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New York State Plant Ranking System for Evaluating Non-Native Plant Species for Invasiveness

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BACKGROUND: In 2007 the Suffolk and Nassau County Legislatures on Long Island passed resolutions that prohibited the sale, introduction and propagation of non-native, invasive plant species. An identical list of 63 non-native plant species was included with each resolution. Periodic review and update of the list was called for, but no formal procedure for conducting such reviews was specified. Under the auspices of the Long Island Invasive Species Management Area (LIISMA), The Nature Conservancy (TNC) contracted with the Brooklyn Botanic Garden (BBG) to help develop a protocol for assessing non-native plant species for invasiveness, and to use the protocol to assess 180 species. Such a protocol, or ranking system, was developed and 108 species assessments have been reviewed by the LIISMA Scientific Review Committee (SRC) as of April 15, 2009. Although the immediate need was for use on Long Island, the authors designed the ranking system so that it could be used by the State of New York. New York State's Office of Invasive Species Coordination adopted the system, and is using assessment results to develop recommendations for a statewide invasive plant species list to be considered by the NYS legislature in 2010.

PURPOSE: The purpose of the New York Invasive Plant Ranking System is to assess the invasive nature of non-native plant species that are established in NYS, and also to assess the potential invasiveness of species that are new arrivals or are not yet present. This ranking system is designed to be repeatable, based on the best available science, clearly explained and fully documented. Results of species assessments using the protocol will make more analytic and transparent the process of creating lists of invasive species for the State and for the eight Partnerships for Regional Invasive Species Management (PRISMs) within. Assessment results and documentation will also be useful in prioritizing control efforts.

Consequences to the native species and natural ecosystems of New York are the focus of this protocol. Impacts to the economy, agriculture and human health are also very important, but should be assessed with separate protocol(s) that include a different set of factors. In the future, these separate assessments could be used in combination to determine the overall impact of an invasive species in the State of New York.

DEFINITIONS: For the purpose of the New York Invasive Plant Ranking System, an invasive plant species is a species that is: "1) nonnative to the ecosystem under consideration, and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health." (Federal Executive Order 13112, signed in 1999 and adopted by the New York State Invasive Species Task Force in 2005). Further, for purposes of this Invasive Plant Ranking System, invasive plants are non-native species that have spread into native or minimally managed plant systems in New York. These plants cause economic or

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environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems. As defined here, "species" includes all synonyms, subspecies, varieties, forms, and cultivars of that species unless proven otherwise by a process of scientific evaluation. Non-native genotypes of a species (e.g. *Phragmites australis*) may be considered separate from the parent species on a case-by-case basis.

At the present time 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.

RATIONALE: Numerous ranking systems exist, but the authors felt that none were completely suitable for both assessing and predicting negative impacts to natural systems in New York State and regions in NYS due to differences in scale, purpose and emphasis. We created a ranking system that incorporates components from other systems, primarily the system adopted in Alaska (Carlson et al. 2007), the system developed by NatureServe (Morse et al. 2004; Randall et al. 2008), and plant characteristics used by Williams and Newfield (2002). Scores are given to a series of questions, and the overall point total determines the invasiveness category for NYS. As is the case for the Alaska system, the New York system requires clear documentation for answers to each question, but allows for species to be evaluated when some information is lacking. Outcomes from the system should generally agree with present knowledge and understanding.

NYS RANKING SYSTEM: The New York System ranks species in a two stage process. First the species are ranked at the state level using a form that contains a series of questions in four broad categories:

	Section categories	Points
1	Ecological impact	40
2	Biological characteristic and dispersal ability	25
3	Ecological amplitude and distribution	25
4	Difficulty of control	10
	Total	100

Questions in categories 1, 2 and 4 address primarily inherent ecological and biological characteristics of the species and its impacts, and control feasibility, which are largely or entirely independent of geographical location within the species' introduced range. Questions in category 3 address the distribution and abundance of the species in the northeastern United

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States, eastern Canada and New York State, and the similarity of climates in the species' native range to climates in New York. Points are assigned to the answers to each question. If a species' impact, characteristics, abundance or feasibility of control are known to vary in different regions of the State, answers to questions should apply to the region(s) in which the species appears to be the most invasive (i.e. has the greatest impacts, most rapid growth, greatest abundance and distribution, etc.).

The maximum possible total for a species, if all questions can be answered, is 100 points. A "New York Invasiveness Rank" is assigned based on the "Relative maximum score" (points accrued as a percent of the maximum possible points for questions that could be answered). For example, if the maximum possible points for the questions that could be answered are 80, and the species received an Outcome Score of 60, then the species "Relative Maximum Score" would be 60/80 or 75. If the total answered points possible are fewer than 70, an invasiveness rank cannot be assigned. For justifications of impact questions and categories see (Heffernan et al. 2001 and Warner et al. 2003).

New York Invasiveness Rank	Relative Maximum Score
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

The second stage focuses on an individual PRISM (region within NYS). Factors considered are (1) the current abundance and distribution of the species and (2) the likelihood of the species occurring or expanding within the PRISM based on suitability of habitats and climate. A combination of the NYS Score, distribution in the PRISM and likelihood of spread are used to assign an invasiveness rank to the species for that PRISM. Invasiveness ranks for a PRISM may be the same as, or lower than, the NYS rank, but may not be higher.

PROCESS FOR SPECIES ASSESSMENT AND REVIEW ON LONG ISLAND:

The New York and PRISM ranking forms are being used in 2008-2009 by BBG to assess 180 species of non-native plants. Assessment documents prepared by BBG are reviewed by the LIISMA Scientific Review Committee (SRC), which was established by the LI Invasive Species Management Area in March 2008. The SRC was initially composed of qualified stakeholders from 18 organizations and agencies listed below. Representatives from four organizations/agencies have been unable to participate during the summer of 2008, but may rejoin the effort in the future.

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SRC meetings have been held twice a month. At each meeting, four to six species are reviewed, revised, and either approved or returned to BBG for more information. Changes to the forms have frequently been made as a result of assessment discussions. Species assessed and approved using significantly older versions of the form are being updated to a newer form version. If a change to the form results in a point score change that changes a species' invasiveness rank, that species will be brought back to the SRC to review again.

Voting Members of the LIISMA Scientific Review Committee: July 2008

<i>Name</i>	<i>Organization / Agency</i>
Marilyn Jordan, Chair	The Nature Conservancy
Gerry Moore, Co-Chair	Brooklyn Botanic Garden
Dwight Andrews/Ellen Talmage	Nursery Industry/Aquarium Industry/Garden Center
Tim Green	Brookhaven National Laboratory
Jonathan Lehrer	Academic, SUNY Farmingdale
Al Lindberg	Nassau County Department of Parks
Gary Lawton	New York State Office of Parks, Recreation, Preservation
Michael Bilecki/Jordan Raphael	National Park Service
Andy Senesac/Tamson Yeh	Cornell Cooperative Extension
Charles Scheer	Farm Bureau
Kathy Schwager	Long Island WIMS database manager
Bill Titus/Margaret Conover	Long Island Botanical Society (LIBS)
Polly Weigand	Suffolk County Soil & Water Conservation District

Non-voting visiting experts

Nick Gibbons	Suffolk County Department of Parks
Andrew Greller	Academic/Botanist Queens College
Charles Hamilton	New York State Dept. of Environmental Conservation
Charles O'Neill/Bill Kent	New York Sea Grant
Steve Young	New York Natural Heritage Program

PROCESS FOR SPECIES ASSESSMENT AND REVIEW BY NEW YORK STATE AND OTHER PRISM:

To be provided by NYS DEC

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. 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.

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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.

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