NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM

Scientific name:

USDA Plants Code: RORU

Common names:	Rugosa rose; Japanese rose
Native distribution:	Temperate Asia (China, Japan, Korea)
Date assessed:	February 3, 2009
Assessors:	Gerry Moore
Reviewers:	LIISMA SRC
Date Approved:	2-11-2009 Form version date: 22 October 2008

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

Distribution and Invasiveness Rank (*Obtain from PRISM invasiveness ranking form*)			
	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	Widespread	Moderate
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

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	16
2	Biological characteristic and dispersal ability	25 (22)	20
3	Ecological amplitude and distribution	25 (21)	15
4	Difficulty of control	10 (10)	8
	Outcome score	100 (93)[b]	56[a]
	Relative maximum score †		63.44
	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

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

☒	Western New York

Documentation:
Sources of information:
Weldy & Werier, 2008; Brooklyn Botanic Garden, 2009.

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
Very 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):
Brooklyn Botanic Garden, 2009.

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*)

	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	Widespread
Lower Hudson	Not Assessed
Saint Lawrence/Eastern Lake Ontario	Not Assessed
Western New York	Not Assessed

Documentation:
Sources of information:
Weldy & Werier, 2008; Brooklyn Botanic Garden, 2009.

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
☐ Salt/brackish waters	☐ Salt/brackish marshes	☐ Cultivated*
☐ Freshwater tidal	☐ Freshwater marshes	☒ Grasslands/old fields
☐ Rivers/streams	☐ Peatlands	☐ Shrublands
☐ Natural lakes and ponds	☐ Shrub swamps	☐ Forests/woodlands
☐ Vernal pools	☐ Forested wetlands/riparian	☐ Alpine
☐ Reservoirs/impoundments*	☐ Ditches*	☒ Roadsides*
	☒ Beaches and/or coastal dunes	

Other potential or known suitable habitats within New York:

Documentation:
Sources of information:
Brooklyn Botanic Garden, 2009.

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 3

Documentation:
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)
Extensive root system may impact foredune dynamics possibly making them resistant to wind storms and allowing their increased growth (Morse, 1996). Dense stands also decrease light availability. The establishment on dunes aided by arbuscular mycorrhizae, which is also found in Ammophila species (Gemma & Koske, 1997). No evidence, however, of significant or irreversible impacts to ecosystem processes or system wide parameters in areas. In Europe Jessen (1958) stated that thickets of Rosa rugosa were initiating dune formation, thus substantially altering the physical habitat.
Sources of information:
Morse, 1996; Gemma & Koske, 1997; Isermann, 2005; author's pers. obs..

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 7

Documentation:
Identify type of impact or alteration:
Lu (2004) indicated "no reported impacts". However, dense stands of Rosa rugosa clearly increase the density of the shrub layer, and, in some cases, the species creates a new layer as it can occupy some areas (e.g., dunes) where there was previously no shrub layer. However, it can often not be determined in the field if the material observed represents remnant planted material or material that has truly spread from cultivation. Dense stands have been observed in New Jersey in which the Rosa rugosa is the only dominant shrub on the dunes.
Sources of information:
Authors' 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	

Score: 3

Documentation:
Identify type of impact or alteration:
Influences community composition by outcompeting native species in the habitats it occupies and reducing the number of individuals. No evidence that the species significantly alters community composition.
Sources of information:
Weber, 2003; Lu, 2004; author'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: 3

Documentation:
Identify type of impact or alteration:
Lu (2004) reported no impacts. However, studies are lacking. Individuals are usually quite thorny. In Europe where this species is introduced it has been reported that the presence of non-native wasps increased pollination; its presence, therefore, might benefit non-native pollinators (Leivisson in Weidema, 2006). Also from Weidema (2006): "Rosa rugosa in Canada is a new host for the introduced leaf galler Diploleppis polita, which normally occurs only on Rosa acicularis (Shorthouse 1994). Rosa rugosa may thereby act as a reservoir for a potential pest species. Rosa acicularis is a native species of Finland and Sweden but this potential new interaction has not been investigated. "
Sources of information:
Lu, 2004; Weidema, 2006.

Total Possible: 40
Section One Total: 16

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	1

seeds per plant and no vegetative reproduction)

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):
Abundant seed production; freely suckers from roots as well.
Sources of information:
Lu, 2004;

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 4

Documentation:
Identify dispersal mechanisms:
Seeds are eaten and dispersed by birds and mammals. Fruit are also buoyant and can be dispersed by water, inlcuding saltwater (Jessen, 1958). Pieces of rhizomes can also be transported long distances (Fremstad, 1997; Bruun, 2005)
Sources of information:
Jessen, 1958; Fremstad, 1997; Weber, 2003; Bruun, 2005; author's 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 1

Documentation:
Identify dispersal mechanisms:
Species still may be planted but not widely done; spread by indirect means is not known.
Sources of information:
Weber, 2003; Lu, 2004; author'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

Score 6

Documentation:
Evidence of competitive ability:
Perennial; ability to grown on poor soils.
Sources of information:
Lu, 2004; author's pers. obs.

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 2

Documentation:
Describe growth form:
Can form thickets.
Sources of information:
Weber, 2003; Lu, 2004; author's pers. obs.

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 U

Documentation:
Describe germination requirements:
Germination requirements in the field are not known. Seedlings have not been observed in the field. In cultivation it needs stratification and scarification.
Sources of information:
LIISMA SRC, pers. obs.

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

A. No 0
B. Yes 3
U. Unknown

Score 3

Documentation:
Species:
Rosa multiflora. Weldy & Werier, 2008; Brooklyn Botanic Garden, 2009.

Total Possible 22
Section Two Total 20

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: U

Documentation:
Identify reason for selection, or evidence of weedy history:
Large dense stands have been noted on Long Island and in adjacent states. However, given that the plant was frequently planted it is not clear if these sites represent wild sites or planted sites that continue to persist.
Sources of information:
Author's pers. 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 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: 2

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
See A2.3.
Sources of information:
Brooklyn Botanic Garden, 2009.

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:
Often found on dunes which are frequently subjected to anthropogenic and natural disturbances.
Sources of information:

Weber, 2003; Lu, 2004; author's pers. obs.

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 3

Documentation:
Describe what part of the native range is similar in climate to New York:
Temperate Asia.
Sources of information:
Lu, 2004; Brooklyn Botanic Garden, 2009.

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, DE, IL, MA, MD, ME, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VA, VT, WI, WV; NB, NF, NS, ON, PE, QC.
Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.
U.S.D.A., 2009.

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, 2008; Brooklyn Botanic Garden, 2009.

Total Possible	21
Section Three Total	15

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:
Rose seed germination ranges from 4 to 27 months; hard seed coat may account for wide germination differences (Dirr and Heuser 2006)
Sources of information:
Author's pers. obs.

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:
Root suckering from extensive root system.
Sources of information:
Weber, 2003; Lu, 2004.

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^2). 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:
Removal of large stands would require a major time investment. Populations can be quite dense and stems are quite thorny. Species often also occurs in sensitive habitats (e.g., dunes) that may also complicate its removal.
Weidema (2006): "The techniques used for control of Rosa rugosa have been digging,

cutting, grazing or the use of herbicides.
"The most efficient method for removing the species is to dig it up. There is a need to ensure that all rhizomes and roots have been removed. Furthermore, the procedure needs to be repeated until one is certain that all rhizome pieces have been found and removed. For small areas this method is preferable, but for larger areas the method has proven effective but labour intensive. In dune areas complete removal of the plant from large areas may lead to sand drift, since no other vegetation will be left to cover the sand.
Mechanical removal by a kind of caterpillar machines with a loading shovel has been used in Hanko district, Finland. The machines have taken a whole layer of sand away from the depth were the rhizomes were found. As a result, the above-ground shrubs and most of the rhizomes have been removed. Pieces of rhizomes have been left and these have been treated manually afterwards. The managed seashore was about half a kilometre long and full of Rosa rugosa.
"Digging up the plants can also be combined with application of herbicides (such as Glyphosate) if local conditions and legislation permit this approach. The herbicide should be applied specifically and only to Rosa rugosa. This can be achieved with some kind of "weeper" (a device with one or more wicks). For small areas a paintbrush can be used, for large areas hand carried or tractor driven devices are needed. The important issue is to avoid affecting other plant species. Education of the technical staff is often necessary (Didriksen 1999).
"Cutting the roses down may be a solution, but this approach needs long-term commitment, since repeated cutting is needed (Didriksen 1999). Cutting only once will have an adverse effect since this will rejuvenate the bush."
Sources of information:
Lu, 2004; Weidema, 2006.

Total Possible	10
Section Four Total	8

Total for 4 sections Possible	93
Total for 4 sections	59

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: the most common cultivar is 'Alba' though there are many rose varieties with Rugosa parentage. Some of these are double and probably sterile. J. Lehrer

References for species assessment:

Brooklyn Botanic Garden. 2009. AILANTHUS database. [Accessed on February 3, 2009.]

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Shorthouse, J.D. 1994. Host shift of the leaf galler Diplolepis polita (Hymenoptera; Cynipidae) to the domestic shrub rose Rosa rugosa. Canadian Entomologist 126: 1499-1503.

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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:

Carlson, Matthew L., Irina V. Lapina, Michael Shephard, Jeffery S. Conn, Roseann Densmore, Page Spencer, Jeff Heys, Julie Riley, Jamie Nielsen. 2008. Invasiveness ranking system for non-native plants of Alaska. Technical Paper R10-TPXX, USDA Forest Service, Alaska Region, Anchorage, AK XX9. Alaska Weed Ranking Project may be viewed at: http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm.

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