

# NEW YORK

## TERRESTRIAL INVERTEBRATES INVASIVENESS RANKING FORM

Scientific name: Pityophthorus juglandis and Geosmithithia morbida  
 Common names: Thousand Canker Disease  
 Native distribution: The walnut twig beetle is native to Arizona, California and New Mexico.  
 Date assessed: 6/25/2013  
 Assessors: D. Adams  
 Reviewers: \_\_\_\_\_  
 Date Approved: \_\_\_\_\_ Form version date: 3 January 2013

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

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

| <b>Invasiveness Ranking Summary</b><br>(see details under appropriate sub-section) |   | Total (Total Answered*)<br>Possible           | Total           |
|--|---|---|-----------------|
| 1  | Ecological impact                               | 30 (30)                                       | 21              |
| 2  | Biological characteristic and dispersal ability | 30 (30)                                       | 17              |
| 3  | Ecological amplitude and distribution           | 30 (30)                                       | 20              |
| 4  | Difficulty of control                           | 10 (10)                                       | 8               |
|  | Outcome score                                   | 100 (100) <sup>b</sup>                        | 66 <sup>a</sup> |
|  | Relative maximum score †                        |   | 66              |
|  | 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) |  |  |
| <input type="checkbox"/>   | Yes – continue to A1.2   |  |
| <input checked="" type="checkbox"/>  | No – continue to A2.1; Yes <input checked="" type="checkbox"/> NA; Yes <input checked="" type="checkbox"/> USA |  |
| A1.2. In which PRISMs is it known (see inset map)?   |  |  |
| <input type="checkbox"/>   | Adirondack Park Invasive Program   |  |
| <input type="checkbox"/>   | Capital/Mohawk   |  |
| <input type="checkbox"/>   | Catskill Regional Invasive Species Partnership   |  |
| <input type="checkbox"/>   | Finger Lakes   |  |
| <input type="checkbox"/>   | Long Island Invasive Species Management Area   |  |
| <input type="checkbox"/>   | Lower Hudson   |  |
| <input type="checkbox"/>   | Saint Lawrence/Eastern Lake Ontario  |  |
| <input type="checkbox"/>   | Western New York   |  |

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**Documentation:**

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

A2.0. Is this species listed on the Federal Injurious Fish and Wildlife, Noxious Weed or PPQ Action Required list?

- Yes – the species will automatically be listed as Prohibited, no further assessment required.  
 No – continue to A2.1.

A2.1. What is the likelihood that this species will occur and persist given the climate in the following PRISMs? (obtain from PRISM invasiveness ranking form)

- Moderately Likely Adirondack Park Invasive Program
- Moderately Likely Capital/Mohawk
- Moderately Likely Catskill Regional Invasive Species Partnership
- Moderately Likely Finger Lakes
- Moderately Likely Long Island Invasive Species Management Area
- Moderately Likely Lower Hudson
- Moderately Likely Saint Lawrence/Eastern Lake Ontario
- Moderately Likely Western New York

**Documentation:**

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

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

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

**Documentation:**

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

A2.3. Describe the potential or known suitable habitats within New York. Natural habitats include all habitats not under active human management. Managed habitats are indicated with an asterisk.

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

Other potential or known suitable habitats within New York:

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**Documentation:**

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

**B. INVASIVENESS RANKING**

*1. ECOLOGICAL IMPACT*

1.1. Impact on Ecosystem Processes and System-wide Parameters (e.g., energy cycle, nutrient and mineral dynamics, light availability, or fire regime).

- A. No perceivable impact on ecosystem processes based on research studies or the absence of impact if a species is widespread and/or has been present in the northeast for > 50 years. 0
- B. Influences ecosystem processes to a minor degree 3
- C. Significant alteration of ecosystem processes 7
- D. Major, possibly irreversible, alteration or disruption of ecosystem processes 10
- U. Unknown

Score

**Documentation:**

Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)

The principle agents involved in this disease are a newly identified fungus Geosmithia morbida and the walnut twig beetle Pityophthorus juglandis. Because walnut is a hard mast producer, wildlife may be negatively impacted.

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

1.2. Impact on Terrestrial Community Composition (species specific)

- 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

**Documentation:**

Identify type of impact or alteration:

Thousand canker disease causes dieback and mortality of eastern black walnut Juglans nigra.

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

1.3. 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).

- A. Negligible perceived impact – no host damage 0
- B. Minor impact – limited host damage (aesthetics or restricts commercial trade) 3
- C. Moderate impact - extensive damage – kills host in 2-5 years (prohibits commercial trade) 7
- D. Severe impact on other species or species groups – kills or predisposed host within 2 years (prohibits commercial trade) 10
- U. Unknown

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Score 7

**Documentation:**  
 Identify type of impact or alteration: (control methods and time-term required)  
 Infested trees can die within three years of initial symptoms.  
 Sources of information:  
 USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

**Total Possible** 30  
**Section One Total** 21

### 2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

#### 2.1. Mode and rate of reproduction (population dynamic - fecundity)

- A. No reproduction (does not complete life cycle) 0
- B. Limited reproduction (minimal population expansion - able to complete only 1 life cycle) 3
- C. Moderate reproduction (mod. population expansion - able to complete 2 or 3 life cycles) 5
- D. Abundant and/or asexual reproduction (high population expansion – able to complete more than 3 lifecycles) 8
- U. Unknown (life cycle information is not available)

Score 5

**Documentation:**  
 Describe key reproductive characteristics:  
 Geosmithia morbida appears to be much more virulent than related species. Trees die as a result of the canker infections that form at each of the thousands of beetle attack sites.  
 Sources of information:  
 USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

#### 2.2. Innate potential for long-distance dispersal (e.g. under it's own power)

- A. Does not occur (no long-distance dispersal mechanisms) 0
- B. Infrequent or inefficient long-distance dispersal (little or no flight capacity) 2
- C. Moderate capabilities for long-distance dispersal (up to 5 miles) 4
- D. High capabilities for long-distance dispersal (5 miles or greater) 6
- U. Unknown

Score 4

**Documentation:**  
 Identify dispersal mechanisms:  
 The walnut twig beetle is estimated to fly one to two miles. The US west to east wind currents could facilitate longer distance flight and aid its movement east, particularly given its small size.  
 Sources of information:  
 USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

#### 2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sales, spread along highways, transport on cargo, contaminated firewood, compost, land and vegetation management equipment such as mowers and excavators, soil, 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) 2

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- extent)  
 D. High (opportunities for human dispersal to new areas by direct and indirect means are numerous, frequent, and successful) 3  
 U. Unknown

Score

**Documentation:**  
 Identify spread mechanisms:  
 Pathways include raw timber, firewood, wood packaging material, nursery stock, scion wood for grafting, nuts and natural spread.  
 Sources of information:  
 USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

**2.4. Potential to be spread by acts of nature (hurricanes, flooding, storms, etc.), and by other animals (mammals/birds/reptiles/insects).**

- A. Does not occur 0  
 B. Low (rarely occurs – 5 or more years between occurrences, requires a severe event) 1  
 C. Moderate (sometimes occurs – less than every 3-5 years, requires a moderate event) 2  
 D. High (commonly transported by nature and/or animals – may occur every 1-2 years) 3  
 U. Unknown

Score

**Documentation:**  
 Identify spread mechanisms:  
 Geosmithia spores surrounding beetle galleries can be moved by wind and water.  
 Sources of information:  
 USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

**2.5. Characteristics that increase competitive advantage such as not being palatable, no primary predator, eats many hosts, has natural or chemical defenses, fills a vacant niche, has tolerance to various extremes such as pH, temperatures, etc., is a generalist, has highly evolved defense mechanisms, has behavioral adaptations, etc.**

- A. Possesses no characteristics that increase competitive advantage 0  
 B. Possesses one (1) or two (2) characteristic that increases competitive advantage 2  
 C. Possesses three (3) or four (4) characteristics that increase competitive advantage 4  
 D. Possesses five (5) or more characteristics that increase competitive advantage 8  
 U. Unknown

Score

**Documentation:**  
 Describe competitive advantages:  
 Adult beetles are very small. Through its association with this newly identified fungus, the walnut twig beetle appears to have greatly increased in abundance and distribution. Adult bark beetles carry fungal spores that are then introduced into the phloem when they construct galleries.  
 Sources of information:  
 USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

**2.6. Other species in the genus invasive in New York or elsewhere**

- A. No 0  
 B. Yes 2  
 U. Unknown

Score

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Documentation:  
 Species:

|                          |    |
|--------------------------|----|
| <b>Total Possible</b>    | 30 |
| <b>Section Two Total</b> | 17 |

**3. ECOLOGICAL AMPLITUDE AND DISTRIBUTION**

**3.1. Current introduced distribution in the North America (which includes: Antigua, Barbuda, Bahamas, Barbados, Belize, Canada, Costa Rica, Cuba, Dominica, Dominican Rep., El Salvador, Granada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, St. Kitts & Nevis, St. Lucia, St. Vincent, Grenadines, Trinidad and Tobago and the United States)**

- A. Not known to be established in North America 0
- B. Established as a non-native in one country in North America. 1
- C. Established as a non-native in 2 or 3 countries in North America. 2
- D. Established as a non-native in 4 or more countries in North America. 3
- U. Unknown

Score 2

Documentation:

Identify states and provinces invaded:

US Mexico and Canada, Thousand canker disease has been found in nine western states and more recently detected east of the Great Plains.

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

**3.2. Current introduced distribution in the northeastern USA (CT, DE, ME, MD, MA, NH, NJ, PA, RI, VT, VI, WV) and eastern Canada (In Canada, includes Nova Scotia, Prince Edward Island, New Brunswick, and parts of Quebec and Ontario lying south of the 47th parallel of latitude.)**

- A. Not known from the northeastern US and adjacent Canada 0
- B. Established as a non-native in one northeastern USA state and/or eastern Canadian province. 1
- C. Established as a non-native in 2 or 3 northeastern USA states and/or eastern Canadian provinces. 2
- D. Established as a non-native in 4 or more northeastern USA states and/or eastern Canadian provinces, and/or categorized as a problem species (e.g., "Invasive") in 1 northeastern state or eastern Canadian province. 4
- U. Unknown

Score 2

Documentation:

Identify states and provinces invaded:

The newly recognized canker disease of walnut has been identified and may threaten the native range of black walnut throughout the eastern United States. Since 2010, confirmed in five eastern states including PA, TN and VA.

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

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3.3. Current introduced distribution of the species in natural areas in the eight New York State PRISMs (Partnerships for Regional Invasive Species Management)

- A. Established in none of the PRISMs 0
- B. Established in 1 PRISM 1
- C. Established in 2 or 3 PRISMs 3
- D. Established in 4 or more PRISMs 5
- U. Unknown

Score

**Documentation:**  
 Describe distribution:  
 Not known to occur in NYS at this time.  
 Sources of information:  
 USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

3.4. Distance to known occurrences in the northeastern USA and eastern Canada.

- A. No population known to be established 0
- B. Established population in nonadjacent states/provinces 3
- C. Established population in adjacent states/provinces 5
- U. Unknown

Score

**Documentation:**  
 Identify reason for selection, or evidence Occurs in five eastern states including PA.  
 Sources of information:  
 USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

3.5. 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 2 or 3 of the habitats given at A2.3, with at least 1/ 2 a natural habitat. 2
- C. Known to occur in 4 or more of the habitats given at A2.3, with at least 3 a natural habitat. 4
- U. Unknown

Score

**Documentation:**  
 Identify type of habitats where it occurs and degree/type of impacts:  
 Hardwood forest and roadside trees.  
 Sources of information:  
 USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

3.6. Role of human and natural disturbance in establishment

- A. Requires human disturbances to establish. 0
- B. May occasionally establish in undisturbed areas but can readily establish in areas with natural or human disturbances. 1
- C. Can establish independent of any known human or natural disturbances. 3
- U. Unknown

Score

**Documentation:**  
 Describe distribution:

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Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

3.7. Climate in native range (e.g., similar latitudinal range)

- A. Native range does not include climates similar to New York 0
- B. Native range possibly includes climates similar to portions of New York. 3
- C. Native range includes climates similar to those in New York 6
- U. Unknown

Score 6

**Documentation:**

Describe what part of the native range is similar in climate to New York:

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

|                            |    |
|----------------------------|----|
| <b>Total Possible</b>      | 30 |
| <b>Section Three Total</b> | 20 |

### 4. DIFFICULTY OF CONTROL & DETECTION

4.1. Re-establishment potential

- A. No known vector for re-establishment following removal 0
- B. Re-establishment from 1 vector following removal 1
- C. Re-establishment from 2-3 vectors following removal 2
- D. Re-establishment from > 3 vectors following removal 3
- U. Unknown

Score 2

**Documentation:**

Describe vegetative response:

The most likely pathway for movement is raw wood. Other potential pathways include nursery stock, scion wood for grafting and natural spread.

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

4.2. Status of monitoring protocols for species

- A. No known monitoring protocols exist 0
- B. Monitoring protocols are available from other countries or states 1
- C. Monitoring protocols appropriate to New York State are available 2
- U. Unknown

Score 2

**Documentation:**

Describe vegetative response:

A pheromone-baited trap placed near walnut trees is available for detecting the beetle.

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

4.3. Status of monitoring resources (e.g. tools, manpower, travel, traps, lures, ID keys, taxonomic specialists, etc.)

- A. No known monitoring resources are available 0



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- B. Monitoring resources may be available 1
- C. Established resources are available including commercial and/ or research tools 2
- U. Unknown

Score 2

**Documentation:**

Identify types of control methods and time-term required:

Visual inspecting walnut trees for dieback is currently the best survey tool for detecting the disease in the eastern US.

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

#### 4.4. Level of effort required

- A. Management is not required: e.g., species does not persist without repeated human mediated action. 0
- B. Management is relatively easy and inexpensive; invasive species can be maintained at low abundance causing little or no ecological harm. (e.g., 10 or fewer person-hours of manual effort can eradicate a local infestation in 1 year.) 1
- C. Management requires a major short-term investment, and is logistically and politically challenging; eradication is difficult, but possible. (e.g., 100 or fewer person-hours/year of manual effort, or up to 10 person-hours/ year for 2-5 years to suppress a local infestation.) 2
- D. Management requires a major investment and is logistically and politically difficult; eradication may be impossible. (e.g., more than 100 person-hours/ year of manual effort, or more than 10 person hours/year for more than 5 years to suppress a local infestation.) 3
- U. Unknown

Score 2

**Documentation:**

Identify types of control methods and time-term required:

Homeowners may face the cost of tree removal.

Sources of information:

USDA. 2009. Pathway Assessment: Geosmithia sp. and Pityophthorus juglandis movement from the western into the eastern United States. 50 pgs.

|                    |    |
|--------------------|----|
| Total Possible     | 10 |
| Section Four Total | 8  |

|                                      |     |
|--------------------------------------|-----|
| <b>Total for 4 sections Possible</b> | 100 |
| <b>Total for 4 sections</b>          | 66  |

### C. STATUS OF HYBRIDS:

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 hybrids of the species known to be available: Culture on agar medium or DNA analysis is required to confirm the identity of *Geosmithia morbida*.

### References for species assessment:

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USDA. 2009. Pathway Assessment: *Geosmithia* sp. and *Pityophthorus juglandis* movement from the western into the eastern United States. 50 pgs.

**Citation:** The New York Terrestrial Invertebrate Invasiveness Ranking Form is an adaptation of the New York Plant Invasiveness Ranking Form. The original plant 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.

**Acknowledgments:** The New York Terrestrial Invertebrate Invasiveness Ranking Form incorporates components and approaches used in several other systems, cited in the references below. Valuable contributions by members of the Invasive Species Council and Invasive Species Advisory Committee were incorporated in revisions of this form. Members of the Office of Invasive Species Coordination's Four-tier Team, who coordinated the effort, included representatives of the New York State Department of Environmental Conservation\* (Division of Fish, Wildlife and Marine Resources, Division of Lands and Forests, Division of Water); The Nature Conservancy; New York Natural Heritage Program; New York Sea Grant; Lake Champlain Sea Grant; New York State Department of Agriculture and Markets\* (Division of Plant Industry and Division of Animal Industry); Cornell University\* (Department of Natural Resources and Department of Entomology); New York State Nursery and Landscape Association; New York Farm Bureau; Brooklyn Botanic Garden; Pet Industry Joint Advisory Council; Trout Unlimited; United States Department of Agriculture Animal and Plant Health Inspection Service\* (Plant Protection and Quarantine and Wildlife Services); New York State Department of Transportation; State University of New York Albany and Plattsburgh; and Cary Institute of Ecosystem Studies. Those organizations listed with an asterisk comprised the Terrestrial Invertebrate Working Group.

### References for ranking form:

The Analytic Hierarchy Process Prioritization Pest List for 2009. 2009. New York State Department of Agriculture, Division of Plant Industry.

Guidelines for the Import of Live Terrestrial Invertebrates. 2004. Commonwealth of Australia, Department of the Environment, Water, Heritage and the Arts.

Guidelines for Pathway-Initiated Pest Risk Assessment. 2000. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Permits and Risk Assessment, Commodity Risk Analysis Branch, 4700 River Road, Unit 133, Riverdale, MD 20737-1236.

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, New York.

Natural Resources Board Order No. IS-34-06, Invasive Species Identification, Classification and Control. 2008. Wisconsin Department of Natural Resources, Madison, Wisconsin.

List of Specimens taken to be Suitable for Live Import. 1999. Environment Protection and Biodiversity Conservation Act 1999.