

New England Plant Conservation Program

Potamogeton ogdenii Hellquist & Hilton

Ogden's Pondweed

Conservation and Research Plan
for New England

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Approved, Regional Advisory Council, December 2002

SUMMARY

Potamogeton ogdenii Hellquist & Hilton (Potamogetonaceae) is a rare aquatic vascular plant historically reported at 18 locations worldwide: 11 in New England, five in New York, and two in Ontario. In New England, there are six current sites; worldwide, there are ten extant sites. It is listed G1 globally, and S1 by Vermont, Massachusetts, and New York. It is a fertile hybrid found in ponds, lakes, and slow moving streams with high alkalinity.

Potamogeton ogdenii faces serious threats to its survival because of eutrophication, competition with invasive species, its restricted habitat, and low population numbers.

Conservation Objectives

1. Maintain and improve the conditions at the six current locations in New England with an eventual goal of 15-20 sites with 500-1000 plants in 20 years
2. Conduct extensive searches in New England in an attempt to locate 10-15 new, viable populations
3. Reduce competition with invasive species at *P. ogdenii* sites
4. Reduce eutrophication at present sites and at sites where it may occur in the future

Conservation Actions Needed

1. Reduce eutrophication at *P. ogdenii* sites by imposing stricter septic laws, establish buffer zones along edges of waterways, and control runoff from paved surfaces
2. Remove invasive species, especially *Myriophyllum spicatum*, from *P. ogdenii* sites
3. Closely monitor known populations for increases or long-term decreases in numbers
4. Survey potential habitats for new *P. ogdenii* populations
5. Conduct water chemical analyses to determine the parameters of the species

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.

This document should be cited as follows:

Hellquist, C. B. and T. Mertinooke-Jongkind. 2003. Ogden's Pondweed (*Potamogeton ogedenii*) Conservation and Research Plan for New England. New England Wild Flower Society, Framingham, Massachusetts, USA.

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I. BACKGROUND

INTRODUCTION

Potamogeton ogdenii (Potamogetonaceae) is one of many linear-leaved pondweeds in northeastern North America that appear similar. It is of hybrid origin between *Potamogeton zosteriformis* Fernald and *Potamogeton hillii* Morong (Hellquist and Hilton 1983). This species is very similar to another hybrid, *Potamogeton* ♂ *haynesii*, and a few other species in the northeast. This taxon is very rare within its range. Historically, it was known from 18 sites and presently from ten sites, six of which are in New England. Threats to this rare aquatic species appear to be eutrophication, competition from invasive species, restricted habitat, and low population numbers. The main conservation objectives recommended are to maintain and improve the conditions of the six current New England locations and to reduce competition from invasive species.

DESCRIPTION

Potamogeton ogdenii has linear submersed leaves 1.2-2.9 mm with (3)5-11(13) veins, 2-4 lacunae bands and a cuspidate-bristled tip. The stipule is white to brown and slightly fibrous. The stem has golden-brown to dark-brown nodal glands at the base of the leaves. Peduncles are mostly terminal, 10-30 mm long. The spike shape is cylindrical, 5-11mm long. The number of flower whorls is 2-4. Fruits are occasionally formed, dark green, with obscure keels, 2.5-3 x 2.2-3 mm, with a 0.5 mm-long, erect beak. Turions (winter buds) are terminal or lateral, uncommon, 3-7-9.9 x 2.6-6 cm, soft to hard (Hellquist and Hilton 1983, Haynes and Hellquist 2000).

TAXONOMIC RELATIONSHIPS, HISTORY, AND SYNONYMY

Potamogeton ogdenii is of hybrid origin between *Potamogeton zosteriformis* and *Potamogeton hillii*. The type locality is Beebe Pond, Canaan, Columbia County, New York. Robert R. Haynes (University of Alabama, personal communication) originally discovered the population while visiting Eugene Ogden during June, 1970. Later in October that year, Ogden and Stanley Smith revisited Beebe Pond and documented the taxon in fruit. At that time, this was the only fertile population of what was known as *P. longiligulatus* Fernald. In 1974, Hellquist visited Beebe Pond and found both *P. hillii* and *P. zosteriformis* present as well as what was then recognized as *P. longiligulatus*. A hybrid between these two former taxa was suspected because the plants appeared to be morphologically intermediate. A thorough morphological and flavonoid study of the putative *P. longiligulatus* supported a hybrid

between *P. hillii* and *P. zosteriformis* (Hellquist and Hilton 1983), with the warranted specific status of *P. ogdenii*. The name *P. longiligulatus* was found to be invalid because the type was found to be a robust form of *P. strictifolius* Ar. Benn. A similar taxon, *P. x haynesii*, from Northern Michigan (also formally known as *P. longiligulatus*) has been shown to be of hybrid origin between *P. strictifolius* and *P. zosteriformis* (Haynes and Williams 1975, Hellquist and Crow 1986).

Below is a key to the closely related species of *Potamogeton* (Hellquist and Hilton 1983, Hellquist and Crow 1986) to aid in the identification of these closely related confusing taxa.

1. Peduncles mostly axillary, 6-14 mm long, usually recurved; flowers and fruits in whorls of 1(-2), globose *P. hillii*

1. Peduncles mostly terminal, 8-45 mm long, straight, occasionally slightly recurved; flowers and fruits in whorls of (1-)4-6, cylindrical.
 2. Winter buds with outer leaves divergent, arcuate, and in-rolled; stipules white, fibrous; lacunae bands lacking, (rarely 2-4) per leaf.
 2. Leaves 3-5(-7)-veined; flower whorls 3-4, frequently formed *P. strictifolius*
 3. Leaves 7-21-veined; flower whorls 4-6, rarely formed *P. x haynesii*
 2. Winter buds with outer leaves occasionally undifferentiated, flattened; stipules brown (rarely white), fibrous only at tips; lacunae bands (0-)2-4(-6) per leaf *P. ogdenii*

SPECIES BIOLOGY

Potamogeton ogdenii is an annual that reproduces mainly by the production of turions (winter buds). These are produced at the tip of the stems during the latter portion of the growing season. As the plant begins to break apart in late summer and autumn, the turions fall to the substrate, remaining dormant through the winter, and start to grow in the spring. This is a very efficient method of asexual reproduction. Viable fruit in small numbers (usually one per plant) are also produced at a few of the populations (Hellquist 1995). These are produced at the ends of terminal peduncles in mid-summer.

Population numbers of *P. ogdenii* vary greatly from year to year at individual sites. This is a common phenomenon that has been observed by Hellquist for various species of the pusilloid pondweeds that produce numerous fruits and turions. *Potamogeton hillii*, one of the

parental species, is a prolific fruiter, but often shows great population fluctuations from year to year. In New England, *P. ogdenii* reproduces mainly through turion production. It has been found producing numerous fruit at VT.004 (Calais) and MA 001 Hancock (Hancock). The type locality just over the Massachusetts border at Beebe Pond, Canaan, New York is also fertile.

HABITAT/ECOLOGY

Potamogeton ogdenii may occur in waters where populations of *P. hillii* and *P. zosteriformis* may be found (Hellquist 1993). However, in most of the known locations, usually only one of the parent species, *P. zosteriformis*, is found with *P. ogdenii*. The plant prefers ponds and lakes with a high alkalinity where they are seen with extensive marl deposits on the plants (Haynes and Hellquist 2000). Hellquist (1975) found the alkalinity at *P. ogdenii* sites ranged from 71.5 to 107.0 mg/l CaCO₃. Some associated plants at *P. ogdenii* sites that share these high alkalinity requirements are *Potamogeton strictifolius*, *P. illinoensis* Morong, *P. foliosus* Raf., and *Stuckenia pectinata* (L.) Börner (Hellquist, personal observation).

THREATS TO TAXON

Eutrophication is a major problem facing this species. This is caused by extensive runoff from adjacent farmland, lawns, and paved areas. Runoff can lead to extensive algal blooms and weed growth, which can crowd out the pondweed. The grazing of geese at CT .001 (Salisbury) may lead to future problems. A large population may lead to increased fertilization from their droppings. The gradual eutrophication and filling in of ponds with vegetation will eventually be detrimental to the species at numerous locations. Other areas where *P. ogdenii* occurs face similar threats (Hellquist 1995).

Sites where *Potamogeton ogdenii* occur are prone to large populations of various aquatic species, particularly *Myriophyllum spicatum* L. and *Trapa natans* L. Invasive and certain native species can overpopulate a pond and prohibit other plants from photosynthesizing by shading. They also compete for nutrients, leading to species decline and possible species exclusion. Chemical control and mechanical harvesting of invasives can present a major problem for *P. ogdenii* populations, since the species grows interspersed with the invasive species.

Acidification may be a minor threat to *P. ogdenii* because it needs alkaline waters to survive. Acidification in *P. ogdenii*'s range is a natural phenomenon as well as anthropogenic via acid precipitation. Russ Pond in central New York is being threatened by a gradual modification in the chemistry of the water due to a bog mat around the perimeter. This gradual change from alkaline to acidic waters will be detrimental to the plant (Hellquist 1995). Most

ponds in New England within the limestone belts do not have any bog mats associated with them.

DISTRIBUTION AND STATUS

General Status

Potamogeton ogdenii is confined to northeastern North America from Vermont, Massachusetts and Connecticut west to New York and Ontario (Table 1). A possible reason for its range limitation is due to the relative rarity of the parent species *P. hillii*. *Potamogeton hillii* is relatively uncommon in alkaline waters (Hellquist 1984) throughout its range, but is locally abundant in portions of its range in New England. The other parental species, *P. zosteriformis*, is widespread in neutral to alkaline waters throughout its range (Hellquist 1975, 1980). The *Flora Conservanda* lists the taxon as Division 1, reflecting its global rarity (Brumback and Mehrhoff et al. 1986).

Eighteen populations (of which ten are extant) occur in Massachusetts, Connecticut, Vermont, and New York, and Ontario. With the exception of southern Ontario, this taxon has not been reported from the Great Lakes region. Both parental species are present in the northern portion of the Lower Peninsula of Michigan and the region near Manitoulin Island, Ontario, so it should be searched for in that region. The plant is listed G1 globally, meaning it is "critically imperiled globally because of extreme rarity (five or fewer occurrences), or very few remaining acres, or miles of stream, or especially vulnerable to extinction because of some factor of its biology" (New York Natural Heritage Program 2002).

Table 1. Occurrence and status of <i>Potamogeton ogdenii</i> in the United States and Canada based on information from Natural Heritage Programs and Herbarium records.			
OCCURS & LISTED (AS S1,S2, OR T & E)	OCCURS & NOT LISTED (AS S1, S2, OR T & E)	OCCURRENCE VERIFIED FROM HERBARIUM RECORDS	HISTORIC (LIKELY EXTIRPATED)
Vermont (S1): 4 sites, 2 current	Not applicable	Ontario: 2 sites, 1 historical and 1 current.	Not applicable
Massachusetts (S1): 2 current sites			
Connecticut (S1): 5 sites, 2 current			
New York (S1): 5 sites, 3 current			



Figure 1. Distribution of *Potamogeton ogednii* in North America. States shaded in gray have 1-5 confirmed, current occurrences of taxon. Ontario, stippled, has two occurrences of the taxon confirmed from herbarium records; the current status of those populations is unknown.

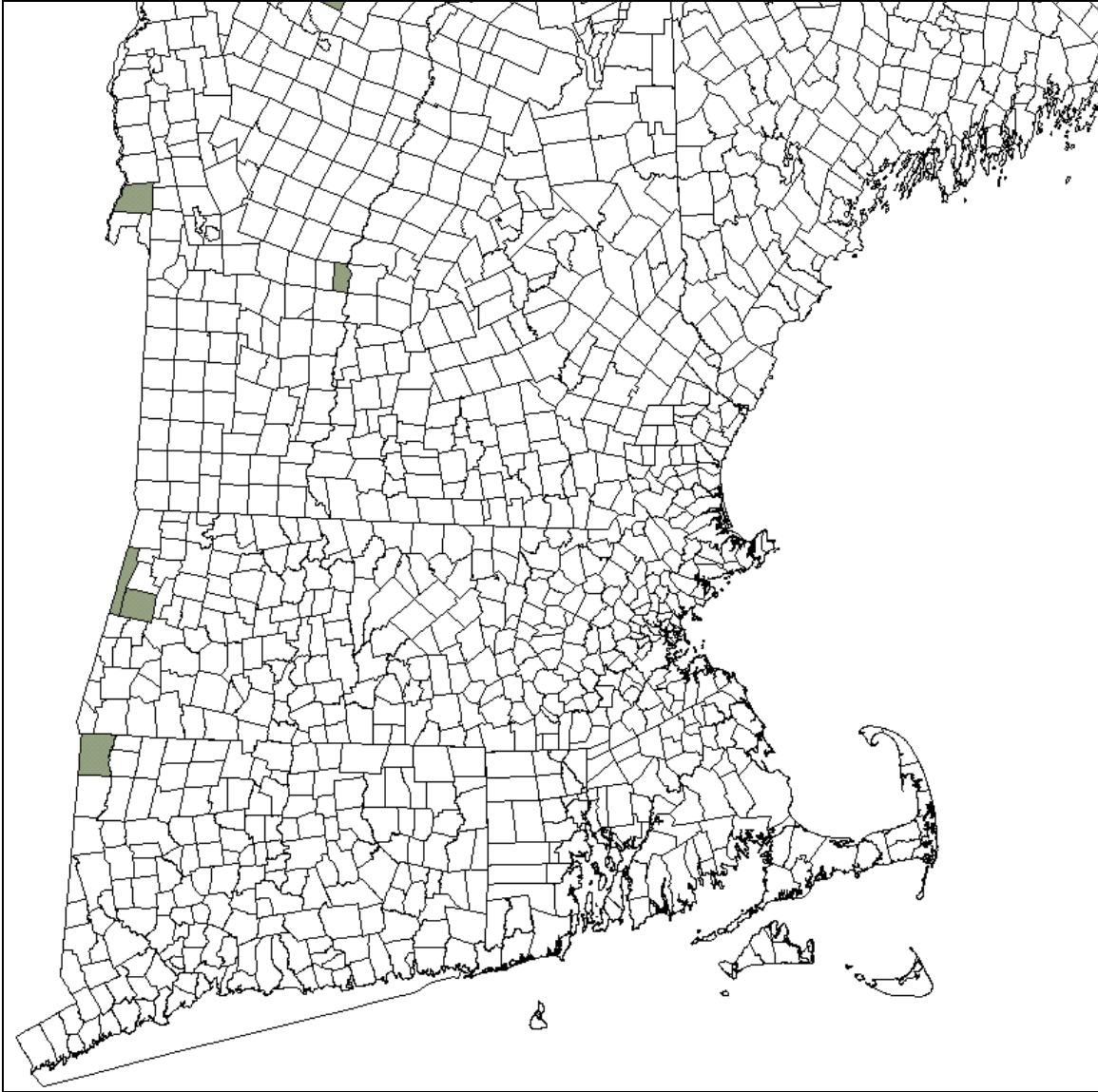


Figure 2. Extant occurrences of *Potamogeton ogdenii* in New England. Town boundaries for southern New England states are shown. Towns shaded in gray have one to five current, confirmed occurrences of the taxon.

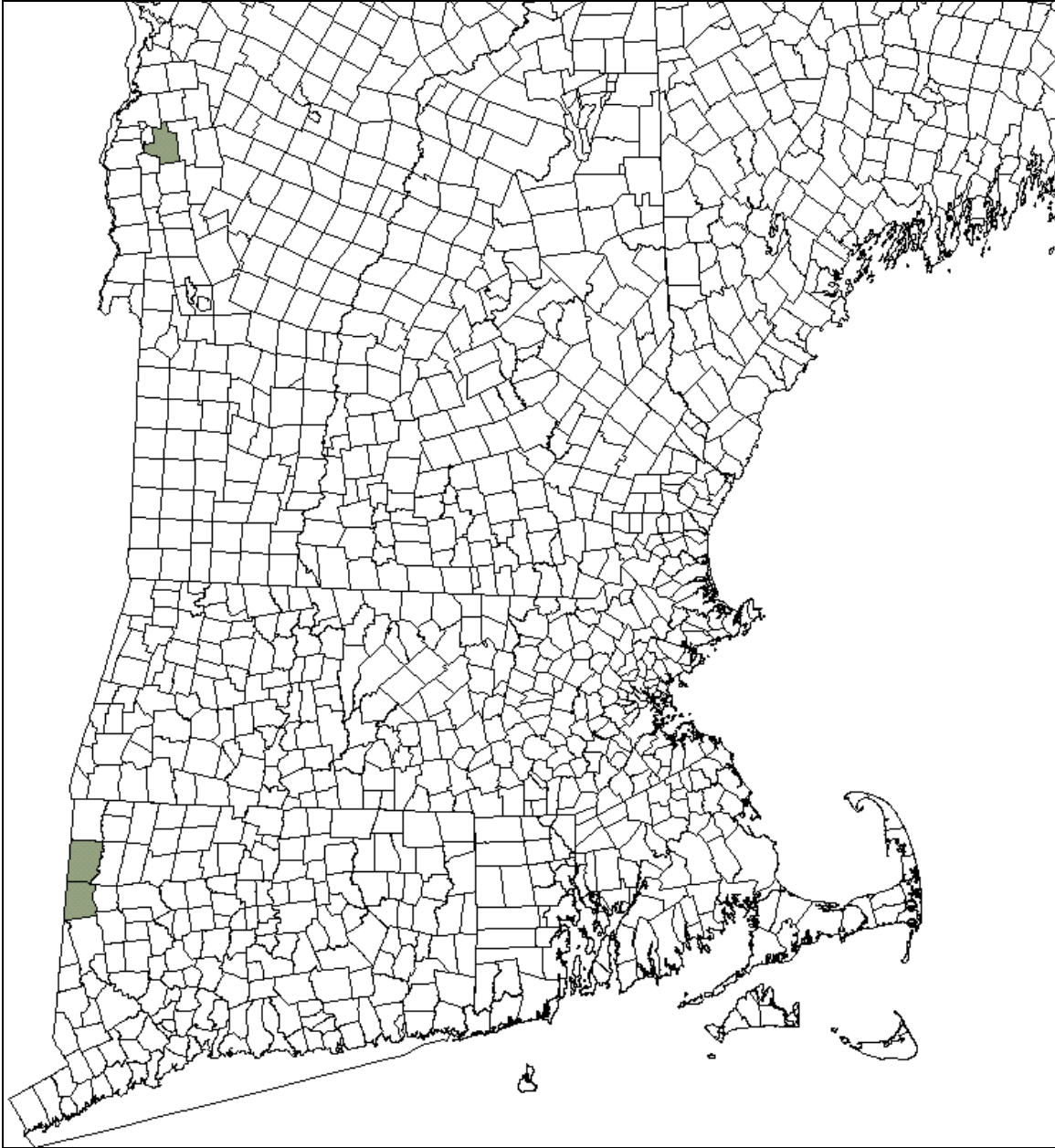


Figure 3. Historic occurrences of *Potamogeton ogdenii* in New England. Towns shaded in gray have one to two historic records of the taxon.

**Table 2. New England Occurrence Records for *Potamogeton ogdenii*.
Shaded occurrences are considered extant.**

State	EO #	County	Town
VT	.001	Addison	New Haven
VT	.002	Windsor	Windsor
VT	.003	Rutland	Benson
VT	.004	Washington	Calais
MA	.001	Berkshire	Hancock
MA	.002	Berkshire	Pittsfield
CT	Site 1	Litchfield	Kent
CT	Site 2	Litchfield	Sharon
CT	Site 3	Litchfield	Sharon
CT	Site 4	Litchfield	Salisbury
CT	Site 5	Litchfield	Salisbury

II. CONSERVATION

CONSERVATION OBJECTIVES FOR TAXON IN NEW ENGLAND.

Potamogeton ogdenii is globally rare (G1) and is ranked S1 by all of the states where it occurs. Worldwide, it has been recorded from only 18 locations, of which ten are extant in the world. At present, there are only six extant sites in New England. The primary goals for *P. ogdenii* are to regularly monitor, maintain, and improve conditions at these six extant sites. It is important to record the change in densities over a number of years to see if and how the population is growing and to determine if there is any correlation among factors that might affect growing conditions. Presently, the most secure site in New England is the occurrence at MA .001 (Hancock) site with hundreds of plants despite the competition with the native plants. The other sites are low in numbers but are known to fluctuate from year to year. This is a phenomenon regularly observed despite the fact that plants produce turions. Because of this natural variability, known and historic sites should be visited at a minimum of every other year.

The lakes and rivers where this species has been found in New England are subjected to eutrophication. Surrounding land use is mostly crop and dairy farming in Vermont and Massachusetts. Some of the lakes have extensive residential buildup along the shores. In either case, this development contributes to the nutrient loading of the bodies of water. Buffer zones should be established to absorb as much runoff from agricultural lands as possible. These zones should not be mowed. These mitigating factors should be practiced at all locations.

Nutrient loading has also promoted the increase of aquatic weeds in many of the locations where *P. ogdenii* occurs. Invasive aquatics found at the *Potamogeton ogdenii* sites include: *Myriophyllum spicatum*, *Najas guadalupensis*, *Potamogeton crispus*, and *Trapa natans*. Eradication of invasives is next to impossible, leaving control as the only alternative. The control methods typically used are herbicide applications, harvesting, benthic barriers, and hand pulling. The preferred method depends on the conditions at the site. Control should only be conducted after a thorough study of the water-body. All state regulations and permitting must be followed. Yearly monitoring of the invasive weeds is needed to make sure they are not encroaching on the *P. ogdenii*. These comments also apply to all sites in New England whether or not invasive species presently occur.

Most invasive aquatics probably were transported into these lakes by boaters and fishermen. Both groups tend to move their boats from lake to lake. If their boats are not thoroughly inspected and cleaned prior to leaving a body of water, new plants are sure to be introduced into the next pond or lake. The first defense against this is educational signage at all public launch sites. At VT .002 (Windsor) and VT .004 (Calais), signage is present. A second method of education to the boaters and fisherman is the distribution of educational literature

when fishing licenses and boat registrations are obtained. Each state should have a publication stating the problems associated with the introduction of invasive weeds into various waters and how they will affect their water uses.

The general actions recommended to conserve *P. ogdenii* in New England are:

1. **Reduce eutrophication** by imposing and/or enforcing stricter septic laws, establish buffer zones along the edge of waterways, and control runoff from paved surfaces
2. **Remove invasive species**
3. **Closely monitor known populations** for increases or long-term decreases in numbers
4. **Survey potential habitats** for new *P. ogdenii* populations
5. **Conduct a water chemical analysis at each extant site** of *P. ogdenii* to determine the habitat parameters of the species

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Appendix 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 observation have been made for more than 20 years. An X rank is utilized for sites that are known to be extirpated. Not all EO's have received such ranks in all states, and ranks are not necessarily consistent among states as yet.