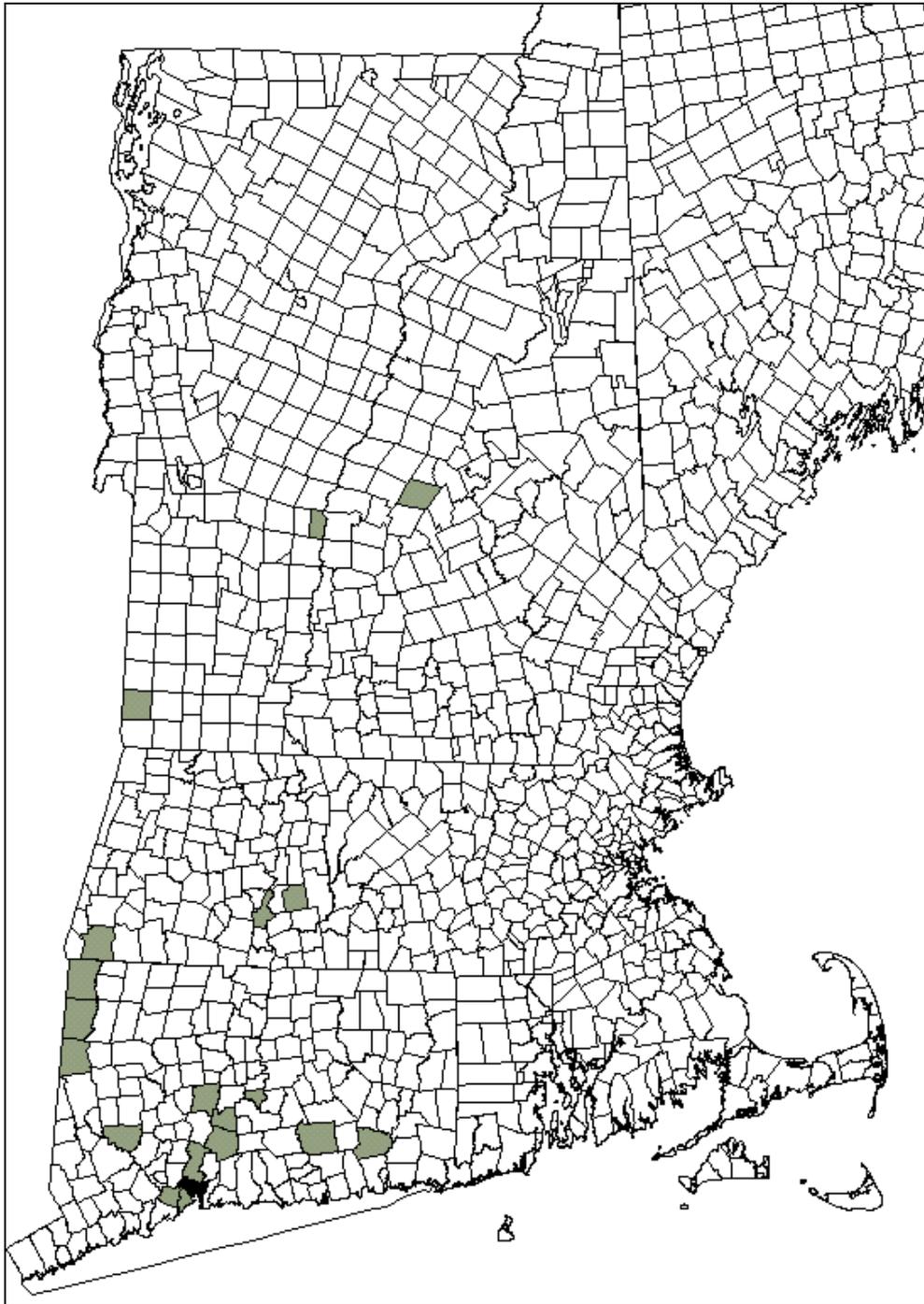


Figure 3. Historic occurrences of *Verbena simplex* in New England. Towns shaded in gray have 1 to 5 historic records of the taxon. The town shaded in black (New Haven, Connecticut) has more than 5 historic records.

CURRENT CONSERVATION MEASURES IN NEW ENGLAND

Current conservation of the three extant Massachusetts sites includes regular monitoring of each population; recent state acquisition of the Holyoke site; and landowner cooperation with the present owner of the Sheffield site. Seed has been collected at each site, and is stored for seedbanking at the New England Wild Flower Society. The New England Wild Flower Society has successfully germinated *Verbena simplex* seeds. Dried seeds from the MA .001 (Sheffield) population (31,000 seeds were collected in 1998) which had received cold treatment had a better than 50% rate of germination after being sown in the greenhouse. Trials with seeds collected from MA .003 (Granby), though far fewer in number, had a similar germination rate. The Garden also has 700 seeds collected in 2001 from the MA .007 (Holyoke) population that will be tested in 2002. So far, no seeds have germinated that had not received cold treatment (Bill Brumback, personal communication).

II. CONSERVATION

CONSERVATION OBJECTIVES FOR THE TAXON IN NEW ENGLAND

The main objectives for conserving *Verbena simplex* in the region are to secure the three existing sites and to introduce or reintroduce the species in several protected locations in Connecticut and Massachusetts. *Verbena simplex* has always been rare in New England due to its natural restriction to a regionally scarce habitat type and to its apparent intolerance of shade and competition. The several dozen populations documented in the region in the 19th and early 20th centuries could have been a temporary phenomenon associated with European colonization and post-settlement deforestation in the 18th and 19th centuries. Prior to this land clearing, which opened habitats for the species to occupy, the plant may have been as rare in New England as it is today. Reforestation of the New England landscape since the late 19th century and the loss of open, dry, calcareous uplands to development limit the potential for natural species recovery.

To secure the plant's regional survival, the three extant populations in western Massachusetts should be protected and new populations should be established in Connecticut (three) and Massachusetts (two). This plan would bring to eight the total number of New England populations. Habitat conditions at the three current sites should serve as a model for potential reintroduction sites. Bedrock type, soil pH, wind exposure, slope aspect, and species composition should be studied at the present sites and used as a basis for selecting habitats for reintroduction.

Seeds taken from both the Berkshire County and the Holyoke Range populations have germinated successfully in propagation trials at the Garden in the Woods (Bill Brumback, New England Wild Flower Society, personal communication).

In Massachusetts, the plant could be reintroduced to traprock balds in Hampshire and Hampden Counties and to marble and limestone uplands in Berkshire County. The traprock ridges in New Haven County and marble-limestone uplands in Litchfield County are potential habitats for the reintroduction of the species in Connecticut. Exposed ledges and dry, woodland openings removed from trails and other human disturbances would require regular monitoring but minimal habitat manipulation.

One example of a potential reintroduction site is an abandoned marble quarry in West Stockbridge owned by The Massachusetts Division of Fisheries and Wildlife. According to Henry Barbour (personal communication), conditions at this quarry resemble those of the Sheffield quarry site. Using the Sheffield population as a model, *Verbena simplex* could be planted in this quarry, and the habitat modified as needed to encourage its viability, expansion, and persistence. Other old quarries in Litchfield County, Connecticut as well as in Berkshire County should be examined as possible sites for reintroduction.

What is the optimum population number for these occurrences? With respect to the current populations, the Hampden and Hampshire County occurrences are very small (fewer than five plants at each site), but these populations have persisted for decades. Both populations occupy suitable habitat remote from human activities. In their present state, they provide a unique window for observing the dynamics of a regionally scarce taxon in natural conditions. Augmentation is not recommended *unless* the population is in a permanent decline, a situation which may apply to the tiny Hampshire County population, which did not appear in 2001.

The Berkshire County occurrence has grown from a total of 60 plants in 1982 to hundreds of plants in the late 1990's following scarification of the habitat. The Berkshire County population has responded favorably to habitat disturbances; it will be educational to observe changes in the population if the habitat is left alone for a period of years. If the numbers decline dramatically, a second bulldozing (or prescribed burn) on the quarry floor should restore this population.

With respect to the introduction of new populations, a total of 15 to 25 mature plants established at each location should be sufficient to initiate viable, permanent populations. These sites should be at least 0.5 acre in size, which would provide enough space for populations to expand and spread. This size should be adequate for experimental habitat manipulations (burning, mowing, and scarification, for example) to promote the establishment and permanence of populations.

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IV. APPENDICES

- 1. An explanation of conservation ranks used by The Nature Conservancy and Natureserve.**

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

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

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

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

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

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