

NEW YORK TERRESTRIAL VERTEBRATE INVASIVENESS RANKING FORM

Scientific name: Cairina moschata
 Common names: Muscovy Duck
 Native distribution: Tropical America from Mexico S to E Peru and N Uruguay
 Date assessed: 7/1/2013
 Assessors: D. Adams
 Reviewers: _____
 Date Approved: _____ Form version date: 3 January 2013

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

Distribution and Invasiveness Rank (<i>Obtain from PRISM invasiveness ranking form</i>)		
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	Restricted	Not Assessed
6 Lower Hudson	Not Present	Not Assessed
7 Saint Lawrence/Eastern Lake Ontario	Not Present	Not Assessed
8 Western New York	Restricted	Not Assessed

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	30 (<u>30</u>)	17
2	Biological characteristic and dispersal ability	30 (<u>30</u>)	23
3	Ecological amplitude and distribution	30 (<u>30</u>)	14
4	Difficulty of control	10 (<u>10</u>)	5
	Outcome score	100 (<u>100</u>) ^b	59 ^a
	Relative maximum score [†]		59
	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 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 checked="" type="checkbox"/>	Long Island Invasive Species Management Area	
<input type="checkbox"/>	Lower Hudson	
<input type="checkbox"/>	Saint Lawrence/Eastern Lake Ontario	

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<input checked="" type="checkbox"/>	Western New York
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Documentation:
Sources of information:
Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

- A2.0. Is this species listed on the Federal Injurious Fish and Wildlife 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 and/ or Climatch score)

- | | |
|-------------------|--|
| Unlikely | Adirondack Park Invasive Program |
| Moderately Likely | Capital/Mohawk |
| Unlikely | 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):
Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

If the species does not occur and is not likely to survive and reproduce within 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)

Adirondack Park Invasive Program	Distribution
Capital/Mohawk	Not Present
Catskill Regional Invasive Species Partnership	Not Present
Finger Lakes	Not Present
Long Island Invasive Species Management Area	Restricted
Lower Hudson	Not Present
Saint Lawrence/Eastern Lake Ontario	Not Present
Western New York	Restricted

Documentation:
Sources of information:
Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

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.

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

Other potential or known suitable habitats within New York:
Well wooded tropical wetlands, preferably in lowlands, occasionally on coastal lagoons or marshes.

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Documentation:

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

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 geomorphological changes (erosion and sedimentation rates).

- 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, has a perceivable but mild influence 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)

Muscovies are often found in large numbers, particularly in the south, and produce a large quantity of droppings which can seriously degrade water quality and present a significant hazard to human health and pets.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

1.2. Impact on Natural Habitat

- A. No perceived impact; causes no apparent change in native habitat 0
- B. Influences natural habitat (e.g., reduces the stem density and height of one or more native species in core habitat) 3
- C. Significantly alters natural habitat (e.g., produces a notable reduction in the population size of one or more native species in core habitat) 7
- D. Causes major alteration in natural habitat (e.g., results in the extirpation of one or more native species, or changes the community composition in core habitat towards species exotic to the natural community) 10
- U. Unknown

Score

Documentation:

Identify type of impact or alteration:

Feeds on a mixture of vegetable and animal foods, roots, seeds, stems and leaves of grasses, sedges and aquatic plants, small vertebrates and invertebrates. The diet of feral Muscovies includes food provided by humans, aquatic vegetation, seeds, acords and invertebrates.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

1.3. Impact on other species or species groups, including cumulative impact of this species on other organisms in the community it invades (e.g., interferes with native predator/ prey dynamics; hybridizes with a native species; hosts a non-native disease which impacts a native species)

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- A. Negligible perceived impact 0
- B. Minor impact (e.g. 1 species, <20% population decline) 3
- C. Moderate impact (e.g. 2-3 species and/ or 20-29% population decline of any 1 species) 7
- D. Severe impact on other species or species groups (e.g. >3 species and/ or ≥30% population decline of any 1 species) 10
- U. Unknown

Score 7

Documentation:

Identify type of impact or alteration:

Domesticated ducks are often responsible for the spread of several serious diseases to native ducks and may also interbreed with native species.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

Total Possible 30
Section One Total 17

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

2.1. Mode and rate of reproduction

- A. No reproduction (e.g. sterile with no sexual or asexual reproduction) 0
- B. Limited reproduction (e.g. intrinsic rate of increase <10%/ year) 1
- C. Moderate reproduction (e.g. intrinsic rate of increase between 10-30%/ year) 2
- D. Abundant reproduction (e.g. intrinsic rate of increase >30%/ year) 4
- U. Unknown

Score 2

Documentation:

Describe key reproductive characteristics:

Feral Muscovies are often found in large flocks, populations expand rapidly in urban areas often becoming a nuisance. Can breed up to three times per year. Do not form stable pairs.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

2.2. Migratory behavior

- A. Always migratory in its native range 0
- B. Non-migratory or facultative migrant in its native range 2
- U. Unknown

Score 2

Documentation:

Describe migratory behavior:

Non-migratory species. Mainly sedentary, subject to local movements linked with water availability during the dry season, with occasional appearances outside normal breeding range.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

2.3. Biological potential for colonization by long-distance dispersal/ movement.

- A. No long-distance dispersal/ movement mechanisms 0
- A. Adaptations exist for long-distance dispersal, but studies report that most individuals (90%) establish territories within 10 miles of parent or within a distance twice the home range of the parent, and tend not to cross major barriers such as rivers and major roads 1

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- B. Adaptations exist for long-distance dispersal, movement and evidence that offspring often disperse greater than 10 miles of parent or greater than twice the home range of parent and will cross major barriers such as river and major roads 2
- U. Unknown

Score 1

Documentation:

Identify dispersal mechanisms:

Domestic variety less able to fly long distances than wild population.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

2.4. Practical potential to be spread by human activities, both directly and indirectly (possible vectors include: commercial sales, deliberate stocking, translocation, rehabilitation, pest control industry, agricultural escapes, pet abandonment and release, 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) 4
- U. Unknown

Score 2

Documentation:

Identify dispersal mechanisms:

Muscovies were intentionally released in the US as an ornamental species for aesthetic appeal.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

2.5. Non-living chemical and physical characteristics that increase competitive advantage (e.g., tolerance to various extremes, pH, temperature, fill vacant niche, charismatic species)

- A. Possesses no characteristics that increase competitive advantage 0
- B. Possesses one characteristic that increases competitive advantage 4
- C. Possesses two or more characteristics that increase competitive advantage 8
- U. Unknown

Score 8

Documentation:

Evidence of competitive ability:

Large duck. Aesthetic appeal.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

2.6. Biological characteristics that increase competitive advantage (e.g., high fecundity, generalist, highly evolved defense mechanisms, behavioral adaptations)

- A. Possesses no characteristics that increase competitive advantage 0
- B. Possesses one characteristic that increases competitive advantage 4
- C. Possesses two or more characteristics that increase competitive advantage 8

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U. Unknown

Score

8

Documentation:

Evidence of competitive ability:

Adapted well to cooler climates. Feral populations found in large numbers.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

2.7. Other species in the family and/ or genus invasive in New York or elsewhere?

A. No 0

B. Yes 2

U. Unknown

Score

0

Documentation:

Identify species:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

Total Possible

30

Section Two Total

23

3. ECOLOGICAL AMPLITUDE AND DISTRIBUTION

3.1. Current introduced distribution of established populations in the northern latitudes of USA and southern latitude of Canada (e.g., between 35 and 55 degrees)

A. Not known from the northern US or southern Canada 0

B. Established as a non-native in 1 northern USA state and/or southern Canadian province 1

C. Established as a non-native in 2 or 3 northern USA states and/or southern Canadian provinces 2

D. Established as a non-native in 4 or more northern USA states and/or southern Canadian provinces, and/or categorized as a problem species (e.g., "Invasive") in 1 northern state or southern Canadian province 3

U. Unknown

Score

3

Documentation:

Identify states and provinces:

Muscovies are found in and around urban centers from New York southwest to Texas, and in Washington and California.

Sources of information:

- See known introduced range at www.usda.gov, and update with information from states and Canadian provinces.

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

3.2. Current introduced distribution of established populations 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

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U. Unknown

Score

Documentation:

Describe distribution:

Not known to be established.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

3.3. Number of known, or potential (each individual possessed by a vendor or consumer is a potential release), individual releases and/ or release events (propagule pressure)

- A. None 0
- B. Few releases (e.g., <10 annually) 2
- C. Regular, small scale releases (e.g., 10-99 annually) 4
- D. Multiple, large scale (e.g., ≥100 annually) 6
- U. Unknown

Score

Documentation:

Describe known or potential releases:

Common domestic species in urban regions of the country, especially in the south.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

3.4. Current introduced population density in northern USA and/ or southern Canada.

- A. No known populations established 0
- B. Low to moderate population density (e.g., ≤1/4 or < to 1/2 native population density) 1
- C. High or irruptive population density (e.g., ≥1/2 native population density) 2
- U. Unknown

Score

Documentation:

Describe population density:

Wild Muscovies live alone or in groups of 4-12, but feral Muscovies are often found in large flocks around lakes and parks. Populations in the NE are currently extremely limited.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

3.5. Number of habitats the species may invade

- A. Not known to invade any natural habitats 0
- B. Known to occur in 2/ 3 habitats, with at least 1/ 2 natural habitat(s) 2
- C. Known to occur in 4 or more habitats, with at least 3 natural habitats 3
- U. Unknown

Score

Documentation:

Identify type of habitats where it occurs and degree/type of impacts:

In their native habitats, wild Muscovies nest in tree cavities, however, feral Muscovies dig out shallow nests on the ground.

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Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

3.6. Role of anthropogenic (human related) features in establishment (e.g. buildings, roads, agricultural fields, etc)

- 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 3
- U. Unknown

Score

Documentation:

Identify anthropogenic features:

Larger groups found in urban parks.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

3.7. Climate in native range (e.g., med. to high, ≥ 5 , Climatch score; within 35 to 55 degree latitude; etc.)

- A. Native range does not include climates similar to New York 0
- B. Native range possibly includes climates similar to portions of New York 4
- C. Native range includes climates similar to those in New York 8
- U. Unknown

Score

Documentation:

Describe known climate similarities: Great Lakes and Long Island occurrences have been documented but no known feral populations in New York State currently.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

Total Possible
Section Three Total

4. DIFFICULTY OF CONTROL

4.1. Re-establishment potential, nearby propagule source, known vectors of re-introduction in vicinity (e.g. biological supplies, pets, game farms, zoos, shooting preserves, connecting corridors, mechanized transportation)

- A. No known vectors/ propagule source for re-establishment following removal 0
- B. Possible re-establishment from 1 vector/ propagule source following removal 1
- C. Likely to re-establish from 2-3 vectors/ propagule sources following removal 2
- D. Strong potential for re-establishment from 4 or more vectors/ propagule sources following removal 3
- U. Unknown

Score

Documentation:

Identify source/ vectors:

Introduced as an ornamental species.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

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4.2. Status of monitoring and/ or management protocols for species

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

Score

1

Documentation:

Describe protocols:

Standard breeding duck surveys are implemented annually.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

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

- A. Established resources are available including commercial and/ or research tools 0
- B. Monitoring resources may be available (e.g. partnerships, NGOs, etc) 1
- C. No known monitoring resources are available 2
- U. Unknown

Score

1

Documentation:

Describe resources:

State agency staff and cooperators implement breeding duck surveys yearly.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

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 population 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 population) 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 population) 3
- U. Unknown

Score

2

Documentation:

Identify types of control methods and time required:

Currently, feral population in the NE are extremely limited. In the southern US large feral populations have become established. In 2010 USFWS added the Muscovy Duck to the List of Migratory Birds, simultaneous to the listing the USFWS published a Control Order that allows for the removal or destruction of Muscovy Ducks, their nests and eggs anywhere outside their natural range without federal migratory bird permits.

Sources of information:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal; USFWS Q & A; University of Florida Fact Sheet.

Total Possible

10

Section Four Total

5

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Total for 4 sections Possible	100
Total for 4 sections	59

C. STATUS OF GENETIC VARIANTS AND HYBRIDS:

At the present time there is no protocol or criteria for assessing the invasiveness of genetic variants 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.

Genetic variants of the species known to exist: The species is divided into two subspecies domestic and wild.

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.

Hybrids of uncertain origin known to exist: Hybridizes with domestic waterfowl. In captivity can be crossed with Mallards.

References for species assessment:

Handbook of the Birds of the World. 1992. Editors: Hoyo, Elliot and Sargatal.

Florida's Introduced Birds: Muscovy Duck. 2009. S. Johnson and M. Hawk, University of Florida IFAS Extension.

Muscovy Duck and the Migratory Bird Treaty Act: Q & A. 2010. US Fish and Wildlife Service.

Citation: The New York Terrestrial Vertebrate 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 Vertebrate 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

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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 at Albany and Plattsburgh; and Cary Institute of Ecosystem Studies. Those organizations listed with an asterisk comprised the Terrestrial Vertebrate Working Group.

References for ranking form:

Bomford, M. 2008. Risk Assessment Models for Establishment of Exotic Vertebrates in Australia and New Zealand. Invasive Animals Cooperative Research Centre, Canberra.

Broken Screens: The Regulation of Live Animal Imports in the United States. 2007. Defenders of Wildlife, Washington, DC.

Cooperative Prevention of Invasive Wildlife Introduction in Florida. 2008. The Environmental Law Institute, Washington, DC.

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.

Preventing Biological Invasions: Best Practices in Pre-Import Risk Screening for Species of Live Animals in International Trade. 2008. Convention of Biological Diversity, Global Invasive Species Programme and Invasive Species Specialist Group of IUCN's Species Survival Commission. University of Notre Dame, Indiana.

Standard Methodology to Assess the Risks From Non-native Species Considered Possible Problems to the Environment. 2005. DEFRA.

Witmer, G., W. Pitt and K. Fagerstone. 2007. Managing Vertebrate Invasive Species. USDA National Wildlife Research Center Symposia, Fort Collins, Colorado.