

The Evaluation Of Non-Native Plant Species For Invasiveness In Massachusetts

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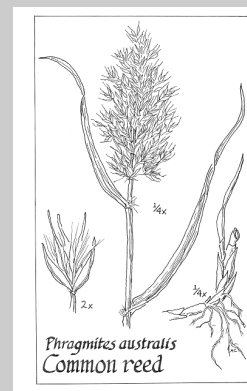
The Massachusetts Executive
Office of Environmental Affairs



The Massachusetts Nursery and
Landscape Association, Inc.

Research conducted by:

Leslie J. Mehrhoff
University of Connecticut
George Safford Torrey Herbarium



*The final report of the
Plant Evaluation Subcommittee
of the Massachusetts Invasive
Plant Working Group
March 14, 2003*

History of the... Massachusetts Invasive Plant (Working) Group

February 23, 1999: The Massachusetts Native Plant Advisory Committee, under the encouragement of the green industry, recruited more broad-based perspectives and support on the invasive plant issue by having a meeting of representatives of diverse interest groups. Attendees had the common goal of outreach and education, agreeing that the group should meet regularly to exchange ideas and points of view. Other goals were to promote alternatives to invasive species and promote research. A proposed goal was suggested: develop an action plan within two years, which would include a statewide list of invasive plants which all participants could agree. In order to accomplish the first step of this goal, a subcommittee was formed to develop scientifically based definitions and criteria to be used to evaluate plant species. The definition crafted by a committee working on the national level was used as the basis for our definition. It was agreed to function as a separate entity from the MA Native Plant Advisory Committee, but remain within its auspices.

April 1999 – December 1999: The Definition and Criteria Subcommittee adopted (with some modifications) the definition presented in February. Several sets of criteria and ranking systems were reviewed. Les Mehrhoff, developer of the criteria in Connecticut, was asked to speak about his criteria. The group decided that it would like to use these criteria as the basis of the Massachusetts criteria. Several meetings were conducted to adapt the Connecticut criteria to meet the needs of our group. When done, a meeting was called of the larger group to get approval.

January 18, 2000: The larger group, now being referred to as the Massachusetts Invasive Plant Group (or Working Group), met to discuss the criteria and decide how to proceed. The group adopted the criteria with the stipulation that a clarifying preamble and definitions accompany them. A new subcommittee was formed to undertake the process of evaluating the plants using the new criteria. Final results from this process would need to be reported to the whole group. It was suggested that a land manager be found to serve on the committee.

Many attendees expressed an interest in meeting on native plant issues, unrelated to the invasive plant issue so we decided to start up the “native plant” counterpart group again, but possibly taking a new identity instead of the MA Native Plant Advisory Committee. We discussed whether these two groups, native and invasive, should be separate entities or not. The sense of this group was that these two groups remain linked by an umbrella organization. (Note: when the native group met, including others outside of the invasive group, they decided that they would like to be a separate group from the invasive group, not joined by an umbrella group, but keeping in close contact through common members)

February 2000 – present: The Plant Evaluation Subcommittee decided that because of member’s limited time and expertise that it needed to hire a researcher to collect the data, run the species through the criteria, and make recommendations on the status of each species. Les Mehrhoff was invited to take on this responsibility if sufficient funds could be acquired. To start the process, he obtained a grant from the Massachusetts Nursery and Landscape Association and the Horticultural Research Institute. Later, additional funds from E.O.E.A. were secured for this research project. A list of 33 species of the most widespread aggressive plants were chosen to begin the evaluation process, and six more species added at a later date. Voting procedures were agreed upon, with each agency/organization entitled to one vote. A statement of organizing principles was adopted. Dr. Mehrhoff searched the literature, collected data from several herbaria and key organization’s databases, and made recommendations to the Plant Evaluation Subcommittee on all 39 species. In the process, he realized that the criteria need modifications and the committee voted to make some of his recommended changes. The subcommittee voted on the recommendations for all 39 species and created an annotated list stating the agreed upon status for each species. This list will be brought before the larger group on September 23, 2002.

Purpose and Organizing Principles Of The Plant Evaluation Subcommittee of the Massachusetts Invasive Plant Working Group

The Plant Evaluation Subcommittee of the Massachusetts Invasive Plant Group (MIPG) was formed in 2000 -to carry on the work begun by the Definition and Criteria Subcommittee of the MIPG. Its purpose is:

- to use and refine the scientific criteria adopted by the MIPG to evaluate whether a plant species is currently invasive or likely invasive within the Commonwealth;
- to gather and assess the best available data on plant species suspected to be invasive that will help determine whether such species meet the criteria for invasive or likely invasive within the Commonwealth;
- to make recommendations to the MIPG that species meeting these criteria be considered invasive or likely invasive within the Commonwealth.

The Plant Evaluation Subcommittee is a voluntary collaboration between both public and private organizations. Its members represent federal and state agencies, land trusts, nurseries and landscape associations, land managers, scientific and academic institutions. The Subcommittee believes that invasive species represent a significant threat to the native flora and natural communities of the Commonwealth. It feels a collaborative evaluation of invasive or likely invasive plants should be an effective and sustainable means to achieve results of real conservation value. Its members affirm their commitment to working within their individual organizations to substantially address the impact of species determined by scientific criteria to be invasive or likely invasive within the Commonwealth. The MIPG will also make recommendations within its member organizations that species meeting these criteria be considered invasive or likely invasive within the Commonwealth, and will advise the Massachusetts Executive Office of Environmental Affairs (EOEA) on invasive species issues within the Commonwealth, including providing an annotated list of the plants it has determined to be invasive or likely invasive.

The Plant Evaluation Subcommittee makes all its important decisions at its scheduled meetings by voting. In certain instances, representatives of the same organization voluntarily share a vote on the Subcommittee and alternate their attendance. Quorum for any meeting must be two-thirds of the voting membership, and any decision must pass by the votes of at least two-thirds of members present. The only exception is when a vote has been taken at a meeting to determine whether a species is invasive or likely invasive within the Commonwealth. In this case, all voting members have the right to vote, with those absent from the meeting having not more than two additional weeks to submit their vote to the recorder. Only one vote per organization is permitted so if more than one member of an organization sits on the committee, they must submit one vote between them. Agreed upon by quorum on 6-12-02 “a 2/3 majority will be calculated only using affirmative and negative votes cast. Abstentions will not be included.”

See list of voting members on the next page.

Voting Members

Of The Plant Evaluation Subcommittee of the Massachusetts Invasive Plant Working

Adopted by vote of the membership meeting in quorum, Voting Members (as of 4/6/2000) include:

Tim Abbott, *The Nature Conservancy*
Pat Bigelow, *New England Nursery Assn.*
Cynthia Boettner, *Silvio O. Conte National Fish & Wildlife Refuge*
Rich Bonanno, *UMass Extension, Northeast Weed Science Society*
Bill Brumback/Chris Mattrick, *New England Wild Flower Society*
Peter Del Tredici/Tom Ward, *Harvard University Arnold Arboretum*
Ron Kujawski, *UMass Extension (see Randy Prostak, below)*
Thom Kyker-Snowman, *Metropolitan District Commission*
Calvin Layton, *NSTAR Services*
R. Wayne Mezitt, *American Nursery and Landscape Assn.*
Paul Somers/ Tom French/ Tim Simmons, *Massachusetts Natural Heritage and Endangered Species Program*
Rena Sumner, *Massachusetts Nursery and Landscape Assn.*
Seth Wilkinson, *Brewster Natural Resources*

New Voting Members

added as of 3-30-2001:

Brad Mitchell/ Al Carl/ Phyllis Michalewich, *MA Dept. of Food and Agriculture*
Jonathan Shaw, *Natural Heritage and Endangered Species Advisory Committee*

added as of 2-12-2002:

Don Bishop, *Ecological Landscaping Assn.*

replacement as of June 2002

Randy Prostak, for Ron Kujawski, *UMass Extension*, due to Ron's retirement

9-16-2002

Phase I—39 species evaluated
The Evaluation of Non-Native Plant Species For Invasiveness In
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Final Report : "Invasive and Likely Invasive Plants in Massachusetts"

Presented by the Plant Evaluation Subcommittee of the Massachusetts Invasive Plant Working Group March 14, 2003

Research sponsored by: Massachusetts Nursery and Landscape Association, Inc.; Horticultural Research Institute; MA Executive Office of Environmental Affairs

CRITERIA FOR EVALUATING NON-NATIVE PLANT SPECIES FOR INVASIVENESS IN MASSACHUSETTS

THESE CRITERIA HAVE NO OFFICIAL STATUS FOR MASSACHUSETTS

Invasive plants, as defined by the Massachusetts Invasive Plant Group, are “plants that have spread into native or minimally managed plant systems in Massachusetts. These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.”

(Under this definition all synonyms, subspecies, varieties, forms, and cultivars of that species are included unless proven otherwise by a process of scientific evaluation.)

The following criteria are being used to objectively evaluate and categorize plant species suspected of being invasive in Massachusetts. They were developed by the George Safford Torrey Herbarium at the University of Connecticut and a subcommittee of the Massachusetts Invasive Plant Group representing science, nursery, and conservation professionals. A separate evaluation will be undertaken for plants not currently in the state, but predicted to become invasive here.

The criteria enable the separation of plants into the following categories:

- *Invasive Plants in Massachusetts*
- *Likely Invasive Plants in Massachusetts*

The process of reviewing individual plant species for their invasiveness in Massachusetts is ongoing and may result in a change in status pending new data and further review.

Tabular summary of how the criteria work.

To be considered	Criteria that must be met
Invasive	1-9
Likely Invasive	1-5, at least 1 of 10-12

THE CRITERIA

For a species to be included as a Non-native Invasive Species or as a Non-native Potentially Invasive Species in Massachusetts, it must be substantiated by scientific investigation (including herbarium specimens, peer-reviewed papers, published records and other data available for public review) to be:

1. Nonindigenous to Massachusetts.
2. Naturalized in Massachusetts.
3. Have the biologic potential for rapid and widespread dispersion and establishment in minimally managed habitats.
4. Have the biologic potential for dispersing over spatial gaps away from site of introduction.
5. Have the biologic potential for existing in high numbers away from intensively managed artificial habitats.

Further, to be included as a Non-native Invasive Species, a species must be documented to:

6. Be widespread in Massachusetts, or at least common in a region or habitat type(s) in the state.
7. Have many occurrences of numerous individuals in Massachusetts
8. Be able to out-compete other species in the same natural plant community.
9. Have the potential for rapid growth, high seed or propagule production and dissemination, and establishment in natural plant communities.

If a species meets the initial 5 criteria but does not, at this time meet Criteria 6-9 (all), it may be considered to be a Likely Invasive Species in Massachusetts if it meets at least one of Criteria 10-12.

In the past, some of these species have been considered invasive in Massachusetts, at least in part because they are known to be invasive in other regions and thus expected to be so here.

10. Have at least one occurrence in Massachusetts that have high numbers of individuals forming dense stands in minimally managed habitats
11. Have the potential, based on its biology and its colonization history in the northeast or elsewhere, to become invasive in Massachusetts.
12. Be acknowledged to be invasive in nearby states but its status in Massachusetts is unknown or unclear. This may result from lack of field experience with the species or from difficulty in species determination or taxonomy.

DRAFT 9-02-02:

includes criteria changes voted upon on 2-12-02 and preamble voted upon on 6-12-02 and 8-22-02. Also see accompanying definitions from 9-02-02.

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Notes

**DEFINITIONS TO ACCOMPANY
“CRITERIA FOR EVALUATING NON-NATIVE PLANT SPECIES FOR INVASIVENESS IN
MASSACHUSETTS”**

The Problem: The biological invasion of native plant communities by non-indigenous species that proliferate, out compete native species, threaten endangered species and decrease biodiversity.

Invasive species - Plants that have spread into native or minimally managed plant systems in Massachusetts. These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.

(Under this definition all synonyms, species, subspecies, varieties, forms, and cultivars of that species are included unless proven otherwise by a process of scientific evaluation.)

Indigenous species - otherwise A species that occurs natively in Massachusetts. Indigenous species often have a pre-colonial presence (pre 1500) or have arrived in the region more recently without the aid of human intervention. Synonymous with native species.

Non-indigenous species - A species that is not native or naturally occurring (based on its biology, phylogeny, distribution and current knowledge about the species) within Massachusetts. A species may be indigenous to North America but non-indigenous in Massachusetts. Synonymous with non-native species.

Naturalized species - A non-indigenous taxon that occurs without the aid and benefits of cultivation in Massachusetts. Further, it implies two biological points: it freely and regularly reproduces in the wild, sexually or asexually, and occurrences persist over time.

Biologic potential - The ability of a species to increase its number, either sexually and/or asexually.

Spatial gaps - This term is used in reference to the ability of a species to disperse away from existing occurrences. The concept of crossing spatial gaps is used to distinguish those species that can disperse over discontinuities and become established elsewhere from species that spread across a habitat only by continual, uninterrupted growth.

Minimally managed habitats - Minimally managed habitats are habitats where management efforts and investments of time, money and labor are infrequent or non-existent. These habitats may have been intensively managed for anthropogenic reasons at one time in their history. In some instances, management may be more intense but management is done for conservation purposes and is primarily aimed at preserving elements of biological diversity such as imperiled species or critical natural communities. Minimally managed habitats are similar to "natural areas" but the distinction is made in order to remove bias, misconceptions or ambiguities that surround the term "natural area".

Intensively managed habitats - Intensively managed habitats are habitats or land systems where management efforts and investments of time, money and labor occur frequently. Examples include manicured lawns, landscaped grounds, gardens, roadsides or agricultural lands for crops or livestock.

Occurrence – Existing example of a species on the landscape.

Natural plant community - A natural plant community is an association or assemblage of plant species that repeatedly occur together in reoccurring patterns in a specific type of habitat. This assemblage can be characterized by dominant species and biological properties. A natural plant community implies a minimally managed situation where all or most of the species that make up the assemblage are indigenous to the defined area.

Draft: 09-02-02 Plant Evaluation Subcommittee of the Massachusetts Invasive Plant Group

Plants voted as: INVASIVE

Aegopodium podagraria L. **Bishop's goutweed, bishop's weed, goutweed**

Form: growth habit – forb/herb; Habitat region - entire state; environment – upland, wetland; light tolerance – all. Notes: Escapes from cultivation; spreads aggressively by roots; forms dense colonies in flood plains

Ailanthus altissima (P. Miller) Swingle **Tree of heaven**

Form: growth habit – tree/duration perennial; Habitat region - entire state; environment - upland, wetland, & coastal; light tolerance – all. Notes: spreads aggressively from root suckers, especially in disturbed areas

Alliaria petiolata (Bieb.) Cavara & Grande **Garlic mustard**

Form: growth habit - forb/herb; duration - biennial Habitat: region - entire state; environment - upland; light tolerance - shade. Notes: spreads aggressively by seed, especially in wooded areas:

Berberis thunbergii DC. **Japanese barberry**

Form: growth habit - shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance – full sun to shade Notes: escaping from cultivation; spread by birds; forms dense stands

Cabomba caroliniana A.Gray **Carolina fanwort; fanwort**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - aquatic; light tolerance - not applicable Notes: common in the aquarium trade; chokes waterways

Celastrus orbiculatus Thunb. **Asian or, Asiatic bittersweet, oriental bittersweet**

Form: growth habit - vine; duration - perennial Habitat: region - entire state; environment - upland; light tolerance - full sun, partial shade Notes: escaping from cultivation; berries spread by birds and humans; overwhelms and kills vegetation

Cynanchum louiseae Kartesz & Gandhi **Black swallow-wort, Louise's swallow-wort**

Form: growth habit - vine; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, partial shade Notes: forms dense stands out-competing native species: deadly to Monarch butterflies.

Elaeagnus umbellata Thunb. **Autumn olive**

Form: growth habit - shrub; duration - perennial Habitat: region - entire state; environment - upland; light tolerance - full sun Notes: escaping from cultivation; berries spread by birds; aggressive in open areas; has the ability to change soil chemistry

Frangula alnus P. Mill. **European buckthorn, glossy buckthorn**

Form: growth habit - shrub, tree; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: produces fruit throughout the growing season; grows in multiple habitats; forms dense thickets.

Glaucium flavum Crantz **sea or horned poppy, yellow hornpoppy**

Form: growth habit - forb/herb; duration - biennial, perennial Habitat: region - southeastern; environment - coastal; light tolerance - full sun Notes: seeds float; spreads along rocky beaches; primarily Cape Cod and Islands

Hesperis matronalis L. **Dame's rocket**

Form: growth habit - forb/herb; duration - biennial, perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: spreads by seed; can form dense stands, particularly in flood plains

Plants voted as: INVASIVE

Iris pseudacorus L. **Yellow iris**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - wetland; light tolerance - full sun, partial shade Notes: found primarily in flood plains; out-competes native plant communities

Lepidium latifolium L. **broad-leaved pepperweed, tall pepperweed**

Form: growth habit - forb/herb; duration - perennial Habitat: region - eastern, southeastern; environment - coastal; light tolerance - full sun Notes: primarily coastal at upper edge of wetlands; also found in disturbed areas; salt tolerant

Lonicera x-bella Zabel [morrowii x tatarica] **Bell's honeysuckle**

Form: growth habit - shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: part of a confusing hybrid complex of nonnative honeysuckle commonly planted and escaping from cultivation via bird dispersal

Lonicera japonica Thunb. **Japanese honeysuckle**

Form: growth habit - vine; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: rapidly growing, dense stands climb and overwhelm native vegetation; produces many seeds that are bird dispersed; more common in southeastern Massachusetts.

Lonicera morrowii A.Gray **Morrow's honeysuckle**

Form: growth habit - shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: part of a confusing hybrid complex of nonnative honeysuckle commonly planted and escaping from cultivation via bird dispersal

Lysimachia nummularia L. **Creeping jenny, moneywort**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: escaping from cultivation; problematic in flood plains, forests and wetlands; forms dense mats

Lythrum salicaria L. **Purple loosestrife**

Form: growth habit - forb/herb, subshrub; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, partial shade Notes: escaping from cultivation; overtakes wetlands; high seed production and longevity

Myriophyllum heterophyllum Michx. **Twoleaved water-milfoil, variable water-milfoil**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - aquatic; light tolerance - not applicable Notes: chokes waterways, spread by humans and possibly birds

Myriophyllum spicatum L. **Eurasian or European water-milfoil, spike water-milfoil**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - aquatic; light tolerance - not applicable Notes: chokes waterways, spread by humans and possibly birds

Phragmites australis (Cav.) Trin. ex Steud. **common reed**

Form: growth habit - graminoid (USDA lists as subshrub, shrub); duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: overwhelms wetlands forming huge, dense stands; flourishes in disturbed areas; native and introduced strains.

Plants voted as: INVASIVE

Polygonum cuspidatum Sieb. & Zucc. **Japanese knotweed; Japanese Bamboo**

Form: growth habit - forb/herb, subshrub, shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: Spreads vegetatively and by seed; forms dense thickets.

Potamogeton crispus L. **Crisped pondweed, curly pondweed**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - aquatic; light tolerance - not applicable Notes: forms dense mats in the spring and persists vegetatively

Rhamnus cathartica L. **Common buckthorn**

Form: growth habit - shrub, tree; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: produces fruit in fall; grows in multiple habitats; forms dense thickets

Robinia pseudoacacia **Black locust**

Form: growth habit - tree; duration - perennial Habitat: region - entire state; environment - upland; light tolerance - full sun, shade. Notes: While the species is native to central portions of Eastern North America, it is not indigenous to Massachusetts. It has been planted throughout the state since the 1700's and is now widely naturalized. It behaves as an invasive species in areas with sandy soils.

Rosa multiflora Thunb. **Multiflora rose**

Form: growth habit - vine, shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: forms impenetrable thorny thickets that can overwhelm other vegetation; bird dispersed

Trapa natans L. **Water-chestnut**

Form: growth habit - forb/herb; duration - annual

Habitat: region - western, central, eastern; environment - aquatic; light tolerance - not applicable Notes: forms dense floating mats on water

Plants voted as: LIKELY INVASIVE

Centaurea biebersteinii DC. **Spotted knapweed**

Form: growth habit - forb/herb; duration - biennial, perennial Habitat: region - entire state; environment - upland, coastal; light tolerance - full sun Notes: aggressively grows in well-drained, disturbed soils; serious problem in western states where it out-competes native grassland species, literature reports are currently lacking for this in the northeast.

Cynanchum rossicum (Kleopov) Borhidi **European swallow-wort, pale swallow-wort** Form: growth habit - forb/herb, vine; duration - perennial Habitat: region - western; environment - upland; light tolerance - full sun, partial shade Notes: forms dense stands; found primarily in the lower CT River Valley.

Egeria densa Planchon **Brazilian water weed**

Form: growth habit - forb/herb; duration - perennial Habitat: region - eastern, southeastern; environment - aquatic; light tolerance - not applicable Notes: common in the aquarium trade; chokes waterways; currently only found in a few MA ponds

Epilobium hirsutum L. **Codlins and cream, hairy willow herb**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - wetland; light tolerance - full sun Notes: seeds dispersed by wind and water; evidence currently lacking that this species out-competes other vegetation in minimally managed habitats

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Plants voted as: **LIKELY INVASIVE**

***Euphorbia cyparissias* L. Cypress spurge**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - upland; light tolerance - full sun Notes: persists in open areas; evidence currently lacking that this species out-competes other vegetation in minimally managed habitats

***Hydrilla verticillata* (L.f.) Royle waterthyme**

Form: growth habit - forb/herb; duration - perennial Habitat: region - southeastern; environment - aquatic; light tolerance - not applicable Notes: only found in one MA pond currently (2002); easily dispersed by birds and humans; chokes entire water bodies

***Microstegium vimineum* (Trin.) A. Camus Japanese stilt grass, Napalese browntop**

Form: growth habit - graminoid; duration - annual Habitat: region - western; environment - upland, wetland; light tolerance - full sun, shade Notes: forms dense stands; currently localized in the lower CT River Valley; spreads in flood plains.

***Myosotis scorpioides* L. Forget-me-not**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - wetland; light tolerance - full sun, shade Notes: escaping from cultivation; prolific in open wooded streams, stream-banks and wet meadows; evidence about its persistence needed

***Najas minor* All. Brittle water-nymph, lesser naiad**

Form: growth habit - forb/herb; duration - annual Habitat: region - western; environment - aquatic; light tolerance - not applicable Notes: chokes waterways; spread by humans and possibly birds; currently found only in Berkshire County (2002)

***Ranunculus repens* L. Creeping buttercup**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - wetland; light tolerance - full sun, shade Notes: common around springs and wetlands; evidence currently lacking that this species out-competes other vegetation in minimally managed habitats

***Tussilago farfara* L. Coltsfoot**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: particularly problematic in lime seeps and disturbed sites; evidence currently lacking that this species out-competes other vegetation in minimally managed habitats

Notes: