New England Plant Conservation Program

Valeriana uliginosa (Torr. & Gray) Rydb.
Marsh valerian

Conservation and Research Plan
For New England

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SUMMARY

Valeriana uliginosa (Torr. & Gray) Rydb., marsh valerian, is considered by most authorities to be a perennial member of the Valerianaceae, but Haines and Vining (1998) place it in the Caprifoliaceae. It is only found in northeastern and north-central North America and is fairly rare throughout its distribution, except for Michigan where it is S4. In New England, *V. uliginosa* is found in Maine (S2), New Hampshire (S1), and Vermont (S1). There are currently 23 occurrences in Maine, 7 of which are historic. There is one occurrence in New Hampshire and two in Vermont, though one of these may be extirpated. Five populations were found in Maine in 2001-2002, in areas that had previously received low survey effort. It is likely that more populations will be discovered in northern Maine with increased surveys of likely habitat. Many of the extant populations, including the New Hampshire and one of the two Vermont occurrences, are reasonably large, with hundreds or more individuals (thousands at some Maine sites). *Flora Conservanda* lists *V. uliginosa* as a Division 2 species, indicating that it is a regionally rare taxon with fewer than 20 occurrences in New England.

Little information is available regarding the biology of *Valeriana uliginosa*. It flowers in early to mid-summer, and a germination trial indicated germination of 9 of 17 seeds. The New England Wild Flower Society has 100 *V. uliginosa* seeds from the large Vermont population in its seed bank. *Valeriana uliginosa* is associated with the shrubby cinquefoil-sedge circumneutral fen community in Maine, and with fen-like openings in northern white-cedar swamps in Maine, New Hampshire, and Vermont. Some disturbances, such as logging, fires, and single-season flooding, seem beneficial to this species, as these disturbances keep the habitat relatively open. The most serious threats to *V. uliginosa* in New England are forest encroachment and hydrological alteration.

The conservation objectives for *Valeriana uliginosa* in New England are: to determine the number, size, and status of extant occurrences by survey of extant occurrences and of likely habitat; to secure the existence of all known populations by information sharing, conservation easement, site design, management agreement, and habitat preservation; and to maintain high population numbers and increase low population numbers by habitat management, specifically winter cutting of competing woody vegetation. An ideal conservation goal for Maine is to assure that the 13 currently ranked viable populations are still viable in 2023, to have at least 250 individuals at 8 of these, and to have 1000 or more individuals at four. An ideal conservation goal for New Hampshire is to maintain or increase population numbers at the single occurrence and to secure the existence of this occurrence. An ideal conservation goal for Vermont is to determine if there are two extant populations (one may be extirpated), ensure their survival, and secure their existence.

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

Valeriana uliginosa, marsh valerian, is a perennial member of the Valerian family (Valerianaceae), though Haines and Vining (1998) place it in the Caprifoliaceae. It was formerly considered a subspecies of the more common western species, *Valeriana sitchensis*. *Valeriana uliginosa* only occurs in northeastern and north-central North America, and in New England, it occurs in Maine (S2), New Hampshire (S1), and Vermont (S1). Other occurrences are in Michigan (S4), New Brunswick (S2), Ontario (S2), Quebec (S2), New York (S1S2), Illinois (S1), Indiana (S1), Wisconsin (S1), Ohio (SX), Massachusetts (SR), and New Jersey (SR).

Flora Conservanda lists *Valeriana uliginosa* as a Division 2 species, indicating that it is a regionally rare taxon with fewer than 20 occurrences in New England (Brumback and Mehrhoff et al. 1996). Maine has 16 extant occurrences and 7 historic occurrences, New Hampshire has one extant occurrence, and Vermont has two extant occurrences, though one may actually be historic. *Valeriana uliginosa* is a species of Special Concern in Maine and is Endangered in both New Hampshire and Vermont. There were five new occurrences found in Maine between 2001-2002, and more are likely to be found in other areas of Maine that have as yet received low survey effort. It is less likely that new occurrences will be found in New Hampshire or Vermont.

Little is known regarding the biology of *Valeriana uliginosa*, except that it is in flower from late May to July and August (Fernald 1950, Meyer 1951, Young 2002). It was not observed in flower in Maine at two known sites in 2001 or 2002. The New England Wild Flower Society (NEWFS) has 100 *V. uliginosa* seeds from the large Vermont population in its seed bank, and in a germination trial, 9 of 17 seeds germinated.

Valeriana uliginosa is typically associated with open circumneutral to calcareous fens, especially those associated with northern white-cedar swamps. In Maine, this community is called the shrubby cinquefoil-sedge circumneutral fen, and many occurrences are in this rare (S2) community type. *Valeriana uliginosa* is also found in fen-like openings within northern white-cedar swamps, and the New Hampshire, Vermont, and many of the Maine occurrences, are in this community. The New Hampshire occurrence, one of the Vermont occurrences, and nine of the Maine occurrences have reasonably large populations in the order of hundreds or more individuals (thousands at some Maine sites). It is difficult to see non-flowering individuals among the sedges with which they grow, so population counts may be low. It is important that surveyors of *V. uliginosa* are familiar with non-flowering material. Some disturbances, such as certain types of logging, fires, and single-season flooding, are likely beneficial to *V. uliginosa* in that these disturbances help maintain the open character of the community in which it occurs

(see the discussion regarding ME .004 [Crystal]). The primary threats to *V. uliginosa* in New England are forest encroachment, heavy intense logging, and hydrological alterations from wetland drainage, semi-permanent flooding from beaver activity, or logging of buffer areas.

This conservation plan is written in two sections. The first section summarizes the available information on the taxonomy, biology, ecology, distribution, and status of *Valeriana uliginosa*. The second section presents conservation objectives and general conservation actions for *V. uliginosa* in New England, specific conservation actions for each occurrence, and a prioritized implementation schedule for these conservation actions.

DESCRIPTION

This description is based on Fernald (1950), Meyer (1951), and Gleason and Cronquist (1991), unless otherwise noted. *Valeriana uliginosa* is a 0.3-1 meter tall, relatively slender, fibrous-rooted perennial with a stout, branched rhizome. The stem is glabrous (or nearly so) and leafy. The basal leaves are simple or cleft, long-petiolate, 5-15 cm long, and 2-8 cm wide. The basal leaf blade is 20-35 cm long, ovate-elliptic to obovate, toothed or entire, and may have a pair of small basilateral lobes. There are 3-6 pairs of well-developed cauline leaves. The cauline leaves are pinnatifid, ciliate, and up to 6-21 cm long and 5-10 cm wide, with 3-6 pairs of lateral leaflets to 0.4-1.6 cm wide. The terminal leaflet is lanceolate to elliptic, acute to acuminate, and 0.9-2.5 cm wide. The inflorescence is a corymb, 3-15 cm broad, and has 4-11 mm long bractlets that are ciliate when young. The flower clusters are round, with small pale pink and white flowers (Vickery and Rooney 1984). The flowers are all perfect, with corollas 5-7 mm long. In fruit, the corymb becomes 6-20 cm long and 6-15 cm wide. The fruits are achenes that are lanceolate to ovate-oblong, glabrous, 3-5 mm long, and 1.5-2 mm thick. The pappus-like calyx aids in dispersal (Art Gilman, William D. Countryman Environmental Assessment and Planning, personal communication). Non-flowering stems and leaves are easily overlooked, because the sedges among which they grow can conceal them (Vickery and Rooney 1984). North American species of *Valeriana* are hollow-stemmed (Meyer 1951). The diploid number of *V. uliginosa* is $2n=96$ (Hinds 2000).

Valeriana uliginosa is similar in morphology to *V. sitchensis*, and it was formerly considered a subspecies of *V. sitchensis*. *Valeriana uliginosa* can be differentiated from *V. sitchensis* by its location and habitat. *Valeriana uliginosa* occurs fens and northern white cedar swamps of the northeast, west to Michigan, while *V. sitchensis* occurs in the northwest, east to western Montana, in subalpine meadows and open mountain woodlands, generally above 4000 feet (1219 m) elevation in the southern part of its range and above 1800 feet (549 m) in the northern part of its range (Meyer 1951). Their ranges are separated by about 1200 miles (1931 km) (Meyer 1951). In addition, *V. sitchensis* generally has fewer pairs (1-3, occasionally 4) of cauline leaves, and the terminal lobe is obovate, ovate-rhombic to suborbicular, acute, or obtuse, in contrast with that of *V. uliginosa*, which is lanceolate to elliptic, acute to acuminate (Meyer 1951).

Valeriana officinalis (garden heliotrope) is commonly cultivated and has naturalized in Maine (Haines and Vining 1998), New Hampshire (Pease 1964), Vermont, Massachusetts, and Connecticut (Seymour 1982). It is the only other *Valeriana* species in New England (Fernald 1950, Seymour 1982, Gleason and Cronquist 1991, Haines and Vining 1998). Bruce Sorrie (Longleaf Ecological, personal communication) indicated that many herbarium specimens from Massachusetts that were labeled *V. uliginosa* were annotated to *V. officinalis*. *Valeriana officinalis* has pinnately divided basal leaves, stem leaves with 11-21 leaflets, a sparsely pubescent rachis and abaxial surfaces, and is overall a taller plant, in contrast to *V. uliginosa*, which has basal leaves that are simple or sometimes with a single pair of lobes, stem leaves with 3-13 leaflets, and a glabrous rachis and abaxial surfaces (Haines and Vining 1998).

Valeriana dioica is known from New Brunswick, where it is extremely rare and at the southern limit of its range (Hinds 2000). The range of *V. dioica* is Yukon to Labrador and Gaspé Peninsula, south to Washington and New Brunswick (Hinds 2000). In contrast to *V. uliginosa*, *V. dioica* has male and female parts on separate flowers, shorter leaves (2.5-7.5 cm long), a shorter corolla (3-4 mm long), basal leaves that are simple and more or less persistent, and is overall a somewhat shorter plant (with flowering stems to 7 dm high) (Hinds 2000).

TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY

Most botanical treatments place *Valeriana uliginosa* in the family Valerianaceae (Fernald 1950, Meyer 1951, Gleason and Cronquist 1991, MOBOT 2002), but Haines and Vining (1998) place it in the Caprifoliaceae. The reasoning is that although the Valerianaceae is morphologically well defined, separating it and the Dipsacaceae from the Caprifoliaceae makes the Caprifoliaceae a paraphyletic group (defined on arbitrary grounds and therefore not evolutionarily meaningful) (Arthur Haines, New England Wild Flower Society, personal communication). Inclusion of Valerianaceae and Dipsaceae within the Caprifoliaceae (but excluding *Sambucus* and *Viburnum*) creates a monophyletic family system (Haines, personal communication, who has chosen to follow the stance of Judd et al. 1999). Within the Valerianaceae, *V. uliginosa* is a member of the series Officinales, and the type species for this series is *V. officinalis* (Meyer 1951, who considers *V. uliginosa* a subspecies of *V. sitchensis*).

The genus *Valeriana* L. occurs on all continents, except for Australia, with the highest number of species in the mountains of South America (Meyer 1951). Höck (1882 in Meyer 1951) lists 155 *Valeriana* species world wide, and 30 in North America and the West Indies.

There are several theories as to the origin of the genus name, *Valeriana* (Meyer 1951). It may be derived from the Latin *valere*, to be strong, or from Valerius, a Roman family name, or from Valerus, the name of a Roman king. Theophrastus, Dioscorides, and Plinius knew of

the medicinal qualities of *Valeriana officinalis* (Meyer 1951). The type locality for *V. uliginosa* is Lake Ontario, Wayne County, New York (Meyer 1951).

Common names for *V. uliginosa* include marsh valerian (Haines and Vining 1998), mountain valerian, swamp valerian, sitka valerian, and, in French, Valériane des vases (Hinds 2000). Synonyms are as follows:

- *Valeriana dioica* var. *sylvatica* S. Wats.
- *Valeriana dioica* var. *uliginosa* S. Wats.
- *Valeriana dubiosa* Gand. *Bulletin de la Société de France* 65: 37. 1918.
- *Valeriana septentrionalis* Rydb., *Memoirs of the New York Botanical Garden* 1: 376. 1900.
- *Valeriana septentrionalis* var. *uliginosa* (Torr. & A. Gray) Gleason, *Phytologia* 4: 25. 1952.
- *Valeriana sitchensis* Bong. ssp. *uliginosa* (Torr. & Gray) F. G. Mey., *Annals of the Missouri Botanical Garden* 38: 399. 1951.
- *Valeriana sitchensis* var. *uliginosa* (Torr. & Gray) Boivin, *Le Naturaliste Canadien* 93: 1062. 1966 [1967].
- *Valeriana sylvatica* ssp. *uliginosa* Torr. & Gray, *Flora of North America* 2: 47. 1841.
- *Valerina uliginosa* (Torr. & Gray) Rydb. ex Britton, *Manual of the Flora of the Northern States and Canada* 878. 1901.

SPECIES BIOLOGY

Valeriana uliginosa flowers May to July (Fernald 1950, Gleason and Cronquist 1991, Young 2002), through August (Meyer 1951). It did not flower in May or early June in Maine at two known sites in 2001 or 2002 (personal observation). The erect annual and perennial species of *Valeriana*, including *V. uliginosa*, normally flower and fruit in response to seasonal fluctuations of climate (Meyer 1951).

As of 1951, methods of pollination were unknown, but observations on several western United States species indicate that small insects of undetermined species may be important in pollination (Meyer 1951). In Great Britain, *Valeriana officinalis* is adapted to butterfly pollination and is often visited by Lepidopterans (Proctor et al. 1996). *Valeriana dioica* is visited by Dipterans in the Tipulidae (crane fly family) and Culicidae (mosquito family) (Proctor et al. 1996). Closer observation of *V. uliginosa* in New England may show if Lepidopterans, Dipterans, or other insect groups act as pollinators.

The New England Wild Flower Society (NEWFS) has 100 *Valeriana uliginosa* seeds in its seed bank (Christopher Mattrick, NEWFS, personal communication). In 1993, Brumback collected 150 seeds from 27 plants at VT .002 (Craftsbury). Seed germinated best

when it was dried warm, followed by a cold treatment, then warm again. Nine of 17 seeds germinated.

No studies have been done on the underground parts of *Valeriana uliginosa*, but information from *V. sitchensis* may be applicable. *Valeriana sitchensis* has short rhizomes and very limited vegetative spread (Antos and Zobel 1984). The new rhizome tip remains at the soil surface, and the older parts of the rhizome become buried by litter, up to about 10 mm. Branching occurs when a rhizome tip turns up to form an inflorescence. New rhizomes then form from lateral buds on the upturned rhizome (Antos and Zobel 1984). The roots radiate in all directions from the rhizome, though most angle downward, and few roots remain in the litter layer. The roots are up to 1 mm in diameter and sparsely branched except at the end (Antos and Zobel 1984).

It is unknown if *Valeriana uliginosa* is affected by pathogenic fungi. However, *V. sambucifolia* of Sweden is a host for *Uromyces valerianae*, and this fungus also infects other *Valeriana* species (Carlsson et al. 1990). Spores develop on the lower sides of *V. sambucifolia* leaves, and heavy infections can cause early leaf withering and a strong reduction or failure of fruit set. Seedlings can also become infected. There is a significant positive correlation between population densities of *V. sambucifolia* and infection by *Uromyces* (Carlsson et al. 1990).

Valeriana officinalis has a strong fetid and aromatic odor, and this is common in many North American species, especially those in the series Officinales (the series *V. uliginosa* belongs to) (Meyer 1951). *Valeriana* is economically important as a genus, primarily for the medicinal action of *V. officinalis*, but also for an aromatic perfume and less frequently as a culinary herb (*V. edulis*) (Meyer 1951). *Valeriana officinalis* is used today primarily as a mild sedative, but in the past was also used as an antispasmodic, emmenagogue, carminative, diuretic, and stimulant (Buckland 1999 and references therein). It was one of the six most prescribed medicines in Europe and the United States between 1730-1930 (Buckland 1999). None of the native North American species is used medicinally (Meyer 1951).

HABITAT/ECOLOGY

The general habitat description offered in many technical manuals is somewhat vague, and includes terms such as wet woods and meadows, marshy meadows, swamps, and bogs (Meyer 1951, Gleason and Cronquist 1991, Haines and Vining 1998). A few manuals give a clearer picture of the habitat of *Valeriana uliginosa*, including calcareous swamps and fens (Hinds 2000), and calcareous bogs, swamps, and wet woods, chiefly with *Larix* and *Thuja* (Fernald 1950, Magee and Ahles 1999, NatureServe 2002). Scientific and common names of vascular plants used in this plan follow Haines and Vining (1998).

In Maine, *Valeriana uliginosa* is typically associated with the shrubby cinquefoil-sedge circumneutral fen community, or with openings in the northern white-cedar swamp community. These community types are often found together in large peatland complexes. The one New Hampshire and two Vermont occurrences are associated with openings in northern white-cedar swamps.

The shrubby cinquefoil-sedge circumneutral fen community is ranked S2 in Maine and is described as a peatland influenced by calcium-rich water, and dominated by sedges or grading into shrubs, with an inverse relationship between dwarf shrub and graminoid cover (Gawler 2001). Characteristic shrubs include *Pentaphylloides floribunda* (shrubby-cinquefoil) and *Andromeda polifolia* var. *glaucophylla* (bog rosemary), and dominant graminoids include *Carex lasiocarpa* var. *americana* (slender sedge), *Rhynchospora alba* (white beak-rush), and *Trichophorum cespitosum* (deer's hair sedge). Other characteristic species include *Carex flava* (yellow sedge), *Carex gynocrates* (northern bog sedge, S2S3 in Maine), *Carex livida* (livid sedge, S1S2 in Maine), *Carex tenuiflora* (sparse-flowered sedge, S2 in Maine), *Muhlenbergia glomerata* (marsh muhly), *Symphyotrichum boreale* (northern bog aster), and *Trichophorum alpinum* (alpine cotton-grass). There is an extensive bryophyte layer, the substrate remains saturated through the year, and the pH is 5.5 or higher (Gawler 2001).

The shrubby cinquefoil-sedge circumneutral fen community corresponds with two National Vegetation types, the *Carex lasiocarpa-Myrica gale-Campylium stellatum* Peatland Fen (ranked G3G4) and the *Myrica gale-Pentaphylloides floribunda*/*Carex lasiocarpa-Carex exilis* Shrub Herbaceous Vegetation (ranked G3G4) (Gawler 2001). In Vermont, this community is termed an intermediate fen, which is ranked S2 (VTNNHP 2002). NatureServe (2002) no longer lists the *Myrica gale-Pentaphylloides floribunda*/*Carex lasiocarpa-Carex exilis* Shrub Herbaceous Vegetation, and the *Carex lasiocarpa-Myrica gale-Campylium stellatum* Peatland Fen is now called *Myrica gale*/*Carex lasiocarpa-Lobelia kalmii-Trichophorum alpinum* Shrub Herbaceous Vegetation (G3G4).

Valeriana uliginosa is also associated with the northern white-cedar swamp community, which occurs in Maine (ranked S4), New Hampshire (titled "northern white cedar-balsam fir seepage swamp", ranked S2), Vermont (ranked S3), Connecticut, and New York (NatureServe 2002, and individual state Natural Heritage programs). The National Vegetation Classification for this community is *Thuja occidentalis/Mitella nuda/Hylocomium splendens* Saturated Forest (Gawler 2001, NatureServe 2002).

In Maine, New Hampshire, and presumably Vermont, the northern white-cedar swamp is represented by a closed-canopy forest of *Thuja occidentalis*, often with *Abies balsamea* (balsam fir) and lesser amounts of *Acer rubrum* (red maple), *Betula alleghaniensis* (yellow birch), *Fraxinus nigra* (black ash), *Larix laricina* (larch), or *Picea mariana* (black spruce) (Sperduto 2000, Gawler 2001). Shrubs are typically sparse, though this layer can be diverse. There is a well-developed herb layer, with small cedar trees and an array of boreal herbs. Characteristic species include *Carex pedunculata* (long-stalked sedge), *Carex trisperma*

(three-seeded sedge), *Coptis trifolia* (goldthread), *Mitella nuda* (naked miterwort), *Orthilia secunda* (one-sided pyrola), *Oxalis montana* (wood sorrel), *Rubus pubescens* (dwarf raspberry), *Tiarella cordifolia* (foam flower), and *Trientalis borealis* (starflower). Hummock-hollow topography carpeted by a lush bryophyte layer is characteristic, including species such as *Bazzania trilobata* (three-lobed bazzania), *Hylocomium splendens* (stair-step moss), *Rhizomnium punctatum* (large-leaved mnium), *Rhytidiadelphus triquetrus* (shaggy moss), *Sphagnum girgensohnii* (white-toothed peat moss), *Thuidium delicatulum* (delicate fern moss), and *Trichocolea tomentella* (common down liverwort). This community is typically found in poorly drained basins along streams or small ponds. The substrate is usually shallow peat over mineral soil, with a somewhat acidic to circumneutral pH (Sperduto 2000, Gawler 2001). *Valeriana uliginosa* is not listed specifically in these community descriptions, but Sperduto (2000) lists it as an indicator species of seepage conditions.

Northern white-cedar swamps and fens are generally found in minerotrophic situations, where water and nutrients are received from ground water, surface runoff, and precipitation (Heinselman 1970, Schwintzer 1981, Crum 1988, Boeye and Verheyen 1992). Hydrology influences vegetation by influencing groundwater nutrient conditions, pH, and specific conductivity. Fens (including forested northern white-cedar swamps) occur in groundwater discharge areas, where the groundwater moves upward. Recharge and discharge volumes are small versus inputs and losses from precipitation, runoff, and evapotranspiration, meaning chemical quality is more important to plants in these communities than water quantity (Siegal 1988). Humified peat can cause significant interactions between groundwater and surficial waters (Chason and Siegal 1986). Vascular plants, especially sedges, contribute to the peat formed in northern white-cedar swamps and fens where groundwater is rich in calcium, magnesium, iron, and carbonate (Verhoeven and Arts 1987).

Natural processes such as windthrow, flooding, fire, drainage, drought, and cutting or heavy browse can affect the northern white-cedar swamp community and can cause community changes (St. Hilaire 1994). Windthrow of a few trees does not change community structure (Curtis 1946, 1959) but the resultant increased light may benefit *Valeriana uliginosa* where it occurs in small openings within a swamp. Windthrow of many trees may cause a change in community structure to a rich sedge fen (St. Hilaire 1994). Flooding may also change community structure and result in a rich shrub fen, rich sedge fen (Schwintzer and Williams 1974, Jeglum 1975), or marsh (Catenhusen 1950, Kenkel 1987). Beavers, roads, railroads, ditches, pipelines, and dams can cause flooding upstream of a peatland or drainage downstream (Catenhusen 1950, Stoeckeler 1967, Boelter and Close 1974, Jeglum 1975, Rowell 1986, Johnston 1990, Jacobson et al. 1991). Drainage and drought can lead to the invasion by pines, balsam fir, and hardwoods, and also to an increased fire frequency (Catenhusen 1950, Christensen et al. 1959, Curtis 1959, Crum 1988). Superficial fires do not affect community structure, but medium intensity and repeat fires may result in community changes and lead to a rich shrub fen or marsh; deep fires may lead to a quaking aspen community (Catenhusen 1950). Cutting, heavy browse, and fire may lead to a black ash/red maple swamp forest (Gates 1942,

Johnston 1990). Many of these disturbances can be beneficial to *V. uliginosa*, especially where it occurs in a fen that is undergoing forest encroachment.

Valeriana uliginosa has been found with *Lonicera involucrata* and *Thuja occidentalis* in Ontario, some 230 miles north of Sault Ste. Marie in 1921 (Pease 1921). *Valeriana uliginosa* was noted as common in two northern white-cedar swamps in Wayne County, New York and was found with the following species *Cypripedium reginae* (showy lady's slipper), *Eriophorum viridicarinatum* (darkscale cotton-grass), *Gaultheria hispidula* (creeping snowberry), *Platanthera clavellata* (green woodland orchid), *Platanthera hyperborea* (leafy northern green orchid), *Pogonia ophioglossoides* (rose pogonia), *Pyrola asarifolia* (pink pyrola), *Triglochin palustre* (slender arrow-grass), and *Trichophorum alpinum* (alpine cotton-grass) (Metcalf and Griscom 1917). *Valeriana uliginosa* was so abundant in one open meadow in Wayne County, New York that the authors deemed there to be enough to supply all the herbaria in the country (Metcalf and Griscom 1917). There were several acres in which *V. uliginosa* was the characteristic and dominant plant.

In a report from the 1919 spring field trip to the Berkshires, the New England Botanical Club noted *Valeriana uliginosa* as "very abundant in some of the marshes and swamps about Pine Plains" over an area some 12 miles (19.3 km) in diameter, with one of the stations within three miles of the Massachusetts-Connecticut line (Fernald et al. 1919: 88). It was growing in swamps with *Salix candida* (hoary willow) and *Betula pumila* (swamp birch) (Fernald et al. 1919). This may be the source of the SR ranking in Massachusetts, but Pine Plains are in Dutchess County, New York (Dutchess County shares its eastern boundary with northwestern Connecticut), at an elevation of about 1000 feet (300 m) (Fernald 1915). There are two or three (it is uncertain if one is redundant) historical, and no extant, records of *V. uliginosa* from Pine Plains in Dutchess County, New York (Steve Young, New York Natural Heritage Program, personal communication), and two extant records from adjacent Columbia County (Tom Rawinski, Massachusetts Audubon Society, personal communication). *Valeriana uliginosa* was also noted as local in Vermont, abundant in calcareous swamps of northern Maine, and local across central and western New York (Fernald et al. 1919). *Valeriana uliginosa* was found with typical plants in a cedar swamp near Fairhaven, Vermont (Flynn 1914). This population (VT .001 [Fair Haven]) has not been seen since 1982.

Valeriana uliginosa was found in a bog underlain by limestone near Petit Rocher, New Brunswick with *Betula pumila* (swamp birch), *Carex aurea* (golden-fruited sedge), *Parnassia glauca* (grass-of-parnassus), *Pyrola asarifolia* (pink pyrola), *Ranunculus gmelinii* (small yellow water crowfoot), *Salix candida* (hoary willow), and *Spiranthes romanzoffiana* (hooded ladies' tresses) (Blake 1918).

Valeriana uliginosa is found in wet meadows and swampy areas in the deciduous forest regions north of the southern extent of the Pleistocene glaciation (Meyer 1951). Hultén (1937 in Meyer 1951) proposed that the pre-Pleistocene distribution was continuous, and that these were therefore the same species. Hultén believed that there were either refugia within the

glaciated northeast, or that species existed south of the glaciated areas and moved northward in post-glacial times. However, Flint (1947 in Meyer 1951) did not locate any large refugia in the northeastern United States.

The USDA Plants database (USDA, NRCS 2002) does not give a wetland indicator status for *Valeriana uliginosa*. However, *V. sitchensis* is listed as occurring only in California, Oregon, Washington, Idaho, Montana, and Alaska, but a wetland indicator status is given for *V. sitchensis* in Region 1, which is the Northeast and not a part of the range of *V. sitchensis*. Presumably, this wetland indicator status is in fact for *V. uliginosa*; in Region 1 it is listed as an obligate wetland plant, indicating that it is found in wetlands 99% of the time (USDA, NRCS 2002).

THREATS TO TAXON

There are no reports of significant global decline of *Valeriana uliginosa* (NatureServe 2002). NatureServe (2002) indicates that loss of habitat due to logging of cedar swamps and/or draining of wetlands/hydrologic alteration is the most serious threat to *V. uliginosa*. Potential threats include hydrological alteration, shrub invasion, logging, competition with other plants, invasive exotic plants, trampling, pollution, and climate change. Sites in northern Maine are relatively stable (NatureServe 2002). There is little evidence that *V. uliginosa* is threatened by collection (NatureServe 2002), though *V. officinalis*, which occurs in New England, is used for medicinal purposes.

I believe the biggest threats to *Valeriana uliginosa* populations in northern New England are forest encroachment and continuous flooding from beaver activity. Logging is indicated as a potential threat at several Maine sites, but I believe that selective logging in winter may be beneficial to *V. uliginosa* populations that occur in relatively small openings within northern white-cedar swamps.

- **Forest encroachment** or succession has been noted as a threat at ME .001 (Perham), ME .002 (Woodland), ME .003 (Perham), ME .004 (Crystal), ME .008 (Chapman), ME .016 (Presque Isle), and VT .002 (Craftsbury). Shrub invasion of fens is another potential threat (Gawler 1983 in NatureServe 2002).

- **Hydrological alteration** is most likely to be caused by drainage, heavy logging of associated cedar swamps, and/or beaver activity. This was noted as a remote potential threat for ME .017 (T13 R15 WELS).

- **Logging** is indicated as a potential threat by NatureServe (2002) and Natural Heritage surveyors at ME .022 (T16 R08 WELS), ME .023 (Saint Francis), and VT .002 (Craftsbury). However, *Valeriana uliginosa* does best in very open fen situations, so selective logging activities may be advantageous for it rather than harmful, especially in

areas where forest encroachment is noted. Threats due to logging would be from direct physical destruction and hydrological alterations associated with large-scale, indiscriminant logging. Selective logging in winter may be beneficial to *V. uliginosa* populations that occur in relatively small openings within northern white-cedar swamps.

- **Competition with other plants.** Aside from competition for light with woody species, *Valeriana uliginosa* may not be able to compete with aggressive species such as *Phragmites australis* or *Betula pumila* at ME .004 (Crystal), *Rhamnus alnifolia* at ME .008 (Chapman), or *Tussilago farfara* at ME .020 (T19 R11 WELS) and ME .022 (T16 R08 WELS).

- **Invasive exotic plants** may be a problem at some sites. *Tussilago farfara* occurs at ME .020 (T19 R11 WELS) and ME .022 (T16 R08 WELS).

- **Trampling** was not indicated specifically in the literature or on Natural Heritage field forms for *Valeriana uliginosa*. A Washington state trampling study of the morphologically similar *V. sitchensis* showed that it was one of the species that lost the most cover when trampled, but that it was fairly resilient, which was indicative of the increase in its cover the year after trampling (Cole 1995a, 1995b). Plant morphology was a more important determinant in vegetation response to trampling than were site characteristics such as altitude, overstory canopy cover, and total vegetation cover, though it is possible that soil fertility, soil moisture, or other site characteristics that were not assessed might have explained more variation (Cole 1995b). It is unknown if the habitat differences between *V. uliginosa* and *V. sitchensi*s would make *V. uliginosa* more or less susceptible to trampling than *V. sitchensis*. *Valeriana uliginosa* is likely not threatened by trampling, except, perhaps, by a moose trail, or possibly by botanists in a heavily visited site.

- **Pollution and climate change**. *Valeriana uliginosa* is one of a number of native boreal taxa that has declined in the Lake Champlain Valley region of New York and Vermont (Zika and Marshall 1991). The authors note that more species are shifting their range to the north than to the south. Possible causes for this include regional climatic warming, changing land use, pollution, or other factors (Zika and Marshall 1991).

DISTRIBUTION AND STATUS

General Status

Valeriana uliginosa is found in northeastern North America, from southern Quebec, south to New Brunswick, and Maine, west to Ohio, north to western Michigan, New York, and western Ontario (Fernald 1950, Meyer 1951, Gleason and Cronquist 1991, Haines and

Vining 1998; Figure 1). The United States distribution is noted as Illinois, Indiana, Maine, Michigan, New York, Ohio, and Vermont (Mitchell and Sheviak 1981). NatureServe (2002) additionally indicates Massachusetts, New Hampshire, New Jersey, and Wisconsin. Hinds (2002) indicates distribution to the west coast, including Alaska, British Columbia, and California, but this either reflects erroneous information or the distribution of *V. sitchensis*, as Hinds includes Sitka valerian as a common name for *V. uliginosa*.

Valeriana uliginosa is globally ranked as a G4 species (NatureServe 2002). Nationally, in the United States, it is an N4 species, and in Canada N? (NatureServe 2002). It is most common in Michigan, where it is ranked S4, and in the United States, it is next most common in Maine with 16 extant occurrences. The New England Plant Conservation Program (NEPCoP) lists *V. uliginosa* as a Division 2 plant, meaning that it is a regionally rare taxon with fewer than 20 occurrences in New England (Brumback and Mehrhoff et al. 1996). *Valeriana uliginosa* is listed as a Special Concern species in Maine, indicating that based on available information it is rare, but not sufficiently so to be considered Threatened or Endangered (MNAP 2002). It is listed as an Endangered species in New Hampshire (NHNHI 2003) and Vermont (VTNNHP 1999), indicating that it is in danger of being extirpated from each state. *Valeriana uliginosa* is a protected native plant in New York (NYS DEC 2001). Mitchell and Sheviak (1981) indicated that *V. uliginosa* is too common in New York State to be listed as threatened, but the New York Natural Heritage Program currently lists it as Endangered. It is listed as an indicator species of fens in Indiana, where fens are considered high quality wetlands and their degradation is not allowed, except under special conditions (IDEM 2002).

In 1981, *Valeriana uliginosa* was a Category 2 species (species that are candidates for listing pending further information on status) under review for federal protection (Crow et al. 1981, Mitchell and Sheviak 1981). It was a candidate in part because there was not much known about this species at the time, and it seemed that many northern white-cedar swamps were being cut (Steve Young, NY NHP, personal communication). Because of Heritage surveys in New York and New England, more occurrences were found, and *V. uliginosa* was removed from the list (Young, personal communication). It is no longer a candidate species for federal protection (USFWS 2003).

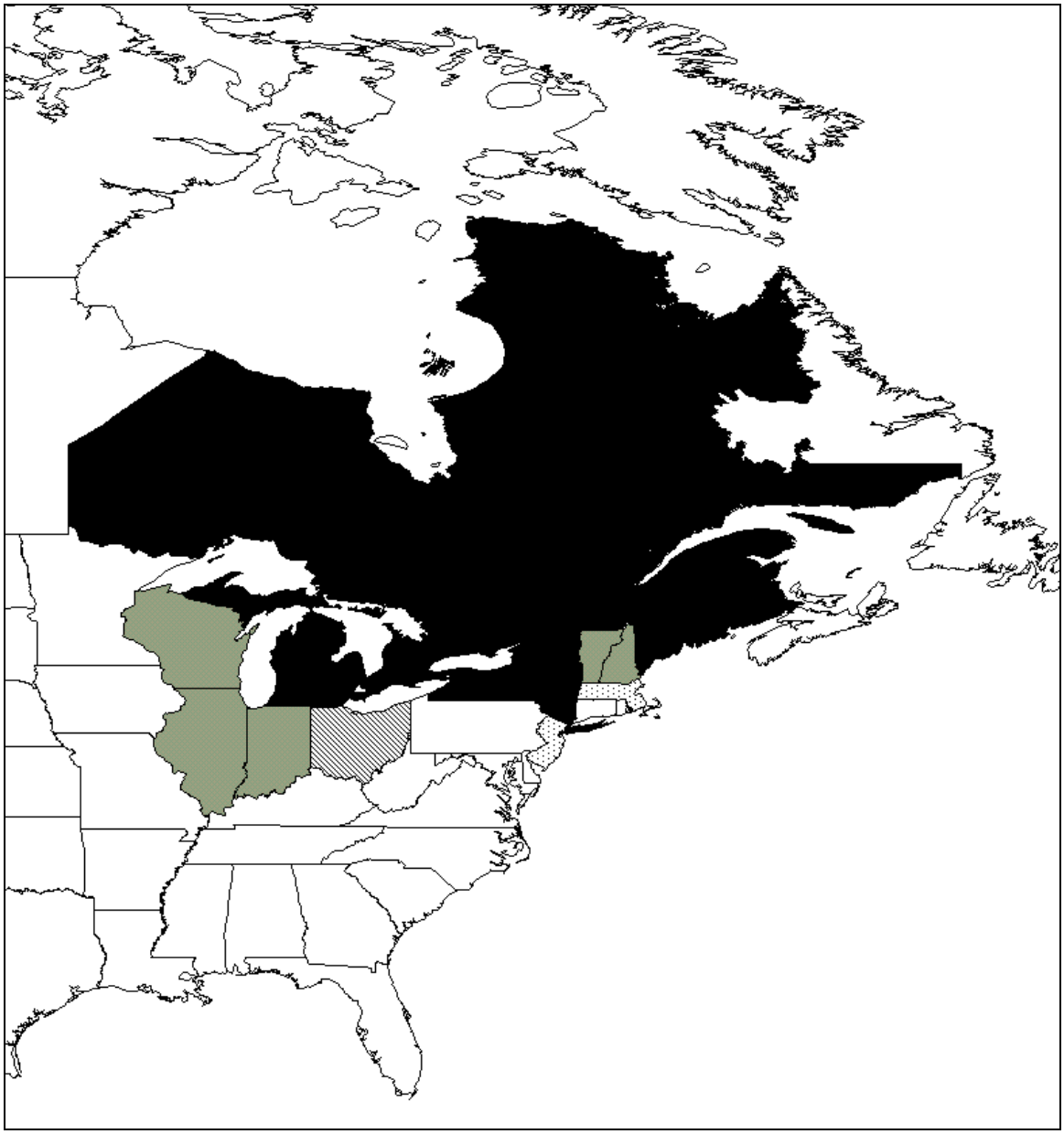

Figure 1. Occurrences of *Valeriana uliginosa* in North America. States and provinces shaded in gray have one to five (or an unspecified number of) current occurrences of the taxon. Areas shaded in black have more than five confirmed occurrences. The state (Ohio) with diagonal hatching is designated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

Table 1. Occurrence and status of *Valeriana uliginosa* 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)**
Maine (S2, SC): 16 extant and 7 historic occurrences, all in Aroostook County	Michigan (S4): Known from 18 counties (Meyer 1951)	Massachusetts (SR)	Ohio (SX): Known from Stark County (Meyer 1951)
New Hampshire (S1, E): 1 extant occurrence		New Jersey (SR)	
Vermont (S1, E): 2 extant occurrences, though one not seen since 1982			
Illinois (S1, E)			
Indiana (S1, E)			
New York (S1S2, E): known from 8 counties (Meyer 1951); 15 counties (Weldy et al. 2002); confirmed in 4 counties, probable in 10, uncertain in 2 counties (Young 2002); 4 extant (3A, 1B), 21 historic, and 3 extirpated occurrences (Young, personal communication)			
Wisconsin (S1, T)			
New Brunswick (S2): Known from 2 counties (Meyer 1951); 10 occurrences in 6 counties (Hinds 2000)			
Ontario (S2)			
Quebec (S2)			

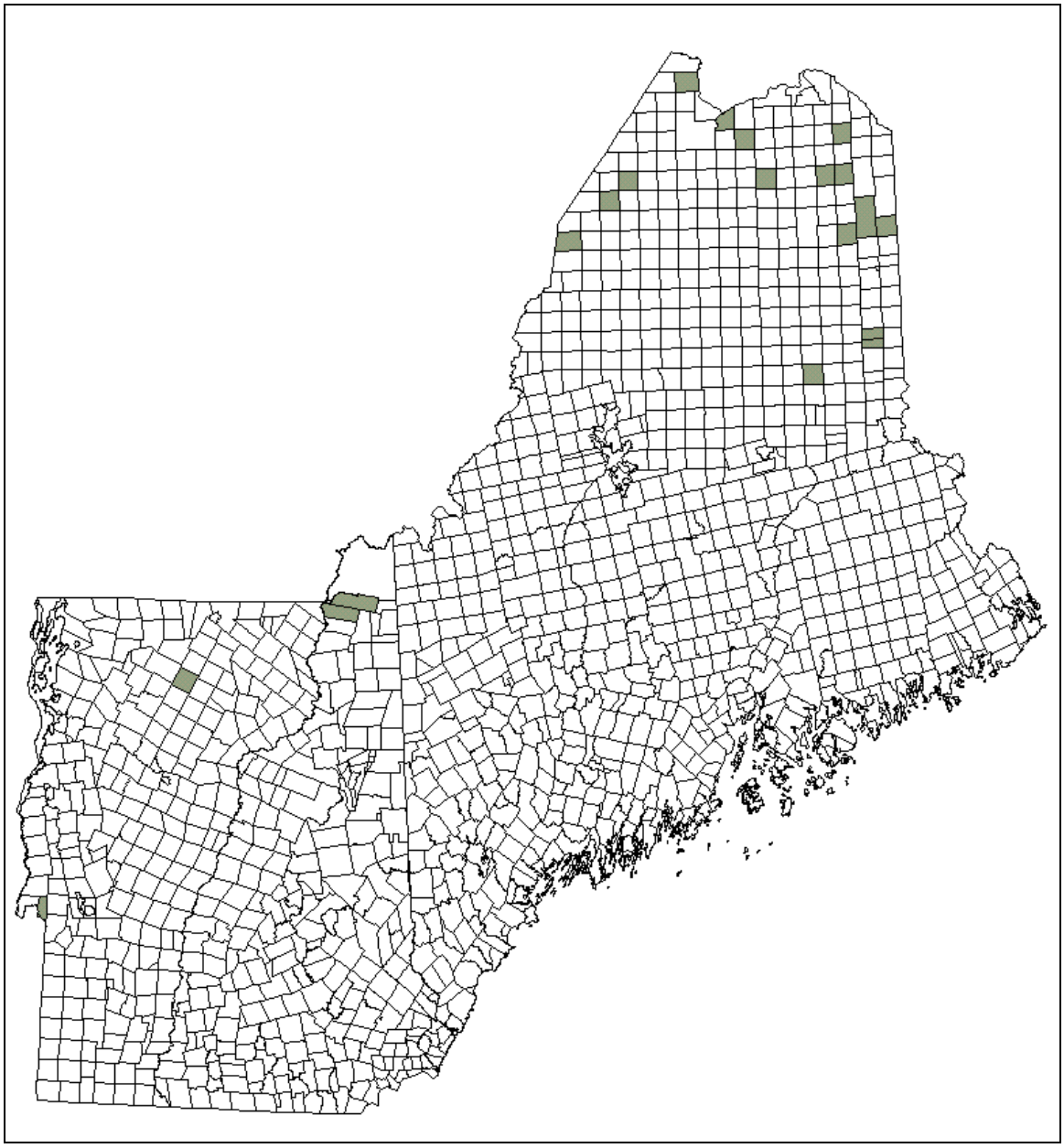

Figure 2. Extant occurrences of *Valeriana uliginosa* in New England. Town boundaries for northern New England states are shown. Towns shaded in gray have one to five extant occurrences of the taxon.

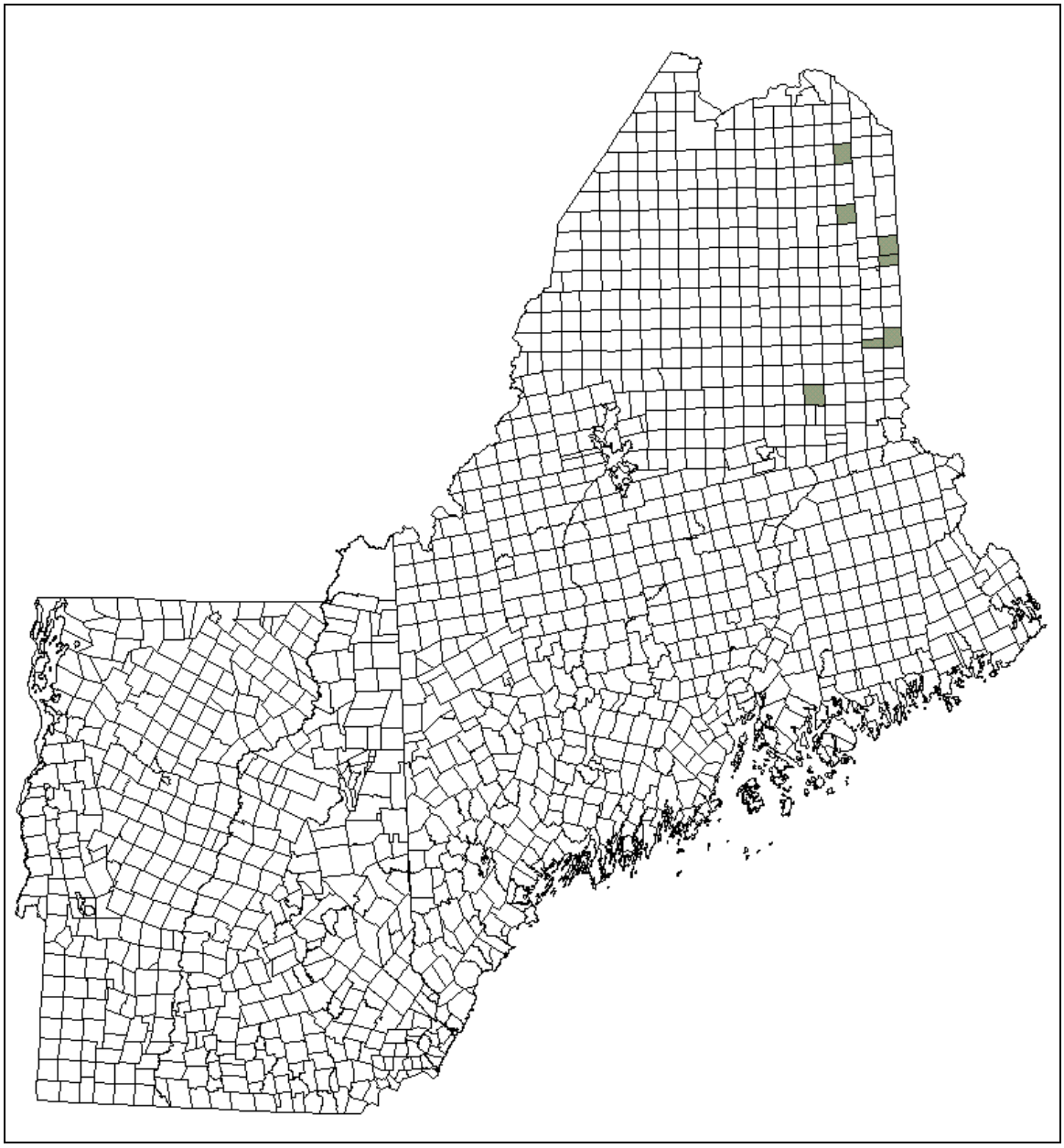

Figure 3. Historical occurrences of *Valeriana uliginosa* in New England. Towns shaded in gray have one to five historical records of the taxon.

Table 2. New England Occurrence Records for *Valeriana uliginosa.* Shaded occurrences are considered extant.

State	EO Number	County	Town
ME	**.001**	**Aroostook**	**Perham**
ME	**.002**	**Aroostook**	**Woodland**
ME	**.003**	**Aroostook**	**Perham**
ME	**.004**	**Aroostook**	**Crystal**
ME	**.005**	**Aroostook**	**New Limerick, Ludlow**
ME	**.006**	**Aroostook**	**T11 R17 WELS**
ME	.007	Aroostook	Blaine
ME	**.008**	**Aroostook**	**Chapman**
ME	**.009**	**Aroostook**	**Easton**
ME	.010	Aroostook	Houlton
ME	.011	Aroostook	Mapleton
ME	.012	Aroostook	Mars Hill
ME	.013	Aroostook	New Limerick
ME	.014	Aroostook	New Sweden
ME	.015	Aroostook	Sherman
ME	**.016**	**Aroostook**	**Presque Isle**
ME	**.017**	**Aroostook**	**T13 R15 WELS**
ME	**.018**	**Aroostook**	**Stockholm**
ME	**.019**	**Aroostook**	**T14 R07 WELS**
ME	**.020**	**Aroostook**	**T19 R11 WELS**
ME	**.021**	**Aroostook**	**T14 R14 WELS**
ME	**.022**	**Aroostook**	**T16 R08 WELS**
ME	**.023**	**Aroostook**	**Saint Francis**
ME	**NEW**	**Aroostook**	**Glenwood**
ME	**NEW**	**Penobscot**	**Stacyville**
NH	**.001**	**Coos**	**Clarksville, Stewartstown**
VT	**.001**	**Rutland**	**Fair Haven**
VT	**.002**	**Orleans**	**Craftsbury**

II. CONSERVATION

CONSERVATION OBJECTIVES FOR THE TAXON IN NEW ENGLAND

The immediate objective for *Valeriana uliginosa* in New England is to determine the full extent of its occurrence. Four large, new populations were discovered in 2001 and 2002, along with one smaller population. These populations are all on private land belonging to a forest products company, and it is likely that more populations will be found on such lands in northern areas of Maine. As new populations are found, they should be protected by sharing information, conservation easement, site design, voluntary management agreement, and habitat preservation. General conservation objectives for *V. uliginosa* in New England are to:

- **Determine number, size, and status** of extant occurrences in New England
- **Secure existence** of populations via information sharing, conservation easement, site design, voluntary management agreement, and habitat preservation, especially those in New Hampshire and Vermont, and the larger Maine populations not currently under conservation ownership
- **Maintain high population numbers** at the large sites
- **Increase population numbers** at sites where habitat is appropriate.

Conserving viable populations of rare plants in their natural habitat is the goal of conservation land managers (New England Wild Flower Society 1992) and should be the goal with *Valeriana uliginosa*. Site design, protection, and habitat management are the three steps used to conserve rare plants in their natural habitats (New England Wild Flower Society 1992). In general, these should be the goals at all *V. uliginosa* sites in New England, and in part have been implemented at the many Maine sites in conservation ownership. Seven of Maine's 16 occurrences are in conservation or public ownership, but all occurrences in New Hampshire and Vermont are privately owned and unprotected. Because of this, initial conservation effort should be focused on New Hampshire and Vermont.

An ideal conservation goal in Maine is to assure that the thirteen currently ranked viable populations in Maine remain viable in 2023. Currently, four of these have populations of 250 or more individuals; an ideal conservation goal is to have 250 or more individuals in at least eight of the 13 viable populations, and to have 500 or more individuals in at least four of these.

Conservation goals for the New Hampshire occurrence are to maintain or increase high population numbers at this site, and to either get conservation ownership or work with the landowner for some sort of conservation easement and/or management plan, to ensure that this population is viable and protected by 2023.

Conservation goals in Vermont are to ensure survival of the two current populations, one of which may be extirpated, and to either get conservation ownership or work with the landowner for some sort of conservation easement and/or management plan. The ultimate goal is to have two viable, protected populations by 2023 in Vermont.

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IV. APPENDICES

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

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

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

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

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

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

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

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

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