# NEW YORK
# FISH & AQUATIC INVERTEBRATE INVASIVENESS RANKING FORM

| | |
|---|---|
| Scientific name: | Sander lucioperca |
| Common names: | Zander, Pike-perch |
| Native distribution: | Continental Europe to western Siberia |
| Date assessed: | 7/12/2013 |
| Assessors: | Erin L. White |
| Reviewers: | |
| Date Approved: | Form version date: 3 January 2013 |

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

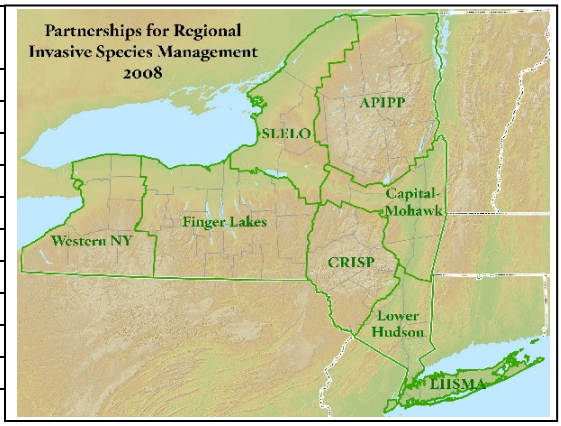
| **Distribution and Invasiveness Rank (***Obtain from PRISM invasiveness ranking form*) | | | |
|---|---|---|---|
| | Status of this species in each PRISM: | Current Distribution | PRISM Invasiveness Rank |
| 1 | Adirondack Park Invasive Program | Not Assessed | Not Assessed |
| 2 | Capital/Mohawk | 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 | Not Assessed | Not Assessed |
| 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 | 30 (30) | 21 |
| 2 | Biological characteristic and dispersal ability | 30 (30) | 18 |
| 3 | Ecological amplitude and distribution | 30 (30) | 16 |
| 4 | Difficulty of control | 10 (10) | 5 |
| | Outcome score | 100 (/100)[b] | 60[a] |
| | Relative maximum score † | | 60 |
| | 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) | |
|---|---|
| ☐ | Yes – continue to A1.2 |
| ☒ | No – continue to A2.1; Yes ☒ NA; Yes ☒ USA |
| 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:
(U.S. Geological Survey 2013)

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)

| | |
|---|---|
| Not Assessed | 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 |

Documentation:
Sources of information (e.g.: distribution models, literature, expert opinions):
If introduced in New York, the climate in all prisms is a 90% match with the climate in its native range, making it very likely to persist. However, the likelihood that the species will occur (be introduced) to NY is unknown.

***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*)

| | 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:

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 |
|---|---|---|
| ☐ Marine | ☐ Salt/brackish marshes | ☐ Cultivated* |
| ☒ Salt/ brackish waters | ☐ Freshwater marshes | ☐ Grasslands/old fields |
| ☒ Freshwater tidal | ☐ Peatlands | ☐ Shrublands |
| ☒ Rivers/streams | ☐ Shrub swamps | ☐ Forests/woodlands |
| ☒ Natural lakes and ponds | ☐ Forested wetlands/riparian | ☐ Alpine |
| ☐ Vernal pools | ☐ Ditches* | ☐ Roadsides* |
| ☐ Reservoirs/ impoundments* | ☐ Beaches/or coastal dunes | ☐ Cultural* |

Other potential or known suitable habitats within New York:

Documentation:

Sources of information:
(Kottelat and Freyhof 2007, Froese and Pauly 2013)

**B. INVASIVENESS RANKING**

*1. ECOLOGICAL IMPACT*

1.1. Impact on Ecosystem Processes and System-wide Parameters (e.g., water cycle, 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 7

Documentation:
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)
It may be presumed that this species has an impact on the energy and nutrient cycles of aquatic systems since it is a top predator and has been stocked to control smaller fish abundance in other countries (Popova & Sytina 1977).
Sources of information:
(Popova & Sytina 1977)

1.2. Impact on Natural Habitat/ 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 of 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 7

Documentation:
Identify type of impact or alteration:
S. lucioperca has been stocked in other countries to control small fish abundance. The outcome of such stocking has been described as either reducing native fish populations (prey) and in some cases "annihilating" them (Popova & Sytina 1977). Stocking of this species has also been shown to have an effect on other native piscivorous fish populations (Schulze et al. 2006).
Sources of information:
(Popova and Sytina 1977, Schulze et al. 2006)

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; injurious components/ spines; reduction in spawning; hybridizes with a native species; hosts a non-native disease which impacts a native species)

| | | |
|---|---|---|
| A. | Negligible perceived impact | 0 |

| | | |
|---|---|---|
| B. | Minor impact (e.g. impacts 1 species, <20% population decline, limited host damage) | 3 |
| C. | Moderate impact (e.g. impacts 2-3 species and/ or 20-29% population decline of any 1 species, kills host in 2-5 years, ,) | 7 |
| D. | Severe impact on other species or species groups (e.g. impacts >3 species and/ or ≥30% population decline of any 1 species, kills host within 2 years, extirpation) | 10 |
| U. | Unknown | |

Score: 7

Documentation:
Identify type of impact or alteration:
Zander does appear to have an impact on native predator/prey dynamics, affecting other top predator populations and behavior as well as prey populations (Popova and Sytina 1977, Schulze et al. 2006). Native fish species have been adversely affected by the introduction of zander and in some cases have been extirpated locally (Larsen and Berg 2013). Zander is one of many possible species that is host to a non-native parasite in Europe, Anguillicola crassus (Rolbiecki 2003).
Sources of information:
(Popova and Sytina 1977, Rolbiecki 2003, Schulze et al. 2006, Larsen and Berg 2013)

Total Possible: 30
Section One Total: 21

*2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY*

2.1. Mode and rate of reproduction (provisional thresholds, more investigation needed)

| | | |
|---|---|---|
| A. | No reproduction (e.g. sterile with no sexual or asexual reproduction). | 0 |
| B. | Limited reproduction (e.g., intrinsic rate of increase <10%, low fecundity, complete one life cycle) | 1 |
| C. | Moderate reproduction (e.g., intrinsic rate of increase between 10-30%, moderate fecundity, complete 2-3 life cycles) | 2 |
| D. | Abundant reproduction (e.g., intrinsic rate of increase >30%, parthenogenesis, large egg masses, complete > 3 life cycles) | 4 |
| U. | Unknown | |

Score: 1

Documentation:
Describe key reproductive characteristics:
S. lucioperca migrate to freshwater habitats to spawn (Kottelat and Freyhof 2007), are external fertilizers, and males care for nests by defending them and fanning eggs (Sokolov and Berdicheskii 1989).
Sources of information:
(Sokolov and Berdicheskii 1989, Kottelat and Freyhof 2007, U.S. Fish and Wildlife Service 2012, Froese and Pauly 2013)

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: 0

Documentation:
Describe migratory behavior:
S. lucioperca migrate to freshwater habitats to spawn (Kottelat and Freyhof 2007).
Sources of information:
(Kottelat and Freyhof 2007, U.S. Fish and Wildlife Service 2012)

2.3. Biological potential for colonization by long-distance dispersal/ movement (e.g., veligers, resting stage eggs, glochidia)

| | | |
|---|---|---|
| A. | No long-distance dispersal/ movement mechanisms | 0 |
| B. | Adaptations exist for long-distance dispersal, but studies report that most individuals (90%) establish territories within 5 miles of natal origin or within a distance twice the home range of the typical individual, and tend not to cross major barriers such as dams and watershed divides | 1 |
| C. | Adaptations exist for long-distance dispersal, movement and evidence that offspring often disperse greater than 5 miles of natal origin or greater than twice the home range of typical individual and will cross major barriers such as dams and watershed divides | 2 |
| U. | Unknown | |

Score 2

Documentation:
Identify dispersal mechanisms:
There is great potential for long-distance dispersal of S. lucioperca, as this species typically migrates 6-18 miles for spawning (Larsen and Berg 2013), with the greatest distance recorded as 250 km (155 miles, USFWS 2012). Adults appear to exhibit homing behavior, but it is unknown if adults were born in the same habitats where they spawn (Lappalainen et al. 2003).
Sources of information:
(Lappalainen et al. 2003, U.S. Fish and Wildlife Service 2012, Larsen and Berg 2013)

2.4. Practical potential to be spread by human activities, both directly and indirectly – possible vectors include: commercial bait sales, deliberate illegal stocking, aquaria releases, boat trailers, canals, ballast water exchange, live food trade, rehabilitation, pest control industry, aquaculture escapes, 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 1

Documentation:
Identify dispersal mechanisms:
There appears to be low potential in the U.S. for human dispersal of this species, as it is currently known only in North Dakota. However, introduction by individuals is possible as this species is stocked in other countries for sport fishing. There are no known populations or stocking activities in NY currently.
Sources of information:
(Lappalainen et al. 2003, Fuller 2013)

2.5. Non-living chemical and physical characteristics that increase competitive advantage (e.g., tolerance to various extremes, pH, DO, temperature, desiccation, 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:
Zander has a tolerance for salinity and is known from both freshwater and brackish coastal

waters as well as lentic and lotic habitats and can be found systems of varying water quality.
Sources of information:
(Poulet et al. 2004, Larsen and Berg 2013)

2.6. Biological characteristics that increase competitive advantage (e.g., high fecundity, generalist/ broad niche space, highly evolved defense mechanisms, behavioral adaptations, piscivorous, etc.)

| | | |
|---|---|---|
| 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: 4

Documentation:
Evidence of competitive ability:
S. lucioperca has been described as having high fecundity and is piscivorous, a top predator in aquatic systems it inhabits, known to adversely affect native fish behaviors and populations.
Sources of information:
(Poulet et al. 2004, Fuller 2013, Larsen and Berg 2013)

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: 2

Documentation:
Identify species:
Sander canadensis, Sander canadensis x vitreus, Sander vitreus in the same genus and 30 species are invasive in the family Percidae

Total Possible: 30
Section Two Total: 18

*3. ECOLOGICAL AMPLITUDE AND DISTRIBUTION*

3.1. Current introduced distribution 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: 1

Documentation:
Identify states and provinces:
North Dakota
Sources of information:
- See known introduced range at www.usda.gov, and update with information from states and Canadian provinces.

(Fuller 2013)

3.2. 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 0

Documentation:
Describe distribution:

Sources of information:
(The Nature Conservancy 2013, U.S. Geological Survey 2013)

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

| | | |
|---|---|---|
| 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 0

Documentation:
Describe known or potential releases:
No known releases in NY.
Sources of information:
(The Nature Conservancy 2013, U.S. Geological Survey 2013)

3.4. Current introduced population density, or distance to known occurrence, in northern USA and/ or southern Canada.

| | | |
|---|---|---|
| A. | No known populations established. | 0 |
| B. | Low to moderate population density (e.g., ≤1/4 to < 1/2 native population density) with few other invasives present and/ or documented in 1 or more non-adjacent state/ province and/ or 1 unconnected waterbody. | 1 |
| C. | High or irruptive population density (e.g., ≥1/2 native population density) with numerous other invasives present and/ or documented in 1 or more adjacent state/ province and/ or 1 connected waterbody. | 2 |
| U. | Unknown | |

Score 1

Documentation:
Describe population density:

Sources of information:
(U.S. Geological Survey 2013)

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 or 2 natural habitat(s). | 2 |
| C. | Known to occur in 4 or more of the habitats given at A2.3, with at least 3 natural habitats. | 3 |

U. Unknown.

Score 3

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
In other countries, the species has been introduced in lake habitats, but has invaded other habitat types through dispersal. There are four potential natural habitat types where this species could invade.
Sources of information:
(Kottelat and Freyhof 2007, Froese and Pauly 2013, Larsen and Berg 2013)

3.6. Role of anthropogenic (human related) and natural disturbance in establishment (e.g. water level management, man-made structures, high vehicle traffic, major storm events, 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 3

Documentation:
Identify type of disturbance:

Sources of information:

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 (e.g., <10%). 0
B. Native range possibly includes climates similar to portions of New York (e.g., 10-29%). 4
C. Native range includes climates similar to those in New York (e.g., ≥30%). 8
U. Unknown.

Score 8

Documentation:
Describe known climate similarities:
90% of NY stations are >5 on Climatch
Sources of information:
(Austrailian Department of Agriculture, Fisheries, and Forestry (ADAFF) 2013)

Total Possible 30
Section Three Total 16

*4. DIFFICULTY OF CONTROL*

4.1. Re-establishment potential, nearby propagule source, known vectors of re-introduction (e.g. biological supplies, pets, aquaria, aquaculture facilities, connecting waters/ corridors, mechanized transportation, live wells, etc.)

A. No known vectors/ propagule source for re-establishment following removal. 0
B. Possible re-establishment from 1 vector/ propagule source following removal and/ or viable <24 hours. 1
C. Likely to re-establish from 2-3 vectors/ propagule sources following removal and/ or viable 2-7 days. 2
D. Strong potential for re-establishment from 4 or more vectors/ propagule sources following removal and/or viable >7 days. 3
U. Unknown.

Score 1

Documentation:
Identify source/ vectors:
Stocking and aquatic connectivity are the known vectors for re-establishment; however, there are no existing introductions of this species in or connected to NY. If it did become established, these would be potential vectors.
Sources of information:
(Fuller 2013, Larsen and Berg 2013)

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:
This species is stocked as a sport fish in other countries and has become a nuisance species in those areas.
Sources of information:
(Larsen and Berg 2013)

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 0

Documentation:
Describe resources:
Zander is stocked as a sport fish in other countries and has become a nuisance species in those areas. There have been numerous studies done on the effects of this top predator on prey fish species and it has been used as a biocontrol on smaller fish populations. There is recognition that this species can decimate native fish populations in some habitats where it has been introduced and it can spread on its own through migration and dispersal capabilities to new habitats. Larsen and Berg (2013) summarize management recommendations existing for other countries for Zander, or pikeperch as it is known in Europe.
Sources of information:
(U.S. Fish and Wildlife Service 2012, Fuller 2013, Larsen and Berg 2013)

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 | 3 |

Documentation:
Identify types of control methods and time required:
Zander can establish self-reproducing populations in habitats and connecting waters where it has been introduced. Management recommendations focus on prevention from introductions to new areas. If already established, control appears difficult with eradication presumably requiring several years and a lot of effort. Smith et al. (1996) recognized the difficulty of culling all Zander from a habitat and suggested a more cost-effective method of intensive culling of the largest size class, but this procedure would presumably need monitoring and repetition in the habitats where it is performed.
Sources of information:
(Smith et al. 1996, Fuller 2013, Larsen and Berg 2013)

| | |
|---|---|
| Total Possible | 10 |
| Section Four Total | 5 |
| **Total for 4 sections Possible** | 100 |
| **Total for 4 sections** | 60 |

**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:

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:

**References for species assessment:**

Austrailian Department of Agriculture, Fisheries, and Forestry (ADAFF). 2013. Climatch Mapping Tool [Online]. Available: http://adl.brs.gov.au:8080/Climatch/. [Accessed: 23-Jan-2013].

Froese, R., and D. Pauly. 2013. Fishbase [Online]. Available: www.fishbase.org. [Accessed: 02-Jul-2013].

Fuller, P. 2013. Sander lucioperca. USGS Nonindigenous Aquatic Species Database, Gainesville, FL. [Online]. Available: http://nas.er.usgs.gov/queries/FactSheet.aspx?SpeciesID=830. [Accessed: 09-Jul-2013].

Kottelat, M., and J. Freyhof. 2007. Handbook of European freshwater fishes. Kottelat, Cornol, Switzerland.

Lappalainen, J., H. Dörner, and K. Wysujack. 2003. Reproduction biology of pikeperch (Sander lucioperca (L.))–a review. Ecology of Freshwater Fish 12:95–106.

Larsen, L. K., and S. Berg. 2013. NOBANIS - Invasive Alien Species Fact Sheet: Sander lucioperca. – From: Online Database of the North European and Baltic Network [Online]. Available: http://www.nobanis.org/files/factsheets/Sander_lucioperca.pdf. [Accessed: 09-Jul-2013].

Popova, O., and L. Sytina. 1977. Food and feeding relations of Eurasian perch (Perca fluviatilis) and pikeperch (Stizostedion lucioperca) in various waters of the USSR. Journal of the Fisheries Board of Canada 34:1559–1570.

Poulet, N., P. Berrebi, A. J. Crivelli, S. Lek, and C. Argillier. 2004. Genetic and morphometric variations in the pikeperch (Sander lucioperca L.) of a fragmented delta. Archiv für Hydrobiologie 159:531–554.

Rolbiecki, L. 2003. On the role of paratenic hosts in the life cycle of the nematode Anguillicola crassus in the Vistula Lagoon, Poland. Acta Ichthyologica et Piscatoria 32.

Schulze, T., U. Baade, H. Dörner, R. Eckmann, S. S. Haertel-Borer, F. Hölker, and T. Mehner. 2006. Response of the residential piscivorous fish community to introduction of a new predator type in a mesotrophic lake. Canadian Journal of Fisheries and Aquatic Sciences 63:2202–2212.

Smith, P. A., R. T. Leah, and J. W. Eaton. 1996. Removal of pikeperch (Stizostedion lucioperca) from a British Canal as a management technique to reduce impact on prey fish populations. Annales Zoologici Fennici 33:537–545. Helsinki: Suomen Biologian Seura Vanamo, 1964-.

Sokolov, L. I., and L. S. Berdicheskii. 1989. Acipenseridae. p. 150-153. In J. Holcík (ed.) The freshwater fishes of Europe. Vol. 1, Part II. General introduction to fishes Acipenseriformes. AULA-Verlag Wiesbaden.

The Nature Conservancy. 2013. iMapInvasives: An Online Mapping Tool for Invasive Species Locations [Online]. Available: iMapInvasives.org. [Accessed: 03-Jan-2013].

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**Citation:** The New York Fish & Aquatic 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 Fish and Aquatic 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 at Albany and Plattsburgh*; and Cary Institute of Ecosystem Studies. Those organizations listed with an asterisk comprised the Fish and Aquatic Invertebrate Working Group.

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