

# NEW YORK NON-NATIVE PLANT INVASIVENESS RANKING FORM

Scientific name: Veronica beccabunga L. USDA Plants Code: VEBE  
 Common names: European speedwell  
 Native distribution: Eurasia, Northern Africa  
 Date assessed: January 27, 2010  
 Assessors: Steve Glenn, Gerry Moore  
 Reviewers: LIISMA SRC  
 Date Approved: 3 Feb. 2010 Form version date: 10 July 2009

**New York Invasiveness Rank:** Moderate (Relative Maximum Score 50.00-69.99)

<b>Distribution and Invasiveness Rank</b> ( <i>Obtain from PRISM invasiveness ranking form</i> )			
	Status of this species in each PRISM:	Current Distribution	PRISM Invasiveness Rank
1	Adirondack Park Invasive Program	Not Assessed	Not Assessed
2	Capital/Mohawk	Not Assessed	Not Assessed
3	Catskill Regional Invasive Species Partnership	Not Assessed	Not Assessed
4	Finger Lakes	Not Assessed	Not Assessed
5	Long Island Invasive Species Management Area	Not Present	Low
6	Lower Hudson	Not Assessed	Not Assessed
7	Saint Lawrence/Eastern Lake Ontario	Not Assessed	Not Assessed
8	Western New York	Not Assessed	Not Assessed

<b>Invasiveness Ranking Summary</b> (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 ( <u>20</u> )	10
2	Biological characteristic and dispersal ability	25 ( <u>25</u> )	15
3	Ecological amplitude and distribution	25 ( <u>25</u> )	18
4	Difficulty of control	10 ( <u>6</u> )	4
	Outcome score	100 ( <u>76</u> ) <sup>b</sup>	47 <sup>a</sup>
	Relative maximum score <sup>†</sup>		61.84
	New York Invasiveness Rank <sup>§</sup>	Moderate (Relative Maximum Score 50.00-69.99)	

\* For questions answered "unknown" do not include point value in "Total Answered Points Possible." If "Total Answered Points Possible" is less than 70.00 points, then the overall invasive rank should be listed as "Unknown."

<sup>†</sup>Calculated as 100(a/b) to two decimal places.

<sup>§</sup>Very High >80.00; High 70.00–80.00; Moderate 50.00–69.99; Low 40.00–49.99; Insignificant <40.00  
 Not Assessable: not persistent in NY, or not found outside of cultivation.

### A. DISTRIBUTION (KNOWN/POTENTIAL): Summarized from individual PRISM forms

A1.1. Has this species been documented to persist without cultivation in NY? (reliable source; voucher not required)		
<input checked="" type="checkbox"/>	Yes – continue to A1.2	
<input type="checkbox"/>	No – continue to A2.1	
A1.2. In which PRISMs is it known (see inset map)?		
<input type="checkbox"/>	Adirondack Park Invasive Program	
<input checked="" type="checkbox"/>	Capital/Mohawk	
<input type="checkbox"/>	Catskill Regional Invasive Species Partnership	
<input checked="" type="checkbox"/>	Finger Lakes	
<input checked="" type="checkbox"/>	Long Island Invasive Species Management Area	
<input type="checkbox"/>	Lower Hudson	
<input type="checkbox"/>	Saint Lawrence/Eastern Lake Ontario	
<input type="checkbox"/>	Western New York	

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**Documentation:**

Sources of information:

Brooklyn Botanic Garden, 2010; Weldy & Werier, 2010.

A2.1. What is the likelihood that this species will occur and persist outside of cultivation, given the climate in the following PRISMs? (obtain from PRISM invasiveness ranking form)

Not Assessed	Adirondack Park Invasive Program
Not Assessed	Capital/Mohawk
Not Assessed	Catskill Regional Invasive Species Partnership
Not Assessed	Finger Lakes
Moderately Likely	Long Island Invasive Species Management Area
Not Assessed	Lower Hudson
Not Assessed	Saint Lawrence/Eastern Lake Ontario
Not Assessed	Western New York

Documentation: Suitability of habitats and climate.

Sources of information (e.g.: distribution models, literature, expert opinions):

Tutin & Heywood, 1972; Fischer, 1985; Grime et al., 1988.

***If the species does not occur and is not likely to occur in any of the PRISMs, then stop here as there is no need to assess the species. Rank is "Not Assessable."***

A2.2. What is the current distribution of the species in each PRISM? (obtain rank from PRISM invasiveness ranking forms)

	Distribution
Adirondack Park Invasive Program	Not Assessed
Capital/Mohawk	Not Assessed
Catskill Regional Invasive Species Partnership	Not Assessed
Finger Lakes	Not Assessed
Long Island Invasive Species Management Area	Not Present
Lower Hudson	Not Assessed
Saint Lawrence/Eastern Lake Ontario	Not Assessed
Western New York	Not Assessed

**Documentation:**

Sources of information:

Brooklyn Botanic Garden, 2010.

A2.3. Describe the potential or known suitable habitats within New York. Natural habitats include all habitats not under active human management. Managed habitats are indicated with an asterisk.

<p><b>Aquatic Habitats</b></p> <p><input type="checkbox"/> Salt/brackish waters</p> <p><input type="checkbox"/> Freshwater tidal</p> <p><input checked="" type="checkbox"/> Rivers/streams</p> <p><input checked="" type="checkbox"/> Natural lakes and ponds</p> <p><input type="checkbox"/> Vernal pools</p> <p><input type="checkbox"/> Reservoirs/impoundments*</p>	<p><b>Wetland Habitats</b></p> <p><input type="checkbox"/> Salt/brackish marshes</p> <p><input checked="" type="checkbox"/> Freshwater marshes</p> <p><input type="checkbox"/> Peatlands</p> <p><input type="checkbox"/> Shrub swamps</p> <p><input checked="" type="checkbox"/> Forested wetlands/riparian</p> <p><input checked="" type="checkbox"/> Ditches*</p> <p><input type="checkbox"/> Beaches and/or coastal dunes</p>	<p><b>Upland Habitats</b></p> <p><input type="checkbox"/> Cultivated*</p> <p><input type="checkbox"/> Grasslands/old fields</p> <p><input type="checkbox"/> Shrublands</p> <p><input type="checkbox"/> Forests/woodlands</p> <p><input type="checkbox"/> Alpine</p> <p><input type="checkbox"/> Roadsides*</p>
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Other potential or known suitable habitats within New York: ballast, springs

**Documentation:**

Sources of information:

Brown, 1879; Tutin & Heywood, 1972; Les & Stuckey, 1985; Grime et al., 1988; authors' pers. obs.

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**B. INVASIVENESS RANKING**

Questions apply to areas similar in climate and habitats to New York unless specified otherwise.

*1. ECOLOGICAL IMPACT*

1.1. Impact on Natural Ecosystem Processes and System-Wide Parameters (e.g. fire regime, geomorphological changes (erosion, sedimentation rates), hydrologic regime, nutrient and mineral dynamics, light availability, salinity, pH)

- A. No perceivable impact on ecosystem processes based on research studies, or the absence of impact information if a species is widespread (>10 occurrences in minimally managed areas), has been well-studied (>10 reports/publications), and has been present in the northeast for >100 years. 0
- B. Influences ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability) 3
- C. Significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, reduces open water that are important to waterfowl) 7
- D. Major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology and/or hydrology, affects fire frequency, alters soil pH, or fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species) 10
- U. Unknown

Score U

**Documentation:**

Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)

No studies regarding the impact to natural ecosystem processes located.

Sources of information:

Authors' pers. comm.

1.2. Impact on Natural Community Structure

- A. No perceived impact; establishes in an existing layer without influencing its structure 0
- B. Influences structure in one layer (e.g., changes the density of one layer) 3
- C. Significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) 7
- D. Major alteration of structure (e.g., covers canopy, eradicating most or all layers below) 10
- U. Unknown

Score 3

**Documentation:**

Identify type of impact or alteration:

Capable of forming clonal patches by prostrate rooted stems (Grime et al., 1988); may increase the density of the herb layer, especially along some streamsides where the vegetation is otherwise sparser.

Sources of information:

Grime et al., 1988; Mehrhoff et al., 2003; author's (Moore's) pers. obs.

1.3. Impact on Natural Community Composition

- A. No perceived impact; causes no apparent change in native populations 0
- B. Influences community composition (e.g., reduces the number of individuals in one or more native species in the community) 3
- C. Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community) 7
- D. Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community) 10
- U. Unknown

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Score 

7
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**Documentation:**

Identify type of impact or alteration:

Can form large stands (clonal patches, Grime et al., 1988), that cover the stream and significantly reduce native riparian and wetland species (Mehrhoff et al., 2003).

Sources of information:

Grime et al., 1988; Mehrhoff et al., 2003; author's (Moore's) pers. obs.

1.4. Impact on other species or species groups (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades.

Examples include reduction in nesting/foraging sites; reduction in habitat connectivity; injurious components such as spines, thorns, burrs, toxins; suppresses soil/sediment microflora; interferes with native pollinators and/or pollination of a native species; hybridizes with a native species; hosts a non-native disease which impacts a native species)

- |    |                                                  |    |
|----|--------------------------------------------------|----|
| A. | Negligible perceived impact                      | 0  |
| B. | Minor impact                                     | 3  |
| C. | Moderate impact                                  | 7  |
| D. | Severe impact on other species or species groups | 10 |
| U. | Unknown                                          |    |

Score 

U
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**Documentation:**

Identify type of impact or alteration:

No studies regarding the impact to other species located.

Sources of information:

Authors' pers. comm.

Total Possible	20
Section One Total	10

**2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY**

**2.1. Mode and rate of reproduction**

- |    |                                                                                                                                                                                                                                                                   |   |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| A. | No reproduction by seeds or vegetative propagules (i.e. plant sterile with no sexual or asexual reproduction).                                                                                                                                                    | 0 |
| B. | Limited reproduction (fewer than 10 viable seeds per plant AND no vegetative reproduction; if viability is not known, then maximum seed production is less than 100 seeds per plant and no vegetative reproduction)                                               | 1 |
| C. | Moderate reproduction (fewer than 100 viable seeds per plant - if viability is not known, then maximum seed production is less than 1000 seeds per plant - OR limited successful vegetative spread documented)                                                    | 2 |
| D. | Abundant reproduction with vegetative asexual spread documented as one of the plants prime reproductive means OR more than 100 viable seeds per plant (if viability is not known, then maximum seed production reported to be greater than 1000 seeds per plant.) | 4 |
| U. | Unknown                                                                                                                                                                                                                                                           |   |

Score 

4
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**Documentation:**

Describe key reproductive characteristics (including seeds per plant):

Veronica generally has "seeds usually numerous" (Tutin & Heywood, 1972); reported to produce large quantities of readily germinable seed (Grime et al., 1988), thus evidence for production of over 100 viable seeds per plant.

Vegetatively- stems can become decumbent, rooting at the nodes (Tutin & Heywood, 1972); detached shoot pieces readily root (Grime et al., 1988).

Sources of information:

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Tutin & Heywood, 1972; Grime et al., 1988; authors' pers. obs.

2.2. Innate potential for long-distance dispersal (e.g. bird dispersal, sticks to animal hair, buoyant fruits, pappus for wind-dispersal)

- A. Does not occur (no long-distance dispersal mechanisms) 0
- B. Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations) 1
- C. Moderate opportunities for long-distance dispersal (adaptations exist for long-distance dispersal, but studies report that 95% of seeds land within 100 meters of the parent plant) 2
- D. Numerous opportunities for long-distance dispersal (adaptations exist for long-distance dispersal and evidence that many seeds disperse greater than 100 meters from the parent plant) 4
- U. Unknown

Score

**Documentation:**

Identify dispersal mechanisms:

Water dispersal (Hydrochory) through detached shoot pieces that readily root (Grime et al., 1988). Seeds reportedly not buoyant, and "not likely that long distance dispersal actually occurs by water transport" (Les & Stuckey, 1985); however another study found seeds in drift samples during a flood and river banks after a flood (Cellot et al., 1998).

Seeds mucilaginous and adhesive (Les, 1985; Grime et al., 1988) and thus transported by animals (epizoochory). "The species is an effective colonist, even in land-locked sites" (Grime et al., 1988).

Sources of information:

Les & Stuckey, 1985; Grime et al., 1988; Cellot et al., 1998; authors' pers. obs.

2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sales, use as forage/revegetation, spread along highways, transport on boats, contaminated compost, land and vegetation management equipment such as mowers and excavators, etc.)

- A. Does not occur 0
- B. Low (human dispersal to new areas occurs almost exclusively by direct means and is infrequent or inefficient) 1
- C. Moderate (human dispersal to new areas occurs by direct and indirect means to a moderate extent) 2
- D. High (opportunities for human dispersal to new areas by direct and indirect means are numerous, frequent, and successful) 3
- U. Unknown

Score

**Documentation:**

Identify dispersal mechanisms:

Ballast disposal (Brown, 1879; Les & Stuckey, 1985); also possibly via fish stocks and home aquaria (Les & Stuckey, 1985). Used medicinally in Europe (Flannery, 1998). Also could be readily adhere to clothing.

Sources of information:

Brown, 1879; Les & Stuckey, 1985; Flannery, 1998; author's (Moore's) pers.obs.

2.4. Characteristics that increase competitive advantage, such as shade tolerance, ability to grow on infertile soils, perennial habit, fast growth, nitrogen fixation, allelopathy, etc.

- A. Possesses no characteristics that increase competitive advantage 0
- B. Possesses one characteristic that increases competitive advantage 3
- C. Possesses two or more characteristics that increase competitive advantage 6
- U. Unknown

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**Documentation:**

Evidence of competitive ability:

Perennial. Tolerant of drying due to its ability to produce terrestrial forms along shores and other drying habitats; also characteristically uprooted during storm damage, and possess the ability to recover quickly from such events (Les & Stuckey, 1985).

Sources of information:

Tutin & Heywood, 1972; Les & Stuckey, 1985; Grime et al., 1988.

**2.5. Growth vigor**

- A. Does not form thickets or have a climbing or smothering growth habit 0
- B. Has climbing or smothering growth habit, forms a dense layer above shorter vegetation, forms dense thickets, or forms a dense floating mat in aquatic systems where it smothers other vegetation or organisms 2
- U. Unknown

Score

**Documentation:**

Describe growth form:

Reportedly capable of forming clonal patches by prostrate rooted stems (Grime et al., 1988); but no documentation demonstrating a climbing or smothering habit.

Sources of information:

Grime et al., 1988.

**2.6. Germination/Regeneration**

- A. Requires open soil or water and disturbance for seed germination, or regeneration from vegetative propagules. 0
- B. Can germinate/regenerate in vegetated areas but in a narrow range or in special conditions 2
- C. Can germinate/regenerate in existing vegetation in a wide range of conditions 3
- U. Unknown (No studies have been completed)

Score

**Documentation:**

Describe germination requirements:

Reported to produce large quantities of readily germinable seed (Grime et al., 1988); one study found germination rates as high as 99% with light enhancing germination (Salisbury, 1970). Generally found germinating in the wild in disturbed, wet areas.

Sources of information:

Salisbury, 1970; Grime et al., 1988.

**2.7. Other species in the genus invasive in New York or elsewhere**

- A. No 0
- B. Yes 3
- U. Unknown

Score

**Documentation:**

Species:

Veronica agrestis, V. anagali-aquatica, V. arvensis, V. austriaca, V. chamaedrys, V. dillenii, V. filiformis, V. grandis, V. hederifolia, V. longifolia, V. officinalis, V. persica, V. polita, V. serpyllifolia, V. spicata, & V. verna reported. V. arvensis and V. filliformis categorized as weedy in the Northeast (Uva et al., 1997) but none tracked as invasive.

Uva et al., 1997; Brooklyn Botanic Garden, 2010; Weldy & Werier, 2010; U.S.D.A. NRCS, 2010.

Total Possible   
Section Two Total

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**3. ECOLOGICAL AMPLITUDE AND DISTRIBUTION**

3.1. Density of stands in natural areas in the northeastern USA and eastern Canada (use same definition as Gleason & Cronquist which is: “The part of the United States covered extends from the Atlantic Ocean west to the western boundaries of Minnesota, Iowa, northern Missouri, and southern Illinois, south to the southern boundaries of Virginia, Kentucky, and Illinois, and south to the Missouri River in Missouri. In Canada the area covered includes Nova Scotia, Prince Edward Island, New Brunswick, and parts of Quebec and Ontario lying south of the 47th parallel of latitude”)

- A. No large stands (no areas greater than 1/4 acre or 1000 square meters) 0
- B. Large dense stands present in areas with numerous invasive species already present or disturbed landscapes 2
- C. Large dense stands present in areas with few other invasive species present (i.e. ability to invade relatively pristine natural areas) 4
- U. Unknown

Score

**Documentation:**

Identify reason for selection, or evidence of weedy history:

Reportedly capable of forming clonal patches by prostrate rooted stems (Grime et al., 1988); however, no documentation of stands larger than 1/4 acre in the Northeast.

Sources of information:

Grime et al., 1988; authors' pers. comm., obs.

3.2. Number of habitats the species may invade

- A. Not known to invade any natural habitats given at A2.3 0
- B. Known to occur in one natural habitat given at A2.3 1
- C. Known to occur in two natural habitats given at A2.3 2
- D. Known to occur in three natural habitat given at A2.3 4
- E. Known to occur in four or more natural habitats given at A2.3 6
- U. Unknown

Score

**Documentation:**

Identify type of habitats where it occurs and degree/type of impacts:

See A2.3.

Sources of information:

Brown, 1879; Tutin & Heywood, 1972; Les & Stuckey, 1985; Grime et al., 1988.

3.3. Role of disturbance in establishment

- A. Requires anthropogenic disturbances to establish. 0
- B. May occasionally establish in undisturbed areas but can readily establish in areas with natural or anthropogenic disturbances. 2
- C. Can establish independent of any known natural or anthropogenic disturbances. 4
- U. Unknown

Score

**Documentation:**

Identify type of disturbance:

There is some inconsistency in the literature with regard to the role of disturbance in the establishment of *Veronica beccabunga*. Some state that this species is associated with moderately disturbed conditions, restricted to fertile sites where disturbances such as winter-flooding, water currents, trampling or grazing restrict the growth of taller perennials (Grime et al., 1988); and found as a pioneer, colonizing freshly exposed and marginal muds, successfully withstanding subsequent successional competition (Salisbury, 1970).

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Les & Stuckey, (1985) state that *V. beccabunga* has an affinity for undisturbed habitats, but further on state that it is characteristically uprooted during storm damage, and possess the ability to recover quickly from such events (Les & Stuckey, 1985).

Sources of information:

Salisbury, 1970; Les & Stuckey, 1985; Grime et al., 1988.

**3.4. Climate in native range**

- A. Native range does not include climates similar to New York 0
- B. Native range possibly includes climates similar to at least part of New York. 1
- C. Native range includes climates similar to those in New York 3
- U. Unknown

Score

**Documentation:**

Describe what part of the native range is similar in climate to New York:

Eurasia, as far north as Scandinavia and southern Siberia.

Sources of information:

Tutin & Heywood, 1972; Fischer, 1985; Grime et al., 1988.

**3.5. Current introduced distribution in the northeastern USA and eastern Canada (see question 3.1 for definition of geographic scope )**

- A. Not known from the northeastern US and adjacent Canada 0
- B. Present as a non-native in one northeastern USA state and/or eastern Canadian province. 1
- C. Present as a non-native in 2 or 3 northeastern USA states and/or eastern Canadian provinces. 2
- D. Present as a non-native in 4–8 northeastern USA states and/or eastern Canadian provinces, and/or categorized as a problem weed (e.g., “Noxious” or “Invasive”) in 1 northeastern state or eastern Canadian province. 3
- E. Present as a non-native in >8 northeastern USA states and/or eastern Canadian provinces. and/or categorized as a problem weed (e.g., “Noxious” or “Invasive”) in 2 northeastern states or eastern Canadian provinces. 4
- U. Unknown

Score

**Documentation:**

Identify states and provinces invaded:

CT, IL, MA, MD, ME, MI, NJ, NY, OH, PA, VA, WI, WV; Ontario, Quebec

Sources of information: See known introduced range in [plants.usda.gov](http://plants.usda.gov), and update with information from states and Canadian provinces.

U.S.D.A. NRCS, 2010.

**3.6. Current introduced distribution of the species in natural areas in the eight New York State PRISMs (Partnerships for Regional Invasive Species Management)**

- A. Present in none of the PRISMs 0
- B. Present in 1 PRISM 1
- C. Present in 2 PRISMs 2
- D. Present in 3 PRISMs 3
- E. Present in more than 3 PRISMs or on the Federal noxious weed lists 4
- U. Unknown

Score

**Documentation:**

Describe distribution:

See A1.1.

Sources of information:



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Brooklyn Botanic Garden, 2010; Weldy & Werier, 2010.

Total Possible	25
Section Three Total	18

**4. DIFFICULTY OF CONTROL**

**4.1. Seed banks**

- A. Seeds (or vegetative propagules) remain viable in soil for less than 1 year, or does not make viable seeds or persistent propagules. 0
- B. Seeds (or vegetative propagules) remain viable in soil for at least 1 to 10 years 2
- C. Seeds (or vegetative propagules) remain viable in soil for more than 10 years 3
- U. Unknown

Score 2

**Documentation:**

Identify longevity of seed bank:  
Seed banking documented, with evidence of viability greater than one year, but evidence lacking for viability greater than ten years.  
Sources of information:  
Champness & Morris, 1948; Grime et al., 1988.

**4.2. Vegetative regeneration**

- A. No regrowth following removal of aboveground growth 0
- B. Regrowth from ground-level meristems 1
- C. Regrowth from extensive underground system 2
- D. Any plant part is a viable propagule 3
- U. Unknown

Score 2

**Documentation:**

Describe vegetative response:  
Detached shoot pieces known to readily root; regrowth also from root system.  
Sources of information:  
Grime et al., 1988.

**4.3. Level of effort required**

- A. Management is not required: e.g., species does not persist without repeated anthropogenic disturbance. 0
- B. Management is relatively easy and inexpensive: e.g. 10 or fewer person-hours of manual effort (pulling, cutting and/or digging) can eradicate a 1 acre infestation in 1 year (infestation averages 50% cover or 1 plant/100 ft<sup>2</sup>). 2
- C. Management requires a major short-term investment: e.g. 100 or fewer person-hours/year of manual effort, or up to 10 person-hours/year using mechanical equipment (chain saws, mowers, etc.) for 2-5 years to suppress a 1 acre infestation. Eradication is difficult, but possible (infestation as above). 3
- D. Management requires a major investment: e.g. more than 100 person-hours/year of manual effort, or more than 10 person hours/year using mechanical equipment, or the use of herbicide, grazing animals, fire, etc. for more than 5 years to suppress a 1 acre infestation. Eradication may be impossible (infestation as above). 4
- U. Unknown

Score U

**Documentation:**

Identify types of control methods and time-term required:  
No studies were located regarding management of this species.

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Sources of information:

Les & Stuckey, 1985; Grime et al., 1988; Onaindia et al., 1996; Mehrhoff et al., 2003.

Total Possible	6
Section Four Total	4

<b>Total for 4 sections Possible</b>	<b>76</b>
<b>Total for 4 sections</b>	<b>47</b>

**C. STATUS OF CULTIVARS AND HYBRIDS:**

At the present time (May 2008) there is no protocol or criteria for assessing the invasiveness of cultivars independent of the species to which they belong. Such a protocol is needed, and individuals with the appropriate expertise should address this issue in the future. Such a protocol will likely require data on cultivar fertility and identification in both experimental and natural settings.

Hybrids (crosses between different parent species) should be assessed individually and separately from the parent species wherever taxonomically possible, since their invasiveness may differ from that of the parent species. An exception should be made if the taxonomy of the species and hybrids are uncertain, and species and hybrids can not be clearly distinguished in the field. In such cases it is not feasible to distinguish species and hybrids, and they can only be assessed as a single unit.

Some cultivars of the species known to be available:

**References for species assessment:**

Brooklyn Botanic Garden. 2010. AILANTHUS database. [Accessed January 27, 2010].

Brown, A. 1879. Ballast plants in New York City and its vicinity. *Bull. Torrey Bot. Club.* 6:353-360.

Cellot, B., F. Mouillot & C. P. Henry. 1998. Flood drift and propagule bank of aquatic macrophytes in a riverine wetland. *J. Vegetation Sci.* 9(5):631-640.

Champness, S. C. & K. Morris. 1948. The population of buried viable seeds in relation to contrasting pasture and soil types. *J. Ecology.* 36(1):149-173.

Fischer, M. A. 1985. *Veronica beccabunga* consists of 3 vicarious subspecies. *Flora (Jena).* 176(1-2):117-128.

Flannery, M. A. 1998. The medicine and medicinal plants of C. S. Rafinesque. *Economic Botany.* 52(1):27-43.

Grime, J. P., J. G. Hodgson & R. Hunt. 1988. *Comparative plant ecology. a functional approach to common British species.* Unwin Hyman, London, UK. 742 pp.

Les, D.H. & R.L. Stuckey. 1985. The introduction and spread of *Veronica beccabunga* (Scrophulariaceae) in eastern North America. *Rhodora* 87: 503-515.

Mehrhoff, L. J., J. A. Silander, Jr., S. A. Leicht, E. S. Mosher and N. M. Tabak. 2003.

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IPANE: Invasive Plant Atlas of New England. Department of Ecology & Evolutionary Biology, University of Connecticut, Storrs, CT, USA. <[www.ipane.org](http://www.ipane.org)> [Accessed January 27, 2010].

Onaindia, M., B. De Bikuna & I. Benito. 1996. Aquatic plants in relation to environmental factors in Northern Spain. *J. Environmental Management*. 47(2):123-137.

Salisbury, E. 1970. The pioneer vegetation of exposed muds and its biological features. *Philosophical Trans. Royal Soc. London. Series B, Biological Sciences*. 259(829):207-255.

Tutin, T. G. & V. H. Heywood (eds.). 1972. *Flora Europaea*. Vol. 3. Cambridge, UK. 374 pp.

United States Department of Agriculture, National Resources Conservation Service. 2010. The PLANTS Database. National Plant Data Center, Baton Rouge, Louisiana. <<http://plants.usda.gov/>> [Accessed January 27, 2010].

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