

NEW YORK NON-NATIVE PLANT INVASIVENESS RANKING FORM

Scientific name:	Epilobium hirsutum	USDA Plants Code: EPHI
Common names:	Great hairy willow-herb	
Native distribution:	Eurasia, Africa	
Date assessed:	15 October 2008; edited 30 March 2009	
Assessors:	Steve Glenn, Gerry Moore	
Reviewers:	LIISMA SRC	
Date Approved:	10-22-2008	Form version date: 22 October 2008

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

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


Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (<u>20</u>)	6
2	Biological characteristic and dispersal ability	25 (<u>25</u>)	15
3	Ecological amplitude and distribution	25 (<u>25</u>)	21
4	Difficulty of control	10 (<u>10</u>)	8
	Outcome score	100 (<u>80</u>) ^b	50 ^a
	Relative maximum score †		62.50
	New York Invasiveness Rank §	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.”

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

§ Very High >80.00; High 70.00–80.00; Moderate 50.00–69.99; Low 40.00–49.99; Insignificant <40.00

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

<p>A1.1. Has this species been documented to persist without cultivation in NY? (reliable source; voucher not required)</p> <p><input checked="" type="checkbox"/> Yes – continue to A1.2</p> <p><input type="checkbox"/> No – continue to A2.1</p> <p>A1.2. In which PRISMs is it known (see inset map)?</p> <p><input checked="" type="checkbox"/> Adirondack Park Invasive Program</p> <p><input checked="" type="checkbox"/> Capital/Mohawk</p> <p><input checked="" type="checkbox"/> Catskill Regional Invasive Species Partnership</p> <p><input checked="" type="checkbox"/> Finger Lakes</p> <p><input checked="" type="checkbox"/> Long Island Invasive Species Management Area</p> <p><input checked="" type="checkbox"/> Lower Hudson</p> <p><input checked="" type="checkbox"/> Saint Lawrence/Eastern Lake Ontario</p> <p><input checked="" type="checkbox"/> Western New York</p>	 <p style="font-size: small;">Partnerships for Regional Invasive Species Management 2008</p>
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Documentation:

Sources of information:

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

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:

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

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

If the species does not occur and is not likely to occur with any of the PRISMs, then stop here as there is no need to assess the species.

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

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

Documentation:

Sources of information:

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

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.

- | | | |
|---|--|---|
| Aquatic Habitats | Wetland Habitats | Upland Habitats |
| <input type="checkbox"/> Salt/brackish waters | <input checked="" type="checkbox"/> Salt/brackish marshes | <input checked="" type="checkbox"/> Cultivated* |
| <input type="checkbox"/> Freshwater tidal | <input checked="" type="checkbox"/> Freshwater marshes | <input checked="" type="checkbox"/> Grasslands/old fields |
| <input type="checkbox"/> Rivers/streams | <input type="checkbox"/> Peatlands | <input type="checkbox"/> Shrublands |
| <input type="checkbox"/> Natural lakes and ponds | <input checked="" type="checkbox"/> Shrub swamps | <input checked="" type="checkbox"/> Forests/woodlands |
| <input type="checkbox"/> Vernal pools | <input checked="" type="checkbox"/> Forested wetlands/riparian | <input type="checkbox"/> Alpine |
| <input type="checkbox"/> Reservoirs/impoundments* | <input checked="" type="checkbox"/> Ditches* | <input checked="" type="checkbox"/> Roadsides* |
| | <input type="checkbox"/> Beaches and/or coastal dunes | |

Other potential or known suitable habitats within New York:

Ballast, waste ground, rr tracks, pond and lake edges- Stuckey, R. L. 1970. "Usually confined to base-rich fens" Shamsi & Whitehead. 1974. In NY, species seems to be more abundant in limestone wetlands.

Documentation:

Sources of information:

Stuckey, 1970; Shamsi & Whitehead, 1974; Gravuer, 2007; S. Young (personal observation).

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B. INVASIVENESS RANKING

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)
 Grauver (2007) reported on evidence that it may alter hydrology of wetlands in sites in Washington State. However, hard data are lacking as well as studies in the Northeast.
 Sources of information:
 Washington State Noxious Weed Control Board, 2003; Gravuer, 2007.

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:
 Increases the density of herb layer; no evidence for creation or elimination of layers.
 Sources of information:
 Mehrhoff et al., 2003; Czarapata, 2005; Gravuer, 2007.

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

3

Documentation:

Identify type of impact or alteration:

This species has been noted to form monotypic stands reducing the number of individuals of native plant species; it competes well with cattails.

Sources of information:

Mehrhoff et al., 2003; Washington State Noxious Weed Control Board, 2003; Czarapata, 2005; Gravuer, 2007.

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

Documentation:

Identify type of impact or alteration:

Although monocultures were noted to have negative impacts generally, Gravuer (2007) reported "no disproportionate impacts on particular native species were mentioned in the literature. The species with which *E. hirsutum* was reported to compete most strongly was purple loosestrife (*Lythrum salicaria*), another exotic plant." Nonetheless, studies on direct impacts on other species groups are lacking..

Sources of information:

Gravuer, K. 2007.

Total Possible	<table border="1" style="display: inline-table;"><tr><td style="width: 50px; text-align: center;">20</td></tr></table>	20
20		
Section One Total	<table border="1" style="display: inline-table;"><tr><td style="width: 50px; text-align: center;">6</td></tr></table>	6
6		

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode and rate of reproduction (provisional thresholds, more investigation needed)

- | | | |
|----|---|---|
| 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

Documentation:

Describe key reproductive characteristics (including seeds per plant):

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Each fruit capsule produces an average of 260 seeds with an average of 300+ capsules per plant, therefore yielding about 75,000+ seeds per plant.
Sources of information:
Shamsi & Whitehead, 1974.

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:
It has wind-dispersed seeds. Hydrochory (dispersal by water) cannot be ruled out based on habitat preferences.
Sources of information:
Shamsi & Whitehead, 1974; Gravuer, 2007.

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:
This species is rarely sold. Sales could potentially increase in the near future, as gardeners reportedly consider this species a substitute for purple loosestrife. Small seeds could be indirectly transported.
Sources of information:
Gravuer, 2007.

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

Score

Documentation:

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Evidence of competitive ability: Perennial habit, although perhaps short-lived. Sources of information: Shamsi & Whitehead, 1974; Etherington, 1984; Lenssen et al., 2000.	
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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 | 0 |

Documentation: Describe growth form: This species has been noted to form dense monotypic stands in wetland areas, but not thickets or smothering growth. Sources of information: Mehrhoff et al., 2003; Gravuer, 2007	
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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 | 2 |

Documentation: Describe germination requirements: Germination inhibited in low pH soil (<5.5) environments; regenerates readily by rhizomes or stolons. Sources of information: Shamsi & Whitehead, 1974; Grauver, 2007.	
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2.7. Other species in the genus invasive in New York or elsewhere

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

Documentation: Species: Weldy & Werier, 2005; U.S.D.A., 2008	
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Total Possible	25
Section Two Total	15

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

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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 2

Documentation:

Identify reason for selection, or evidence of weedy history:

Always found in areas with disturbance, although sometimes this is limited to natural disturbance such as the stands in marshes in Northeast (Mehrhoff, 2003). Large stands are found in central and western NY. Invades fens, but has yet not taken over large areas.

Sources of information:

Mehrhoff, 2003; Grauver, 2007; D. Werier (personal observation).

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 two or more of the habitats given at A2.3, with at least one a natural habitat. 1
- C. Known to occur in three or more of the habitats given at A2.3, with at least two a natural habitat. 2
- D. Known to occur in four or more of the habitats given at A2.3, with at least three a natural habitat. 4
- E. Known to occur in more than four of the habitats given at A2.3, with at least four a natural habitat. 6
- U. Unknown

Score 6

Documentation:

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

See A2.3.

Sources of information:

Stuckey, 1970; Shamsi & Whitehead, 1974; Gravuer, 2007

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 2

Documentation:

Identify type of disturbance:

Although it is most often found in open, disturbed areas, this species is clearly capable of spreading into wet meadows and salt/brackish marshes with natural disturbances.

Sources of information:

Mehrhoff et al., 2003; Gravuer, 2007.

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

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Score

3

Documentation:

Describe what part of the native range is similar in climate to New York:
Northern Europe, may be restricted to neutral to alkaline soils. As early as 1934, a New York botanist noted, "The progress of this species across New York State in the past twenty or thirty years has been rather rapid" (Zenkert in Stuckey, 1970).
Sources of information:
Stuckey, 1970; Shamsi & Whitehead, 1974.

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

4

Documentation:

Identify states and provinces invaded:
CT, IL, IN, KY, MA, MD, ME, MI, MN, NH, NJ, NY, OH, PA, RI, VT, WI, WV; NB, NS, ON, PIE, QB, Canada
Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.
U.S.D.A., 2008.

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

4

Documentation:

Describe distribution:
See A1.1.
Sources of information:
Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

Total Possible	25
Section Three Total	21

4. DIFFICULTY OF CONTROL

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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:
 The seed bank of this species generally lasts at least 3 years.
 Sources of information:
 Blomquist et al., 2004; Gravuer, K. 2007

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:
 Hairy willow-herb has quickly spreading rhizomes or stolons and it resprouts readily when cut.
 Sources of information:
 Shamsi & Whitehead, 1974; Gravuer, 2007

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 ft²). 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 4

Documentation:
 Identify types of control methods and time-term required:
 Gravuer (2007): "Herbicide treatment with aquatic-suitable glyphosate (Rodeo) appears to afford the greatest management success. Herbicide can be applied to bundles of cut stems. However, even with this method, regrowth from rootstocks may still occur and increase the resources needed to achieve effective control. Mowing may prevent the addition of new seeds to the seed bank, but regrowth can be a major issue with this method, as any stems intact to the first node can resprout." The wetland habitat no doubt will complicate any control measures. In Europe, species was reported to be resistant to dalapon, an herbicide used for aquatic weed control.
 Sources of information:

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Gravuer, K. 2007; Chancellor, 1960.

Total Possible	10
Section Four Total	8

Total for 4 sections Possible	80
Total for 4 sections	50

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:

Blomquist, M. M., R. M. Bekker and P. Vos. 2004. Restoration of ditch bank plant species richness: The potential of the soil seed bank. *Applied Vegetation Science* 6: 179-188.

Brooklyn Botanic Garden. 2008. AILANTHUS database. [Accessed on October 15, 2008].

Chancellor, R.J. 1960. Proc. 5th Brit. Weed Contr. Conf

Czarapata, E. J. 2005. *Invasive Plants of the Upper Midwest*. The University of Wisconsin Press. Madison, WI. 215 pp.

Gravuer, K. 2007. *Epilobium hirsutum*. U.S. Invasive Species Impact Rank (I-Rank). NatureServe Explorer. <www.natureserve.org>. [Accessed on October 15, 2008].

Etherington, J. R. 1984. Comparative studies of plant growth and distribution in relation to waterlogging: X. Differential formation of adventitious roots and their experimental excision in *Epilobium hirsutum* and *Chamerion angustifolium*. *The Journal of Ecology*, 72(2): 389-404.

Lenssen, J. P. M. & F. B. J. Menting, W. H. Van Der Putten & C. W. P. M. Blom. 2000. Vegetative reproduction by species with different adaptations to shallow-flooded habitats. *New Phytologist*, 145(1):61-70.

Shamsi, S. R. A. & F. H. Whitehead. 1974. Comparative eco-physiology of *Epilobium hirsutum* L. and *Lythrum salicaria* L.: I. General biology, distribution and germination. *The Journal of Ecology*, 62(1):279-290.

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Stuckey, R. L. 1970. Distributional history of *Epilobium hirsutum* (Great Hairy Willow-herb) in North America. *Rhodora* 72(790): 164-181.

United States Department of Agriculture, National Resources Conservation Service. 2008. The PLANTS Database. National Plant Data Center, Baton Rouge, Louisiana. <plants.usda.gov>. [Accessed on October 15, 2008].

Washington State Noxious Weed Control Board. 2003. Written findings of the State Noxious Weed Control Board. <www.nwcb.wa.gov/weed_info/contents.html>. [Accessed October 15, 2008].

Weldy, T. and D. Werier. 2005. New York Flora Atlas. [S.M. Landry, K.N. Campbell, and L.D. Mabe (original application development), Florida Center for Community Design and Research. University of South Florida]. New York Flora Association, Albany, New York. <atlas.nyflora.org/>. [Accessed on October 15, 2008].

Citation: This NY ranking form may be cited as: Jordan, M.J., G. Moore and T.W. Weldy. 2008. Invasiveness ranking system for non-native plants of New York. Unpublished. The Nature Conservancy, Cold Spring Harbor, NY; Brooklyn Botanic Garden, Brooklyn, NY; The Nature Conservancy, Albany, NY. Note that the order of authorship is alphabetical; all three authors contributed substantially to the development of this protocol.

Acknowledgments: The NY form incorporates components and approaches used in several other systems, cited in the references below. Valuable contributions by members of the Long Island Invasive Species Management Area's Scientific Review Committee were incorporated in revisions of this form. Original members of the LIISMA SRC included representatives of the Brooklyn Botanic Garden; The Nature Conservancy; New York Natural Heritage Program, New York Sea Grant; New York State Office of Parks, Recreation and Historic Preservation; National Park Service; Brookhaven National Laboratory; New York State Department of Environmental Conservation Region 1; Cornell Cooperative Extension of Suffolk/Nassau Counties; Long Island Nursery and Landscape Association; Long Island Farm Bureau; SUNY Farmingdale Ornamental Horticulture Department; Queens College Biology Department; Long Island Botanical Society; Long Island Weed Information Management System database manager; Suffolk County Department of Parks, Recreation and Conservation; Nassau County Department of Parks, Recreation and Museums; Suffolk County Soil & Water Conservation District.

References for ranking form:

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