NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM

Scientific name:	Viburnum lantana L.	USDA Plants Code: VILA
Common names:	Wayfaring-tree	
Native distribution:	Eurasia	
Date assessed:	January 6, 2010	
Assessors:	Steve Glenn, Gerry Moore	
Reviewers:	LIISMA SRC	
Date Approved:	Jan. 20, 2010	Form version date: 10 July 2009

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

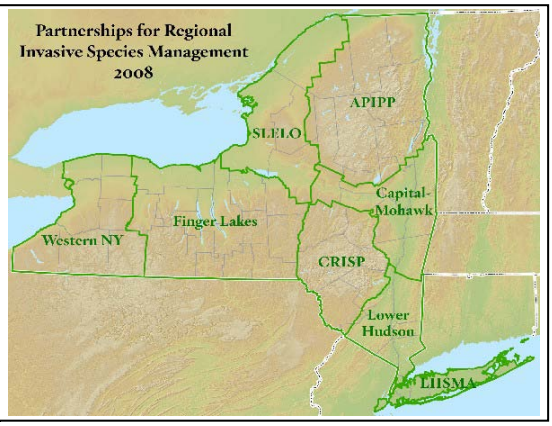
Distribution and Invasiveness Rank (*Obtain from PRISM invasiveness ranking form*)			
	Status of this species in each PRISM:	Current Distribution	PRISM Invasiveness Rank
1	Adirondack Park Invasive Program	Not Assessed	Not Assessed
2	Capital/Mohawk	Not Assessed	Not Assessed
3	Catskill Regional Invasive Species Partnership	Not Assessed	Not Assessed
4	Finger Lakes	Not Assessed	Not Assessed
5	Long Island Invasive Species Management Area	Restricted	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

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (20)	6
2	Biological characteristic and dispersal ability	25 (25)	17
3	Ecological amplitude and distribution	25 (25)	17
4	Difficulty of control	10 (10)	3
	Outcome score	100 (80)[b]	43[a]
	Relative maximum score †		53.75
	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
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)	
☒	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:
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
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):
Kollmann & Grubb, 2002.

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	Restricted
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.

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: hedges

Documentation:
Sources of information:
Schnitzler et al., 1992; Kollmann & Grubb, 2002; Brooklyn Botanic Garden, 2010.

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 on the impact to 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:
Can increase the density of the shrub layer. No published evidence or observations that the species causes significant impact or major alteration of structure.
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:
Species noted to influence community structure by reducing the number of individuals of native species in a community. Listed as potentially threatening to Wisconsin's native habitats (Hoffman & Kearns, 1997); no other studies on the impact to community composition located.
Sources of information:
Hoffman & Kearns, 1997; authors' pers. comm.

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:
No studies on the impact to other species located.
Sources of information:
Authors' pers. comm.

Total Possible: 20
Section One Total: 6

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: 2

Documentation:
Describe key reproductive characteristics (including seeds per plant):
Anecdotal web site information state that fruits can be profusely borne and attractive, but are often sparse or non-existent, as several shrubs are apparently needed in close proximity for cross-pollination and reliable fruit set, and fruit set is often poor to non-existent. However Kollmann & Grubb (2002) state that selfing is possible with 15-30 fruits per infrutescence and seeds 100% viable (Kollmann et al., 1998).

Sources of information:
Kollmann et al., 1998; Kollmann & Grubb, 2002.

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:
Bird and mammal dispersed (endozoochory).
Sources of information:
Herrera, 1982; Hernandez, A. 2001; Kollmann & Grubb, 2002.

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: 3

Documentation:
Identify dispersal mechanisms:
Cultivated; for sale on numerous web sites; possible indirect transport through yard waste.
Sources of information:
Grier & Grier. 1929; authors' 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, shade tolerant, semi-evergreen (deciduous as an adult, tending to be evergreen when juvenile, Kollmann & Grubb, 2002) shrub. Seedlings reported tolerate of deep shade (Grubb et al., 1996), but more light might be required for further growth (Kollmann &

Grubb, 2002). Reportedly adaptable to dry to wet soils (Lee et al., 1991), including soils liable to drying in the summer, but which suffer a degree of water logging in the spring (Kollmann & Grubb, 2002). One water potential investigation (Hinckley et al., 1992) suggested that V. lantana would do poorly on drought sites- the investigators hypothesized "the competitive advantage must therefore depend on successful tolerance, not on avoidance of a drought-induced reduction in photosynthesis. We can only speculate upon the mechanisms in involved in this tolerance. One factor might be found in the lower carbohydrate requirements for the development and metabolic maintenance of the restricted root system of this species." Reported to tolerate soils of various pH (usually pH 5-7>, Kollmann & Grubb, 2002), although one European study found V. lantana displayed lime-chlorosis (Grime & Hutchinson, 1967). Another study found high salt levels inhibited new growth (Thompson & Rutter, 1986). One study found V. lantana highly unpalatable to deer and rabbits (Kollmann & Grubb, 2002).

Sources of information:
Grime & Hutchinson, 1967; Thompson & Rutter, 1986;Lee et al., 1991; Hinckley et al., 1992; Grubb et al., 1996; Kollmann & Grubb, 2002.

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:
No reports or observations of V. lanatana forming thickets or having a climbing or smothering habit in North America.
Sources of information:
Authors' pers. comm., 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 2

Documentation:
Describe germination requirements:
Viburnum seed is slow to germinate and most species have embryo dormancy as well as seedling (epicotyl) dormancy and hard seed coats (Giersbach, 1937); stratification required. Seed reportedly viable for less than 2 years (Kollmann & Grubb, 2002). One controlled experiment found germination rates as high as 65% (Adams, 1927), and Kollmann et al. (1998) found seeds 100% viable. Not known to germinate in a wide range of conditions.

Sources of information:
Giersbach, 1937; Kollmann et al., 1998; Kollmann & Grubb, 2002; Dirr, 2007; authors' pers. obs.

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:
V. dilatatum, V. opulus var. opulus, V. plicatum, V. rhytidophyllum, V. setigerum, V. sieboldii reported from the NY-NJ-CT area; none tracked as invasive.

Mehrhoff et al., 2003; Brooklyn Botanic Garden, 2010; CJISST, 2010; Weldy & Werier, 2010; U.S.D.A. NRCS, 2010.

Total Possible	25
Section Two Total	17

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: 0

Documentation:
Identify reason for selection, or evidence of weedy history:
Reportely rarely becoming locally dominant even in its native range; no reports of large stands in the Northeast located in literature or observed.
Sources of information:
Kollmann & Grubb, 2002.

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: 4

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
See A2.3.
Sources of information:
Schnitzler et al., 1992; Kollmann & Grubb, 2002; Brooklyn Botanic Garden, 2010.

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:
Readily establishes in disturbed areas; not known to require anthropogenic disturbance.
Sources of information:
Authors' 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:
Ukraine, Caucusus Mountains, northern Turkey, and reportely naturalized in southern Sweden.
Sources of information:
Kollmann & Grubb, 2002.

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, IA, IL, IN, MA, MD, ME, MI, NJ, NY, OH, PA, VT, WI; New Brunswick, Ontario, Quebec.
Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.
Brooklyn Botanic Garden, 2010; 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 4

Documentation:
Describe distribution:
See A1.1.
Sources of information:
Brooklyn Botanic Garden, 2010; Weldy & Werier, 2010.

Total Possible	25
Section Three Total	17

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:
Seeds remain viable for up to two years but not longer than five.
Sources of information:
Kollmann, J. 1996; Davies & Waite, 1998; Kollmann & Grubb, 2002.

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 1

Documentation:
Describe vegetative response:
Perennial shrub, could presumably resprout from roots.
Sources of information:
Kollmann, J. 1996; Davies & Waite, 1998; Kollmann & Grubb, 2002; authors' pers obs.

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 0

Documentation:
Identify types of control methods and time-term required:
Management is not currently known to be required in New York state. Listed as potentially threatening to Wisconsin's native habitats (Hoffman & Kearns, 1997), presently not listed as invasive elsewhere including the Northeast (Mehrhoff et al., 2003). No management studies located. BioControl: Numerous phytophagous insects reported from its native range (Kollmann & Grubb, 2002); with the European Pyrrhalta viburni becoming established in North America on viburnums (Hoebeke & Wheeler, 1983). The following recommendations are given for V. opulus and may be applicable to V. dilatatum: Hand-pull plants less than 3 feet tall, before the root system becomes established. Taller shrubs should be cut at ground level. Natural area managers recommend applying a 20% solution of glyphosate herbicide to the cut stump to avoid resprouting, and chipping the brush to prevent seed dispersal (Brooklyn Botanic Garden ,1996).
Sources of information:
Hoebeke & Wheeler, 1983; Brooklyn Botanic Garden ,1996; Kollmann & Grubb, 2002; Mehrhoff et al., 2003.

Total Possible	10
Section Four Total	3
Total for 4 sections Possible	80
Total for 4 sections	43

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: 'Aureum', 'Emerald Triumph', 'Macrophyllum', 'Mohican', 'Rugosum', 'Variegatum', 'Variifolium', 'Versicolor'

References for species assessment:

Adams, J. 1927. The germination of the seeds of some plants with fleshy fruits. American J. Botany. 14(8):415-428.

Brooklyn Botanic Garden [Randall, J. M. & J. Marinelli eds.]. 1996. Invasive Plants: Weeds of the Global Garden. Handbook #149. Brooklyn, NY. 111 pp.

Brooklyn Botanic Garden. 2010. AILANTHUS database. [Accessed January 5, 2010].

Central Jersey Invasive Species Strike Team (CJISST). 2010. Invasive Plant Fact Sheet

Siebold Viburnum (Viburnum sieboldii).
<http://www.cjisst.org/factsheets/Viburnum%20sieboldii_Invasive%20Plants%20Fact%20Sheet.pdf>
[Accessed January 6, 2010].

Davies, A. & S. Waite. 1998. The persistence of calcareous grassland species in the soil seed bank under developing and established scrub. Plant Ecology. 136(1):27-39.

Dirr, M. A. 2007. Viburnums, flowering shrubs for every season. Timber Press, Portland, OR. 262 pp.

Giersbach, J. 1937. Germination and seedling production of species of Viburnum. Contr. Boyce Thompson Inst. Pl. Res. 9: 79-90.

Grier, N. M. & C. R. Grier. 1929. A list of plants growing under cultivation in the vicinity of Cold Spring Harbor, N.Y. American Midland Naturalist. 11(8):389-434.

Grime, J. P. & T. C. Hutchinson. 1967. The incidence of lime-chlorosis in the natural vegetation of England. J. Ecology. 55(2):557-566.

Grubb, P. , W. G. Lee, J. Kollmann & J. B.Wilson . 1996. Interaction of irradiance and soil nutrient supply on growth of seedlings of ten European tall-shrub species and Fagus sylvatica. J. Ecology. 84(6):827-840.

Hernandez, A. 2001. Are wayfaring tree Viburnum lantana fruits adapted for consumption by seed-disperser mammals? Mammalia. 65(4):521-524.

Herrera, C. M. 1982. Breeding systems and dispersal-related maternal reproductive effort of southern spanish bird-dispersed plants. Evolution. 36(6):1299-1314.

Hinckley, T. M., F. Duhme, A. R. Hinckley & H. Richter. 1983. Drought relations of shrub species: assessment of the mechanisms of drought resistance. Oecologia. 59(2/3):344-350.

Hoebeke, E. R. & A. G. Wheeler. 1983. Exotic insects reported new to northeastern United States and eastern Canada since 1970. J. New York Entomological Soc. 91(3):193- 222.

Hoffman, R. & K. Kearns. (eds). 1997. Wisconsin manual of control recommendations for ecologically invasive plants. Wisconsin Dept. Natural Resources, Bureau of Endangered Resources. Madison, Wisconsin. 102pp.

Kollmann, J. 1996. Differences in the regeneration niche of endozoochorous species. Jahreshefte Gesellschaft fuer Naturkunde in Wuerttemberg. 152:85-113.

Kollmann, J., D. A. Coomes & S. M. White. 1998. Consistencies in post-dispersal seed predation of temperate fleshy-fruited species among seasons, years and sites. Functional Ecology. 12(4):683-690.

Kollmann, J. & P. J. Grubb. 2002. Viburnum lantana L. and Viburnum opulus L. (V. lobatum Lam., Opulus vulgaris Borkh.). J. Ecology. 90(6):1044-1070.

Lee, W. G., P. J. Grubb & J. B. Wilson. 1991. Patterns of resource allocation in fleshy fruits of nine European tall-shrub species. Oikos. 61(3):307-315.

Mehrhoff, L. J., J. A. Silander, Jr., S. A. Leicht, E. S. Mosher and N. M. Tabak. 2003. IPANE: Invasive Plant Atlas of New England. Department of Ecology & Evolutionary Biology, University of Connecticut, Storrs, CT, USA. < http://www.ipane.org> [Accessed January 5, 2010].

Schnitzler, A. R. Carbiener & M. Tremolieres. 1992. Ecological segregation between closely related species in the flooded forests of the Upper Rhine Plain. New Phytologist. 121(2):293-301.

Thompson, J. R. & A. J. Rutter. 1986. The salinity of motorway soils. IV. Effects of sodium chloride on some native British shrub species, and the possibility of establishing shrubs on the central reserves of motorways. J. Applied Ecology. 23(1):299-315.

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 5, 2010].

Weldy, T. and D. Werier. 2010. 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. <www.newyork.plantatlas.usf.edu> [Accessed January 5, 2010].

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.).

Morse, L.E., J.M. Randall, N. Benton, R. Hiebert, and S. Lu. 2004. An Invasive Species Assessment Protocol: Evaluating Non-Native Plants for Their Impact on Biodiversity. Version 1. NatureServe, Arlington, Virginia. http://www.natureserve.org/getData/plantData.jsp

Randall, J.M., L.E. Morse, N. Benton, R. Hiebert, S. Lu, and T. Killeffer. 2008. The Invasive Species Assessment Protocol: A Tool for Creating Regional and National Lists of Invasive Nonnative Plants that Negatively Impact Biodiversity. Invasive Plant Science and Management 1:36–49

Warner, Peter J., Carla C. Bossard, Matthew L. Brooks, Joseph M. DiTomaso, John A. Hall, Ann M.Howald, Douglas W. Johnson, John M. Randall, Cynthia L. Roye, Maria M. Ryan, and Alison E. Stanton. 2003. Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands. Available online at www.caleppc.org and www.swvma.org. California Exotic Pest Plant Council and Southwest Vegetation Management Association. 24 pp.

Williams, P. A., and M. Newfield. 2002. A weed risk assessment system for new conservation weeds in New Zealand. Science for Conservation 209. New Zealand Department of Conservation. 1-23 pp.