NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM

Scientific name:	Wisteria sinensis /W. floribunda	USDA Plants Code: WISI/ WIFL
Common names:	Chinese wisteria/ Japanese wisteria	
Native distribution:	Eastern Asia	
Date assessed:	November 18, 2008	
Assessors:	Steve Glenn, Gerry Moore	
Reviewers:	LIISMA SRC	
Date Approved:	December 17, 2008	Form version date: 22 October 2008

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

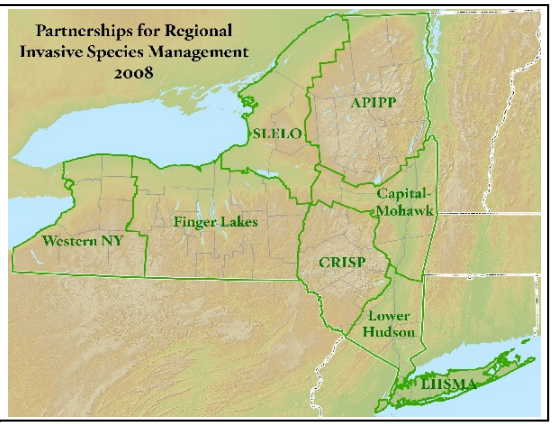
Distribution and Invasiveness Rank (*Obtain from PRISM invasiveness ranking form*)			
	Status of this species in each PRISM:	Current Distribution	PRISM Invasiveness Rank
1	Adirondack Park Invasive Program	Not Assessed	Not Assessed
2	Capital/Mohawk	Not Assessed	Not Assessed
3	Catskill Regional Invasive 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)	12
2	Biological characteristic and dispersal ability	25 (25)	18
3	Ecological amplitude and distribution	25 (25)	21
4	Difficulty of control	10 (7)	6
	Outcome score	100 (97)[b]	57[a]
	Relative maximum score †		58.76
	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:
[W. sinensis reported in Vermont just across Lake Champlain (Essex Co., NY) by Zika et al., 1983]; 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
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, 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*)

	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:
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
☐ 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:
Forest edges, railroad banks

Documentation:
Sources of information:
Authors' personal observations; Lu, 2005; Brooklyn Botanic Garden, 2008; Nature Conservancy, 2008; P. Weigand and A. Entrup, pers obs (seen on coastal dunes)..

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)
Roots form symbiotic relationship with the nitrogen-fixing bacterium Rhizobium (Valder, 1995)- large infestations may increase nitrogen fixation of soil. can decrease light availability when growing on and over trees, but increase light availability when it kills trees. .
Sources of information:
Valder, 1995.

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:
Climbing wisteria vines can kill sizable trees, opening the forest canopy and increasing sunlight to the forest floor. However, there is no evidence that it creates a new layer or eliminates an existing layer.
Sources of information:
Authors' personal observations; Lu, 2005.

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:
Wisterias can significanly reduce native species where it occurs, especially in areas south of New York. Evidence of significant alteration in New York is lacking.
Sources of information:
Authors' personal observations; Nature Conservancy, 2008.

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:
Pods and seeds are toxic if ingested- possible poisoning of native fauna? Roots symbiotic with N-fixing bacterium, Rhizobium, so likely has some impact on soil microoganisms.
Sources of information:
Valder, 1995; Nature Conservancy, 2008.

Total Possible 40

Section One Total 12

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):

While wisteria racemes may have up to 170 flowers and seeds can be produced in favorable conditions, it is unusual for more than one or two flowers to produce pods. Vegetative growth is rampant and the main method of wisteria spread.
Sources of information:
author's personal observations; Valder, 1995; Nature Conservancy, 2008.

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 1

Documentation:
Identify dispersal mechanisms:
Hydrochory- seeds reportedly transported down rivers, but infestations often not near water.
Sources of information:
Lu, 2005; Nature Conservancy, 2008.

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 2

Documentation:
Identify dispersal mechanisms:
Still widely used in horticulture with numerous cultivars, so direct dispersal is high, but doesn't readily spread by indirect means since seed production is limited.
Sources of information:
Valder, 1995; Trusty et al., 2007a; Nature Conservancy, 2008.

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 habit. Reported to be shade-tolerant (Nature Conservancy, 2008). Roots form symbiotic relationship with the nitrogen-fixing bacterium Rhizobium (Valder, 1995). Reported to have a high adaptive ability to water stress (Zhang et al., 2007). Reported to be "remarkably free from troublesome diseases and pests" (Valder, 1995). Hybrid vigor (heterosis) may play a role, providing genetic diversity and possibly ecological amplitude- two studies in the southeastern U.S. found 82-96% of wisteria collections were hybrids of W. sinensis and W. floribunda (Wisteria x formosa Rehder) (Trusty et al., 2007a; Trusty et al., 2007b).
Sources of information:
Valder, 1995; Trusty et al., 2007a; Trusty et al., 2007b; Zhang et al., 2007; Nature Conservancy, 2008

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 a smothering growth habit.
Sources of information:
author's personal observations; Nature Conservancy, 2008

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 3

Documentation:
Describe germination requirements:
Seeds reported to lack dormancy and to germinate readily.
Sources of information:
Valder, 1995.

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:
W. sinensis and W. floribunda (and the hybrid W. formosa) are treated together on this form.

Total Possible 25
Section Two Total 18

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 2

Documentation:
Identify reason for selection, or evidence of weedy history:
Large stands usually present in disturbed areas.
Sources of information:
Authors' personal observations

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 (3 natural habitats).
Sources of information:
Author's personal observations; Lu, 2005; Brooklyn Botanic Garden, 2008; Nature Conservancy, 2008.

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:
Usually establishes in disturbed areas. Breaks in closed canopies reported to facilitate growth of wisteria.
Sources of information:
Authors' personal observations; Nature Conservancy, 2008.

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:
North-central China.
Sources of information:
Valder, 1995.

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, DC, DE, IL, KY, MA, MD, ME, MI, NH, NJ, NY, OH, PA, VA, VT, WV
Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.
Brooklyn Botanic Garden, 2008; USDA, 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:
Adirondack, Capitol/Mohawk, Catskills, Lower Hudson, Long Island
Sources of information:
[W. sinensis reported in Vermont just across Lake Champlain (Essex Co., NY) by Zika et al., 1983]; Weldy & Werier, 2005;Brooklyn Botanic Garden, 2008.

Total Possible 25
Section Three Total 21

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 U

Documentation:
Identify longevity of seed bank:
Seeds reported to lack dormancy and to sprout readily, but no seed banking/viability studies found.
Sources of information:
Valder, 1995.

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:
Will resprout from extensive underground root system.
Sources of information:
Lu, 2005; Nature Conservancy, 2008.

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:
Mechanical Control: Mechanical control methods can be labor intensive and are usually better suited for small populations. Cut vines close to the root collar to discontinue growth of existing vines, reduce seed production, and eventually exhaust the photosynthates stored in the root. Wisteria will resprout; repeated cuttings every 2 weeks are recommended from early in the growing season until autumn. Remove cut vines, or cut vines into smaller lengths because they may continue to grow and girdle trees and shrubs.
Chemical Control: Use cut-stump herbicide applications in areas with large stands of established vines or where desirable plants occur that could be affected by a foliar spray. Cut the vine close to the ground and apply glyphosate or triclopyr (25% solutions in water)

to the cut area. Retreatment may be necessary if resprouting occurs. These treatments are not effective if the ground is frozen.

Use foliar sprays in areas where mechanical control methods would be disruptive, or where cut-stump methods are impractical. Compared to cut-stump applications, the use of foliar sprays requires additional precautions because non-target plants have a greater likelihood of being affected. Spray the foliage thoroughly, but do not apply so much herbicide that it drips off the leaves. Since translocation is slower during cooler weather, the foliar application may be more effective at warmer temperatures (above 60-65ºF). Triclopyr (2% with 0.5% non-ionic surfactant) is specific for the control of broadleaved plants – as such, it may be particularly appropriate in situations where valuable native grasses are near the wisteria plants to be treated. Glyphosate (2% solution with 0.5% non-ionic surfactant) is non-selective. Chlopyralid (0.5% solution) targets aster, buckwheat, and the pea family. However, chlopyralid can leach into groundwater in sandy and limestone soil types. Picloram (4.731 L/ha or 0.5 gal/acre with 0.5% non-ionic surfactant) may provide control in areas where desirable vegetation is not present (Nature Conservancy, 2008).

AMS [ammonium sulfamate] 95% soluble crystal (Ammate), isopropylamine salt of glyphosate [N-(phosphonomethyl) glycine] 480 g/L (Roundup), and fosamine ammonium [ammonium ethyl carbamoylphosphonate] 480 g/L (Krenite) applied to cut stumps are reported effective (Thomas, 1993).

Sources of information:
Thomas, 1993; Nature Conservancy, 2008.

Total Possible	7
Section Four Total	6
Total for 4 sections Possible	97
Total for 4 sections	57

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. 2008. AILANTHUS database. [Accessed on November 18, 2008].

Lu, S. 2005. Wisteria sinensis. U.S. Invasive Species Impact Rank (I-Rank). NatureServe Explorer. <www.natureserve.org>. [Accessed on November 18, 2008].

Nature Conservancy. 2008. Weed Notes- Wisteria sinensis (Chinese Wisteria), Wisteria floribunda (Japanese Wisteria). <http://tncinvasives.ucdavis.edu/esadocs/wist_spp.html>. [Accesssed on November 18, 2008].

Thomas, L. K. 1993. Grubbing for control of exotic wisteria. Castanea. 58(3):209-213.

Trusty, J. L., L. R. Goertzen, W. C. Zipperer, & B. G. Lockaby. 2007a. Invasive Wisteria in the Southeastern United States: genetic diversity, hybridization and the role of urban centers. Urban Ecosystems. 10(4):379-395.

Trusty, J. L., B. G. Lockaby, W. C. Zipperer, & L. R. Goertzen. 2007b. Identity of naturalised exotic Wisteria (Fabaceae) in the south-eastern United States. Weed Research (Oxford). 47(6):479-487.

United States Department of Agriculture, National Resources Conservation Service. 2008. The PLANTS Database. National Plant Data Center, Baton Rouge, Louisiana. <plants.usda.gov>. [Accesssed on November 18, 2008].

Valder, P. 1995. Wisterias: a comphrehensive guide. Timber Press, Portland, OR. 160 pp.

Weldy, T. & 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/>. [Accesssed on November 18, 2008].

Zika, P. F., R. J. Stern, & H. E. Ahles. 1983. Contributions to the Flora of the Lake Champlain Valley, New York and Vermont. Bull. Torrey Bot. Club. 110(3):366-369.

Zhang, S., X. Jiang-bao, Z. Ze-fu, & Z. Guang-can. 2007. Photosynthesis responses to various soil moisture in leaves of Wisteria sinensis. Journal of Forestry Research (Harbin). 18(3):217-220.

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.

Heffernan, K.E., P.P. Coulling, J.F. Townsend, and C.J. Hutto. 2001. Ranking Invasive Exotic Plant Species in Virginia. Natural Heritage Technical Report 01-13. Virginia Dept. of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. 27 pp. plus appendices (total 149 p.).

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