

New England Plant Conservation Program

Agastache scrophulariifolia (Willd.) Kuntze
Purple Giant Hyssop

Conservation and Research Plan
for New England

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SUMMARY

Purple giant hyssop, *Agastache scrophulariifolia* (Willd.) Kuntze is a large, late-flowering, herbaceous perennial of the Lamiaceae. It grows along the edges of the upper limits of floodplains associated with high-gradient rivers and streams, favoring areas where competition from other plants is limited. Habitat preference in conjunction with the land-use history of historical and extant sites and the fact that its seeds require sunlight to germinate, point to a species dependent on soil disturbance. It is sympatric throughout most of its range with *Agastache nepetoides* (L.) Kuntze, which is also considered rare and is the only other *Agastache* species native to New England.

Historically, purple giant hyssop ranged from New England south to Georgia, west to Kansas and north into Ontario. However, its range is apparently shrinking as the species is now presumed extirpated from Massachusetts, Delaware, the District of Columbia, Kansas, Georgia and Ontario. In New England, purple giant hyssop appears to reach its eastern limit at the Connecticut River Valley and its northern limit in northern Vermont. There are three disjunct, historical occurrences, however, east of the Connecticut River Valley. One of those occurrences is believed to be adventive but it is uncertain if the others are as well.

Globally, purple giant hyssop is ranked G4 indicating that it is apparently secure; *Flora Conservanda* lists *A. scrophulariifolia* as Division 2 (Regionally Rare). In New England, it is ranked S1 (critically imperiled) in Vermont and Connecticut and SH (historic) in Massachusetts. Twenty three New England occurrences are historical and three are considered extirpated. The current known distribution in New England is limited to two populations in Connecticut. Herbarium searches at NCBS, NEBC, NYBG YU located 42 specimens from New England, including one occurrence from New Hampshire that was not in that state's database.

Threats to one of the Connecticut occurrences include: changes in land use that destroy its riparian habitat; competition from non-native species; natural succession; and browsing by deer. Conservation efforts have been regular but limited to keeping natural succession at bay. There has been no management or consistent yearly surveys of the other occurrence.

The highest conservation priority is to protect and maintain the two extant Connecticut occurrences. Further research on species biology is critical to ensure the successful long-term conservation of the species. Recommendations also include surveys of all documented sites — both extant and historical — including the general vicinity occurrences for suitable habitats. Since purple giant hyssop is sensitive to competition and is easily out-competed, populations tend to be short-lived and probably do not remain at the same site for very long.

PREFACE

This document is an excerpt of a New England Plant Conservation Program (NEPCoP) Conservation and Research Plan. Full plans with complete and sensitive information are made available to conservation organizations, government agencies, and individuals with responsibility for rare plant conservation. This excerpt contains general information on the species biology, ecology, and distribution of rare plant species in New England.

The New England Plant Conservation Program (NEPCoP) of the New England Wild Flower Society is a voluntary association of private organizations and government agencies in each of the six states of New England, interested in working together to protect from extirpation, and promote the recovery of the endangered flora of the region.

In 1996, NEPCoP published “*Flora Conservanda: New England.*” which listed the plants in need of conservation in the region. NEPCoP regional plant Conservation Plans recommend actions that should lead to the conservation of *Flora Conservanda* species. These recommendations derive from a voluntary collaboration of planning partners, and their implementation is contingent on the commitment of federal, state, local, and private conservation organizations.

NEPCoP Conservation Plans do not necessarily represent the official position or approval of all state task forces or NEPCoP member organizations; they do, however, represent a consensus of NEPCoP’s Regional Advisory Council. NEPCoP Conservation Plans are subject to modification as dictated by new findings, changes in species status, and the accomplishment of conservation actions.

Completion of the NEPCoP Conservation and Research Plans was made possible by generous funding from an anonymous source, and data were provided by state Natural Heritage Programs. NEPCoP gratefully acknowledges the permission and cooperation of many private and public landowners who granted access to their land for plant monitoring and data collection.

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I. BACKGROUND

INTRODUCTION

Purple giant hyssop, *Agastache scrophulariifolia* (Willd.) Kuntze, is a late-flowering, herbaceous perennial of the Lamiaceae. Characteristic features include: small, purplish flowers compacted into terminal spikes; a branched, obtusely four-angled stem that is diamond-shaped in cross-section; and leaves with an anise-like aroma when crushed. Throughout most of its range, it is sympatric with *Agastache nepetoides* (L.) Kuntze, the only other *Agastache* native to New England.

Historically, the taxon ranged from New England south to Georgia, west to Kansas and north into Ontario. It appears that its range is contracting. In New England, *Agastache scrophulariifolia* apparently reaches its eastern limit at the Connecticut River Valley and its northern limit in northern Vermont. New England floras and herbarium records from the late 1800's and early 1900's indicate that while the species was once widespread, it was uncommon even then. The few extant occurrences in New England show *Agastache scrophulariifolia* favoring the mesic, sandy soils in upland edge areas along floodplains where competition from other plants is limited; historically, it has also been documented from thickets, meadows, rich woods and roadsides throughout its range.

Globally ranked G4, *Agastache scrophulariifolia* is apparently secure. In New England, it is considered regionally rare and is listed as Division 2 in *Flora Conservanda: New England* (Brumback and Mehrhoff et al. 1996), indicating fewer than 20 documented occurrences since 1970. Vermont and Connecticut list *Agastache scrophulariifolia* as S1, critically imperiled. In Massachusetts, it is listed as SH (historic). There is one New Hampshire record from 1899 but it is not tracked by the New Hampshire Natural History Inventory (Sara Cairns, personal communication). The taxon is not reported from Maine and Rhode Island; *Agastache scrophulariifolia* and its native congeners are not known to occur outside of cultivation in those states.

This Conservation and Research Plan evaluates the status of *Agastache scrophulariifolia* in New England and provides recommendations necessary to recover and preserve the taxon. The ecology and biology of *Agastache scrophulariifolia* is largely unknown. Therefore, the critical need for further research is emphasized.

DESCRIPTION

Morphological characteristics were compiled from the following sources: Lint and Epling (1945); Gleason and Cronquist (1991) and Britton and Brown (1970), Moorhead and Corrigan, personal observations (CT. 023 [Roxbury]). *Agastache scrophulariifolia* (Lamiaceae) is a tall, late-flowering, herbaceous perennial growing up to 2.1 m in height. Its obtusely four-angled stem (diamond-shaped in cross-section), the upper part of which is branched, is usually tinged with purple. The inflorescence, which grows up to 15 cm in length, is composed of small flowers compacted into terminal, cylindrical or tapering verticillate clusters 1.5 - 2 cm in diameter. Occasionally, the clusters are interrupted. Glabrous, inconspicuous bracts, with margins often colored, subtend the inflorescence. The 6 to 8 mm-long corolla ranges from pale pink to purple, projecting significantly beyond the calyx. The calyx is white or purplish; its 2 to 2.5 mm teeth are acute and deltoid in shape. Leaves are opposite, petioled, coarsely serrate and rounded to somewhat cordate at the base. Crushed leaves emit a strong, anise-like aroma. Leaves grow up to 13 cm in length. Leaf tips are acuminate or acute. The upper and lower leaf surfaces vary from nearly glabrous to pubescent. Petioles tend to be pubescent but are sometimes villous; those of the lowest leaves are often 5 cm long.

In New England, *Agastache scrophulariifolia* flowers from July through September. The fruit is a 1.5 to 2mm, dark brown nutlet with a hispidulous apex and is rounded-truncate in shape.

Agastache scrophulariifolia is sympatric throughout most of its range with *A. nepetoides* (L.) Kuntze, yellow giant hyssop, but no other *Agastache* species. Although the two species are unusually tall for mints and similar in their upright habit and in leaf shape, *A. scrophulariifolia* is readily distinguished from its congener by its obtuse stem, and purplish flowers; *A. nepetoides* has a square, winged stem and yellowish flowers (Britton and Brown 1970, Gleason and Cronquist 1991).

TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY

The genus *Agastache* (Lamiaceae, Tribe Nepeteae) is composed of two allopatric sections, *Agastache* and *Brittonastrum*, separated on the basis of geographic distribution and stamen orientation (Lint and Epling 1945). *Agastache* section *Agastache*, into which *A. scrophulariifolia* is placed, has a disjunct distribution — preferring the mesic soils of eastern and central North America, as well as eastern Asia. The antrorsely bent filaments of the upper stamens are characteristic of section *Agastache*. *Agastache* section *Brittonastrum*, on the other hand, is distributed in the dry regions of the American southwest (including Mexico) and is typified by parallel stamens.

Electrophoretic enzyme analyses by Vogelmann and Gastony (1987) show that section *Agastache* is comprised of infrasectional groups. Similarities in banding patterns placed

Agastache scrophulariifolia and *A. foeniculum* together into one group, suggesting that they are closely related, while a dissimilar banding pattern put *A. nepetoides* into a different group all by itself. *Agastache rugosa*, a disjunct Asian species that exhibited a closer relationship to the eastern species than to those of the west, was also placed into a separate group. All four western species — *Agastache utricifolia*, *A. cusickii*, *A. parviflora*, and *A. occidentalis* — were found to belong to yet another infrasectional group.

Although sectional differences are clear, the variable morphology of the genus and consequent difference of opinion on the type specimen has created uncertainty among the authors. According to Lint and Epling (1945) the type is a garden specimen. Hence, *Agastache scrophulariifolia* has undergone many nomenclatural changes (Lint and Epling 1945, Vogelmann 1983, Sanders 1987). Synonyms are as follows (Vogelmann 1983):

- *Hyssopus scrophulariaefolius* Willd. Sp. PL. 3: 48. 1800
- *Lophanthus scrophulariaefolius* (Willd.) Benth. Bot. Reg. Sub.t. 1282. 1829
- *Hyssopus catariaefolius* Hort. Par. Ex Benth., Lab. 463. 1834
- *Vleckia scrophulariaefolia* (Willd.) Raf. FL. Tellur. 3: 89. 1836
- *Agastache scrophulariaefolia* Kuntze. Rev. Gen. Pl. 511. 1891
- *Agastache scrophulariifolia* (Willd.) Kuntze. Rev. Gen. 511. 1891
- *Lophanthus scrophulariaefolius* var. *mollis* Fern. Ex Day, Rhodora 1: 220. 1899
- *Agastache scrophulariaefolia* var. *mollis* (Fern. ex Day) Heller, Muhlenbergia 1: 4. 1900

SPECIES BIOLOGY

Agastache scrophulariifolia is an herbaceous perennial. Stems with infructescences remain persistent throughout the winter. Basal rosettes can emerge as early as mid-March (Corrigan, personal observation). At the southern-most Roxbury (CT .023) subpopulation, Corrigan observed seven rosettes on 14 March 2002, approximately 5 cm in diameter, each emerging from the base of dried stems that remained from the previous year. The rosettes were covered with dried grasses, mowed the previous year during field management. Rosettes were multi-layered and light green in color with some white along the leaf-margins. Rosettes were not observed emerging from stem bases at the northern-most Roxbury when Corrigan checked under the leaf-litter. It is important to note that the southern-most subpopulation at CT .023 (Roxbury) receives an estimated five hours of full sun during the growing season, while the northern-most subpopulation receives approximately three. Plants at both sites have a southerly exposure.

Agastache scrophulariifolia is evidently capable of rapid propagation by seeds in both a natural setting and under cultivation, and it apparently transplants easily. It is not known, however, if seeds are persistent and viable in the soil seed bank. At the Shelton site (CT .002),

Mehrhoff noted two plants when he discovered the occurrence in 1992. By the following year, after the soil near the plants had been disturbed by the road crew, Mehrhoff found that the population had increased to approximately 100 plants that were growing out of the mound. According to Chris Mattrick (New England Wild Flower Society, personal communication), seeds planted at Garden in the Woods in Framingham, Massachusetts were first sown into flats. When the plants reached approximately 30 centimeters in height, they were transplanted into the rare plant garden and handled the transition well. Bill Cullina (New England Wild Flower Society, personal communication) noted that an initial planting of two or three plants covered an area approximately 3 square meters but by the following year, seedlings filled an area approximately 45 square meters which was open ground with a light mulch covering. He also noted that the plants "clumped" and did not reproduce vegetatively. He also stated that seeds require freshly disturbed soil and sunlight to germinate. It must be noted that the seeds were obtained from the Shaw Arboretum in Missouri through the *Index Seminum*. Their exact origin is uncertain and they are, therefore, of no conservation value to New England conservation efforts. Similar studies are needed for seed stock from New England populations.

Pollinators of *Agastache scrophulariifolia* have not been identified, even though some members the genus such as *Agastache foeniculum* are considered important bee forage (Ayers and Widrechner 1994, Fuentes-Granados 1997). Quinlan observed *Bombus* sp. on flowers at the West Cummington, Massachusetts station, but evidence of pollen transfer was not documented. According to North Haven Gardens, purple giant hyssop attracts hummingbirds, another potential pollinator, but this has not yet been scientifically documented.

Economic Importance

Agastache scrophulariifolia and its cultivars are sold by nurseries as an ornamental. Seeds as well as plants are available through the trade. Cultivars include 'Blue Fortune', 'Premium Blue', 'Licorice Blue', 'Carmine Red' and 'Premium Blush'. A white cultivar, 'White Licorice', is also in the trade (e.g., Rommy Lopat's Weedpatch 2002, The Mint Chronicles 2002).

The genus *Agastache* is noted for its essential oils that are used by the flavoring and perfume industries (Fuentes-Granados 1997). Some species, most notably *A. foeniculum*, are important to the honey industry as a valuable source of nectar for honey bees (Ayers and Widrechner 1994). It is not known whether *Agastache scrophulariifolia* has such economic potential.

HABITAT/ECOLOGY

Floras generally describe the habitat of *Agastache scrophulariifolia* throughout its range as rich woods and thickets (Appendix 1). Sorrie (1987) acknowledges that the preferred

habitat in Massachusetts is not known "with certainty" and that "most Massachusetts collections are from roadside thickets or woods near rivers." Collection data from many New England herbarium specimens (Appendix 2) point to a riverine distribution, while site information from the few extant occurrences suggests an affinity for the upper edges of high-gradient stream floodplains where soils are rich, moist, sandy and consequently well-drained and where competition from other plants is minimal.

Agastache scrophulariifolia apparently also requires some disturbance for seed germination and for populations to persist at a given site over time. Field observations of New England occurrences show that it is intolerant of competition from other plants and requires some degree of disturbance to persist. Bill Moorhead (Consulting Botanist, personal communication) suggests that perhaps the plants at the CT .023 (Roxbury) southern suboccurrence are growing exclusively at the meadow's edge because of their inability to compete with the dense root mats of grasses. The meadow proper, however, also exhibits preferred site conditions such as mesic, sandy soils and plenty of sunlight. Les Mehrhoff (Torrey Herbarium, University of Connecticut, personal communication) reported that the population he observed growing in disturbed soil at the Shelton station (CT .002) decreased significantly by the following year due to the natural succession of the disturbed area. Charlie Quinlan in his field notes regarding the West Cummington, Massachusetts station (MA No EO Number), which was located in a clearing in the woods, was concerned that "succession will gradually take over at some point" and recommended that other clearings be created so that the species can persist.

Purple giant hyssop requires a moderate amount of sunlight to persist. Vogelmann (Raytheon Corporation, personal communication) has observed plants in "young, sparse deciduous woodlands with lots of sunlight filtering through the canopy," noting that perhaps it can tolerate some shading. It is doubtful that a population could sustain itself under such conditions unless there are regular disturbance events to keep the site open by preventing canopy closure.

The vectors for seed dispersal have not been identified. Dr. Ferry Boumann (Hugo de Vries Laboratory, personal communication) notes that the dispersal of many temperate plants, including the members of the Lamiaceae, is often obscure and/or a combination of several vectors (polychory). Most plants with winter-persistent infructescences are wind-ballasts. It is not known what part, if any, the hairs at the apex of the seed may play in dispersal. They may aid in wind-dispersal or might even help to anchor the seeds during germination. Also, winter-persistent infructescences are a type of aerial seed-bank that enable seeds to escape biodegradation in the soil or predation by animals such as mice.

Little is known about the pests and pathogens of *Agastache scrophulariifolia*. Wilson (1908) merely lists the taxon as a host for the fungus *Peronospora lophanthii* Farlow; it is unknown whether the fungus is a pathogenic to the taxon. According to the Mint Chronicles, a gardening web page, the Genus *Agastache* "is predominantly affected by mildews and rusts,"

but no other specific information is available. Moorhead noted some insect damage on plants at the northern-most Roxbury subpopulation (CT .023) but it is not evident whether the insects negatively impacted the occurrence.

THREATS TO TAXON

The most apparent threat to the long-term survival of *Agastache scrophulariifolia* is the succession of the once open agrarian landscape into one that is forested. Most of the historical Element Occurrences (EOs) and specimens found through herbarium searches date back to the late 1800's to early 1900's when the landscape was more open; many specimens were collected from more or less open sites such as riverbanks, roadsides and thickets. Farm machinery may have served as a vector for seed dispersal and also might have created the disturbance necessary for plant populations to persist and disperse in a given area.

The "taming" of New England rivers may also play a negative role in the taxon's long-term survival. It is possible that free-flowing, undammed rivers were the original or initial habitat creators and maintainers (Bill Moorhead, personal communication), eliminating competing vegetation through scour from ice flows and occasional violent flooding. Once these rivers were dammed and velocity slowed, farming activities might have replaced natural processes.

Other threats include development. The Revere occurrence (MA .001), for example, has disappeared due to development of the island that eliminated all viable habitat.

Short-term or immediate threats, evident at one extant site regularly surveyed (CT .023 [Roxbury]) include: natural succession; competition from non-native invasive plants; and browsing by deer.

DISTRIBUTION AND STATUS

General Status

Agastache scrophulariifolia is found in the eastern half of North America, from New England, west to Nebraska, and south to North Carolina. Table 1 and Figure 1 summarize its distribution in North America.

Table 1. Occurrence and status of *Agastache scrophulariifolia* 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)
Connecticut (S1, E)	Illinois (S?)	Arkansas (SRF)	Delaware (SH)
Maryland (S1S2)	Iowa (S4)	Indiana (SR)	District of Columbia (SX)
Nebraska (S1)	Kentucky (S3)	Minnesota (SR)	Georgia (SH)
Vermont (S1, T)	Michigan (S?)	Missouri (SR)	Kansas (SX)
	North Carolina (S3)	New Hampshire (SR)	Massachusetts (H)
	West Virginia (S?)	New York (SR)	Ontario (SX)
	South Dakota (SU)	Ohio (SR)	
		Pennsylvania (SR)	
		South Carolina (SR)	
		Virginia (SR)	
		Wisconsin (SR)	

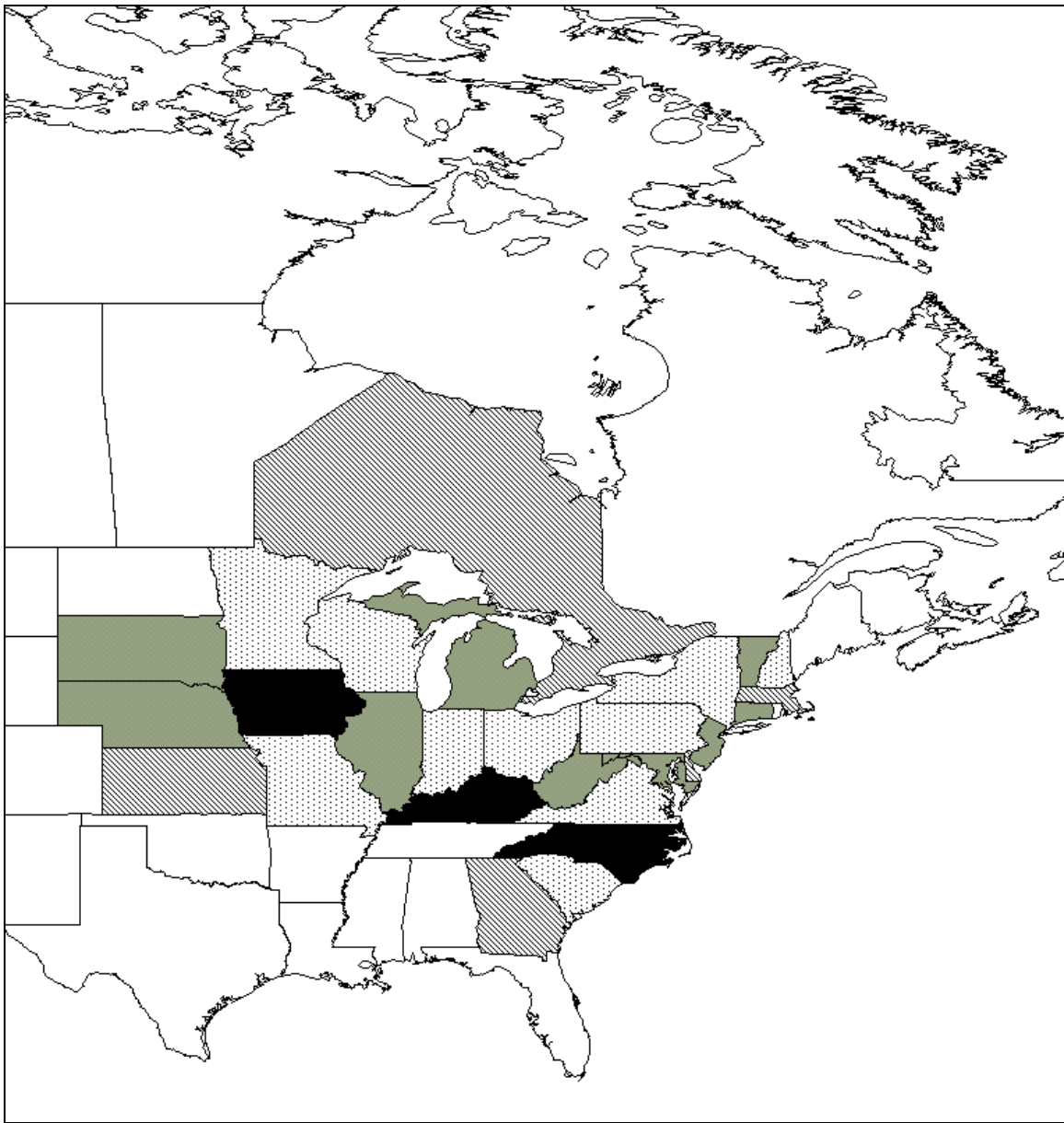


Figure 1. Occurrences of *Agastache scrophulariifolia* in North America. States shaded in gray have one to five current occurrences of the taxon. States shaded in black have more than five confirmed occurrences. States and provinces with diagonal hatching are designated "historic" or "presumed extirpated," where the taxon no longer occurs. States with stippling are ranked "SR" (status "reported" but not necessarily verified). See Appendix 3 for explanation of state ranks).

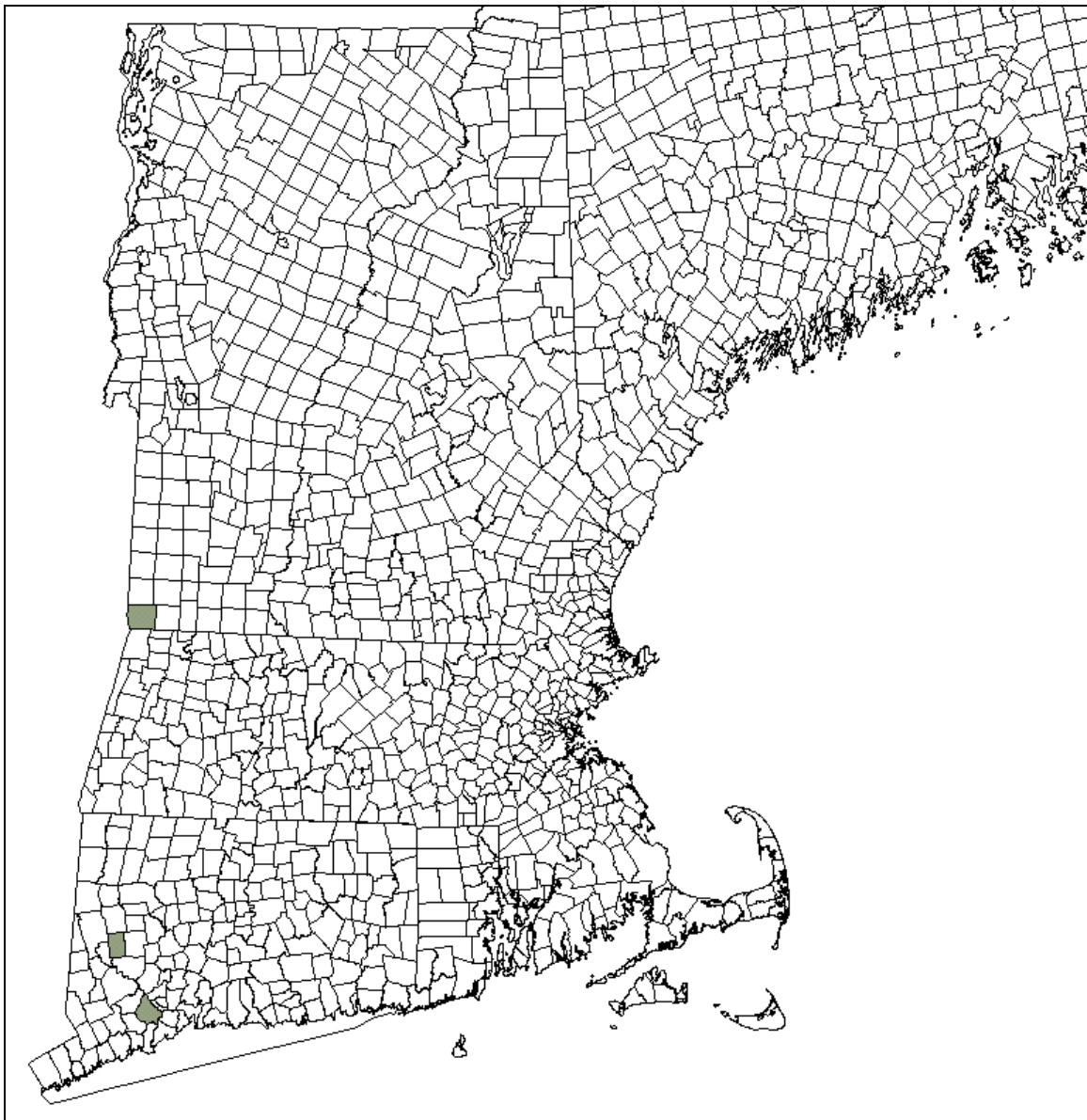


Figure 2. Extant occurrences of *Agastache scrophulariifolia* in New England. Town boundaries for New England states are shown. Towns shaded in gray have one to five confirmed, extant occurrences of the taxon.

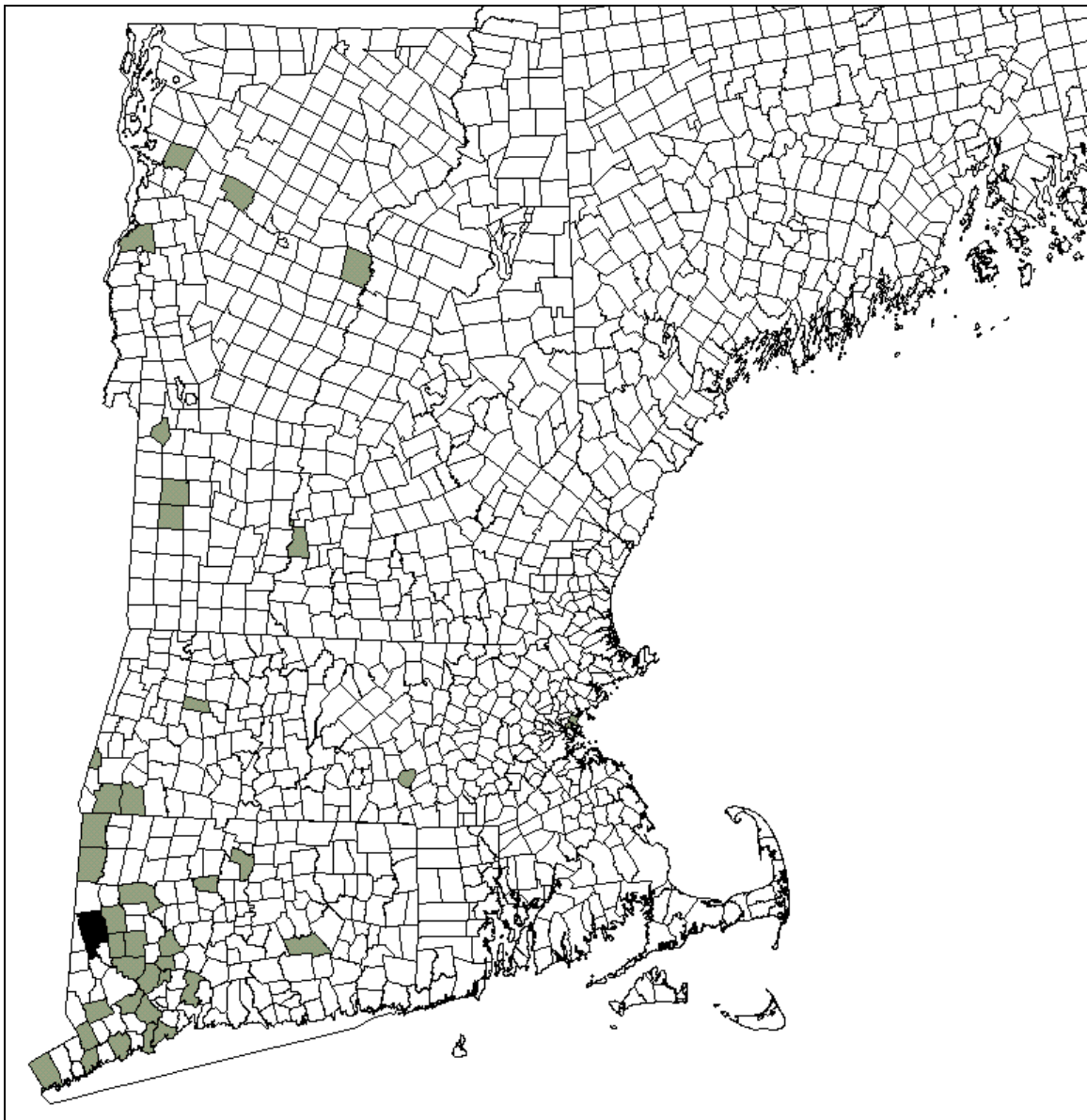


Figure 3. Historical occurrences of *Agastache scrophulariifolia* in New England. Towns shaded in gray have one to five historic records of the taxon, and those shaded in black have more than five records.

Status of All New England Occurrences — Current and Historical

New England Natural Heritage programs have documented 34 Element Occurrences, many of which have not been assigned EO ranks. The current known distribution in New England is limited to two populations, both in Connecticut. According to NEPCoP criteria, however, five additional occurrences can be considered extant because plants have been observed at those sites since 1970. Twenty three occurrences are presumed historical, three of which are considered extirpated.

Agastache scrophulariifolia once occurred in four New England states. Most occurrences are documented from west of the Connecticut River valley and just south of northern Vermont, the apparent limits of its range. The species has declined significantly in numbers since the late 1800's. Herbarium searches at Yale University (YU), the New England Botanical Club (NEBC), the Connecticut Botanical Society (NCBS), the George Safford Torrey Herbarium (CONN), and the New York Botanical Garden (NYBG) located 42 New England specimens listed in Appendix 1. Unfortunately, due to insufficient locality information on many of the labels, the exact number of unique occurrences is uncertain. One occurrence (CT .x), however, can be considered extant (according to NEPCoP definitions) and should be added to the Connecticut Natural Diversity Database (see Recommended Actions). Two historical occurrences (CT .xi and CT .xxx) have good locality information and should also be added.

**Table 2. New England Occurrence Records for *Agastache scrophulariifolia*.
Shaded occurrences are considered extant.**

State	EO #	County	Town
VT	.001	Bennington	Pownal
VT	.002	Rutland	Middletown Springs
VT	.003	Washington	Waterbury
VT	.004	Orange	Newbury
VT	.005	Addison	Ferrisburgh
VT	.006	Chittenden	Essex
VT	.007	Bennington	Dorset
VT	.008	Bennington	Manchester
MA	.001	Suffolk	Revere
MA	.002	Berkshire	Sheffield
MA	No #	Hampshire	West Cummington
CT	.001	Litchfield	Roxbury
CT	.002	Fairfield	Shelton
CT	.003	Litchfield	Salisbury
CT	.004	Fairfield	Fairfield
CT	.005	Fairfield	Stratford
CT	.006	New Haven	Beacon Falls
CT	.007	Litchfield	Woodbury
CT	.008	Hartford	Windsor
CT	.009	Fairfield	Wilton
CT	.010	Fairfield	Greenwich
CT	.011	New Haven	Waterbury
CT	.012	Fairfield	Redding
CT	.013	Litchfield	Sharon
CT	.014	Litchfield	New Milford
CT	.015	Litchfield	Washington
CT	.016	New Haven	Southbury
CT	.017	Hartford	Avon
CT	.018	Fairfield	Monroe
CT	.019	Fairfield	Norwalk
CT	.020	New Haven	Milford
CT	.021	Litchfield	Litchfield
CT	.022	New Haven	Naugatuck

CURRENT CONSERVATION MEASURES IN NEW ENGLAND

Vermont

The state of Vermont lists *Agastache scrophulariifolia* as a "Threatened Species" which is defined as a species that has a high likelihood of becoming Endangered in the near future and is protected under the Vermont Endangered Species Law (10 V. S. A. Chapter 123). Taking of any species included on the list requires a permit from the Agency of Natural Resources; individuals taking a listed species are subject to a fine. However, no conservation measures are currently being implemented for *A. scrophulariifolia* because this species is considered to be historic in Vermont.

Connecticut

The State of Connecticut lists *A. scrophulariifolia* as "Endangered," which is defined as any native species documented by biological research and inventory to be in danger of extirpation throughout all or a significant portion of its range within the state and to have no more than five occurrences in the state, and any species determined to be an "Endangered species" pursuant to the federal Endangered Species Act. The State Endangered and Threatened species are protected by the Connecticut Endangered Species Act (Connecticut General Statutes Sec. 26-303 to Sec. 26-315). The purpose of the act is to conserve, protect, restore and enhance any endangered or threatened species. The Act requires that any action authorized, funded, or performed by state agencies cannot threaten the continued existence of any State Endangered or State Threatened species. While the act also prohibits the taking of these species for the purpose of sale, transport or export, it does not prohibit a private landowner from performing legal activities on his land that may result in the incidental taking of the species.

Wetland regulations, administered by local Inland-Wetland commissions can afford substantial protection to plants located within regulated areas. The laws, however, vary with municipalities and commission members need to be aware of the plant's possible existence so that decisions regarding potential land-use activities safeguard its habitat.

Conservation measures have been taken at CT .023 in Roxbury. The landowner has been contacted and some cooperation has been achieved at the northern subpopulation: the landowners are amenable to monitoring activities and the thinning back of some competing vegetation. They are concerned, however, about losing their privacy; the land trust property boundary abuts the western and southern edge of their property adjacent to the plants, while the land trust trail runs along the western edge of their property. Some large shrubs, including *Lonicera* spp., afford the owners some protection. At the southern subpopulation, located on Land Trust property, competing vegetation has been thinned back and the area in the immediate vicinity of the plants has been staked out to prevent the plants from being mowed down during routine field maintenance.

II. CONSERVATION

CONSERVATION OBJECTIVES FOR TAXON IN NEW ENGLAND

The conservation objectives for *Agastache scrophulariifolia* are to protect, study, and maintain the four known extant populations. The taxon should be reintroduced to at least three historical sites to levels that will ensure their ongoing survival. Population sizes should have a minimum of 10-15 individuals for sustainability but larger populations consisting of 100-350 individuals would be preferable, especially for biological studies. *De novo* surveys may add additional Element Occurrences while simultaneously providing valuable ecological information and permitting a more accurate assessment of the taxon's distribution.

The New England populations are critically important to preserve because they are at the northeastern limit of the taxon's range, which is apparently contracting. Only one other *Agastache* species, *Agastache nepetoides*, occurs in New England, and it is also rare (Toomey and Toomey 2002). The number of occurrences has dropped dramatically since the late 1800's and early 1900's, evidently due to changes in land use such as the succession of once open farmlands into forests, the loss of habitat due to development, and competition from non-native invasive plants.

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IV. APPENDICES

1. Notes on *Agastache scrophulariifolia* from Various Floras
2. Additional New England Occurrence Records of *Agastache scrophulariifolia*
Compiled from Herbarium Searches
3. An Explanation of Conservation Ranks Used by The Nature Conservancy and
NatureServe

1. Notes on *Agastache scrophulariifolia* from Various Floras

Delaware: "Infrequent in valleys of Red Clay and Brandywine Creeks." Flowers mid-August to September. Page 220 in Tatnall, R. R. 1946. *Flora of Delaware and the Eastern Shore*. The Society of Natural History of Delaware, Lancaster, Pennsylvania, USA.

Illinois: "Sandy soil in open woods along roads, infrequent." August - September. Page 217 in Gordon, R. E. (Editor). 1971. *Flora of Illinois*. American Midland Naturalist Monograph Number 7. University of Notre Dame, Notre Dame, Indiana, USA.

Indiana: "A rare plant and found more often in the northern part of the state. It is generally found in somewhat moist and sandy soils in dry, open woods and along roadsides. The flowers vary greatly in color. They are usually purplish but sometimes white with a tinge of purple or pink." Pages 806-870 in Deam, C. C. 1984. *Flora of Indiana*. J. Cramer, Vaduz, Germany.

Maryland: "Woodland. Reported from Frederick, Howard, and Baltimore Counties; also the Mountain Zone." July-September. Page 801 in Brown, M. L. and R. G. Brown. 1984. *Herbaceous Plants of Maryland*. University of Maryland, College Park, Maryland, USA.

Missouri: "Occurs in open and cut-over woods, low alluvial ground near streams, and thickets." Northern and west-central Missouri. July-September. Page 1278 in Steyermark, J. A. 1975. *Flora of Missouri*. The Iowa State University Press, Ames, Iowa, USA.

New Jersey: "Frequent on the edges of woods in the northern counties; rare southward in the Middle district." Late July- September. Page 666 in Stone, W. 1973. *The Plants of Southern New Jersey*. Quarterman Publications, Boston, Massachusetts, USA.

New York: "In situations similar to the preceding" referring to *Agastache nepetoides*: wild banks, in rich gravelly and bottomland soils. "Rare or absent on the coastal plain. A plant of the rich lands of the Mississippi Basin." Page 357 in Wiegand, K. M. and Eames, A. J. 1925. *The Flora of the Cayuga Lake Basin, New York. Vascular Plants*. Cornell University, Ithaca, New York, USA.

Ohio: "Mostly in northeastern and south-central counties; woods, thickets, banks and ditches along roads and railroads." Late July - September. Page 392, in Cooperrider, T. S. 1995. *The Dicotyledoneae of Ohio. Part 2. Linaceae through Campanulaceae*. Ohio State University Press: Columbus, Ohio, USA.

Pennsylvania: "Rich woods, moist thickets and roadsides." Page 304 in Rhoads, A. F. and Klein, W. M. Jr. 1993. *The Vascular Flora of Pennsylvania: Annotated Checklist and Atlas*. American Philosophical Society, Philadelphia, Pennsylvania, USA.

South Dakota: "Rare to infrequent in upland woods of the east". August to September. Page 337 in Van Bruggen, T. 1985. *The Vascular Plants of South Dakota*. Second Edition. Iowa State University Press, Ames, Iowa, USA.

West Virginia: "Rich woods and thickets, mostly in the mountains (Barbour, Greenbrier, Hancock, Hampshire, Mercer, Mineral, Pocahontas, Summers, Tucker, and Wetzel Counties); much scarcer than preceding" (referring to *Agastache nepetoides*). Page 800 in Strausbaugh, P. D. and E. L. Core. 1973. *Flora of West Virginia*. Part III. Second Edition. West Virginia University, Morgantown, West Virginia, USA.

2. Additional New England collections of *Agastache scrophulariifolia* compiled from herbarium searches

State/ id no	County	Town	Date	Description	Collector	Herbarium
NH.i	Cheshire	Walpole	1899-08-02	Thicket	M. L. Fernald	NEBC
VT.i	Bennington	Pownal	1902-08-10	Fence hedgerow opposite mowing	W. H. B.	NEBC
VT.ii	Bennington	Manchester	1899-08		H. J. Banker	NYBG
MA.i	Suffolk	Chelsea	1861-08-16		Wm. Boott	NEBC
MA.ii	Berkshire	Alford	1912-09-06	Roadside thicket	R. Hoffman	NEBC
MA.ii	Berkshire	Sheffield	1916-07-29	Roadside thicket		NEBC
MA.iv	Berkshire	New Marlborough	1920-08-28		R. Hoffman	
CT.i	New Haven	Beacon Falls	1879-08-21		E. B. Harger	NEBC
CT.ii	New Haven	Beacon Falls	1886-08-14	"(Naugatuck R. R.) opposite depot"	A. L. Winton	YU
CT.iii	New Haven	Beacon Falls	1880-08-17		E.B. Harger	NCBS
CT.iv	New Haven	Beacon Falls	1886-08-14		A. L. Winton	YU
CT.v	New London	Colchester	1902-09-14	Roadside east of Viaduct Station	C. B. Graves	NEBC
CT.vi	Fairfield	Fairfield	1914-09-13	Edge of hillside thicket in Mill River Valley. Plentiful	E.H. Eames	CONN and YU
CT.vii	New Haven	Hamden	1890-07-23	Rich woods, High Rock Grove		NCBS
CT.viii	Fairfield	Monroe	1932-08-29	Dry thicket along the Housatonic River	E.H. Eames	CONN
CT.ix	Litchfield	New Milford	1934-08-19	Edge of dry woods, 2 mi. south of N. Milford; 6 ft. high	L. Griscom	NEBC
CT.x	Litchfield	New Milford	1982-09-25	Very dry roadside along open roadside; River Road	R. Porges	CONN
CT.xi	Litchfield	New Milford	1980-08-30	Deciduous woods along Housatonic River	H. E. Ahles	NYBG
CT.xii	Litchfield	New Milford	1929-07-23	Roadside near Mt. Tom	E. B. Harger	NCBS
CT.xiii	Litchfield	New Milford	1859		D.C. Eaton	YU
CT.xiv	Litchfield	New Milford	1926-08-26	Roadsides	E.B. Kelsey	YU

2. Additional New England collections of *Agastache scrophulariifolia* compiled from herbarium searches

State/ id no	County	Town	Date	Description	Collector	Herbarium
CT .xv	New Haven	Oxford	1896-09-06	Near Housatonic River	C. H. Bissell	NEBC
CT .xvi	New Haven	Oxford	1896-09-06	Near Otter Rock	E.B. Harger	NEBC
CT .xvii	Litchfield	Roxbury	1919-08-08	Moist hillside	G. E. Nichols	YU
CT .xviii	Litchfield	Salisbury	1909-09-07	Roadside thicket	C.A. Weatherby	NEBC
CT .xix	Litchfield	Salisbury	1909-09-07	Thicket	C.H. Bissell	NCBS
CT .xx	Fairfield	Shelton	1903-08-18	Near the Housatonic River below Shelton	E.B. Harger	NCBS
CT .xxi	Fairfield	Shelton	1938-09-02	From a colony growing on a dry, lightly wooded bank near the Housatonic River	E.H. Eames	CONN and NCBS
CT .xxii	Fairfield	Stratford	1897-08-15	Low woods	E.H. Eames	NCBS
CT .xxiii	Litchfield	Washington	1919-08-07	Low ground	A. W. Evans	YU
CT .xxiv	Litchfield	Washington	1919-07-20	Moist thickets	A. W. Evans	YU
CT .xxv	New Haven	Waterbury	1906-08-13		A. E. Blewitt	NCBS
CT .xxvi	New Haven	Waterbury	1908-08-12	Dry river bank	A. E. Blewitt	NCBS
CT .xxvii	New Haven	Waterbury	1909-08-09	Edge of a thicket	A. E. Blewitt	NEBC
CT .xxviii	New Haven	Waterbury	1902-08-18		A. E. Blewitt	NCBS
CT .xxix	Fairfield	Wilton	1931-09-07	Border of a thicket	E.B. Harger	NCBS
CT .xxx	Fairfield	Wilton	1905-09-14		A. E. Carpenter	NCBS
CT .xxxi	Litchfield	Woodbury	1917-80-12	Edge of thicket near Orenaug Park	E. B. Harger	NCBS
CT .xxxii	Litchfield	Woodbury	1905-09-29	Roadside, from a shrubby bank	E. H. Eames and C. C. Godfrey	CONN
CT .xxxiii	Litchfield	Woodbury	1905-09-30	"Rocky roadside shade"	E. H. Eames and C. C. Godfrey	YU
CT .xxxiv	Litchfield	Woodbury	1904-08-04		H. S. Clark	NCBS
CT .xxxv	No data	Location unknown	1885-10-04	Along Housatonic River	A. L. Winton	YU

3. An Explanation of Conservation Ranks Used by The Nature Conservancy and NatureServe

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

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

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

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

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

Ranking is a qualitative process: it takes into account several factors, including total number, range, and condition of element occurrences, population size, range extent and area of occupancy, short- and long-term trends in the foregoing factors, threats, environmental specificity, and fragility. These factors function as guidelines rather than arithmetic rules, and the relative weight given to the factors may differ among taxa. In some states, the taxon may receive a rank of SR (where the element is reported but has not yet been reviewed locally) or SRF (where a false, erroneous report exists and persists in the literature). A rank of S? denotes an uncertain or inexact numeric rank for the taxon at the state level.

Within states, individual occurrences of a taxon are sometimes assigned element occurrence ranks. Element occurrence (EO) ranks, which are an average of four separate evaluations of quality (size and productivity), condition, viability, and defensibility, are included in site descriptions to provide a general indication of site quality. Ranks range from: A (excellent) to D (poor); a rank of E is provided for element occurrences that are extant, but for which information is inadequate to provide a qualitative score. An EO rank of H is provided for sites for which no observations have been made for more than 20 years. An X rank is utilized for sites that are known to be extirpated. Not all EOs have received such ranks in all states, and ranks are not necessarily consistent among states as yet.