

NEW YORK

NON-NATIVE PLANT INVASIVENESS RANKING FORM

Scientific name: Carex kobomugi/C. macrocephala USDA Plants Code: CAKO2/CAMA10
 Common names: Japanese sedge/largehead sedge
 Native distribution: Eastern Asia
 Date assessed: 21 January 2009
 Assessors: Steve Glenn, Gerry Moore
 Reviewers: LIISMA SRC
 Date Approved: 28 Jan 2009 Form version date: 22 October 2008

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 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	Unknown	Moderate
6 Lower Hudson	Not Assessed	Not Assessed
7 Saint Lawrence/Eastern Lake Ontario	Not Assessed	Not Assessed
8 Western New York	Not Assessed	Not Assessed

Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (<u>30</u>)	21
2	Biological characteristic and dispersal ability	25 (<u>25</u>)	17
3	Ecological amplitude and distribution	25 (<u>21</u>)	13
4	Difficulty of control	10 (<u>10</u>)	8
	Outcome score	100 (<u>86</u>) ^b	59 ^a
	Relative maximum score †		68.60
	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 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	
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:

Carex kobomugi reported from NY state per Flora of North America Editorial Committee, 2002, but no specific PRISM cited; reported from NJ (Monmouth & Ocean Cos.) per Small, 1954; Stalter, 1980; Wootton et al., 2005; Wootton, 2007. Carex macrocephala recently reported from Monmouth Co., NJ (Wootton, 2007) but not NY. Recently seen by author (Moore) in Monmouth and Ocean Cos.

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

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

Documentation:

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

Rhizomes of these species could be transported along offshore currents during storm tide events. Also theorized that the seeds of C. kobomugi are salt water tolerant and could be carried away by ocean currents to new locations. Both species documented from nearby Monmouth and Ocean Cos., NJ. In addition, the Long Island PRISM has numerous suitable habitats. Stalter, 1980; Oliver, 2007; Wootton, 2007.

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

Documentation:

Sources of information:

Flora of North America Editorial Committee, 2002; Weldy & Werier, 2008; Brooklyn Botanic Garden, 2009; authors' pers. obs.

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"/> 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 type="checkbox"/> Salt/brackish marshes <input type="checkbox"/> Freshwater marshes <input type="checkbox"/> Peatlands <input type="checkbox"/> Shrub swamps <input type="checkbox"/> Forested wetlands/riparian <input type="checkbox"/> Ditches* <input checked="" type="checkbox"/> Beaches and/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*
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Other potential or known suitable habitats within New York:

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Documentation:

Sources of information:

Small, 1954; Stalter, 1980; Flora of North America Editorial Committee. 2002; Oliver, 2007; Wootton, 2007; authors' pers. obs.

B. INVASIVENESS RANKING

1. ECOLOGICAL IMPACT

1.1. Impact on Natural Ecosystem Processes and System-Wide Parameters (e.g. fire regime, geomorphological changes (erosion, sedimentation rates), hydrologic regime, nutrient and mineral dynamics, light availability, salinity, pH)

- A. No perceivable impact on ecosystem processes based on research studies, or the absence of impact information if a species is widespread (>10 occurrences in minimally managed areas), has been well-studied (>10 reports/publications), and has been present in the northeast for >100 years. 0
- B. Influences ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability) 3
- C. Significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, reduces open water that are important to waterfowl) 7
- D. Major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology and/or hydrology, affects fire frequency, alters soil pH, or fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species) 10
- U. Unknown

Score

U

Documentation:

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

Oliver, 2007: "It is difficult to assess the abiotic impact this species has on dune environments given that other native species perform the same dune-stabilizing function." Virginia Native Plant Society suggested that "...when this sedge is present on the dunes, the dunes are vulnerable to shifting sands and blowouts" (Oliver 2007). However the given citation (Small, 1954) does not support this.

Sources of information:

Lea & McGlaughlin, 2003; Oliver, 2007.

1.2. Impact on Natural Community Structure

- A. No perceived impact; establishes in an existing layer without influencing its structure 0
- B. Influences structure in one layer (e.g., changes the density of one layer) 3
- C. Significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) 7
- D. Major alteration of structure (e.g., covers canopy, eradicating most or all layers below) 10
- U. Unknown

Score

7

Documentation:

Identify type of impact or alteration:

In studies of New Jersey populations, *Carex kobomugi* formed dense mats- maximum shoot densities reaching over 500 per square meter. *Carex macrocephala* was found to have less density (maximum stem densities rarely exceeding 40 per square meter) and impact on

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communities where it grows; although this was caveated by the possibility of population age-dependant growth patterns. No evidence of creation of a new layer or elimination of an existing layer, but significant increase in the density in the otherwise sparse density of the herb layer of the dunes.

Sources of information:
Wootton et al., 2005; Wootton, 2007.

1.3. Impact on Natural Community Composition

- | | | |
|----|---|----|
| A. | No perceived impact; causes no apparent change in native populations | 0 |
| B. | Influences community composition (e.g., reduces the number of individuals in one or more native species in the community) | 3 |
| C. | Significantly alters community composition (e.g., produces a significant reduction in the population size of one or more native species in the community) | 7 |
| D. | Causes major alteration in community composition (e.g., results in the extirpation of one or several native species, reducing biodiversity or change the community composition towards species exotic to the natural community) | 10 |
| U. | Unknown | |

Score

7

Documentation:

Identify type of impact or alteration:
In areas where *Carex kobomugi* was sampled native species diversity was significantly reduced; no evidence for extirpation of native species
Sources of information:
Wootton et al., 2005; Oliver, 2007; Wootton, 2007.

1.4. Impact on other species or species groups (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades.

Examples include reduction in nesting/foraging sites; reduction in habitat connectivity; injurious components such as spines, thorns, burrs, toxins; suppresses soil/sediment microflora; interferes with native pollinators and/or pollination of a native species; hybridizes with a native species; hosts a non-native disease which impacts a native species)

- | | | |
|----|--|----|
| A. | Negligible perceived impact | 0 |
| B. | Minor impact | 3 |
| C. | Moderate impact | 7 |
| D. | Severe impact on other species or species groups | 10 |
| U. | Unknown | |

Score

7

Documentation:

Identify type of impact or alteration:
Possibly threatening rare or endangered species such as piping plovers, beach tiger beetles, and sea beach amaranth due to direct competition or reduction of habitat or food availability.
Sources of information:
Wootton et al., 2005.

Total Possible	<table border="1" style="width: 100%;"><tr><td style="text-align: center;">30</td></tr></table>	30
30		
Section One Total	<table border="1" style="width: 100%;"><tr><td style="text-align: center;">21</td></tr></table>	21
21		

2. BIOLOGICAL CHARACTERISTICS AND DISPERSAL ABILITY

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

- | | | |
|----|--|---|
| A. | No reproduction by seeds or vegetative propagules (i.e. plant sterile with no sexual or asexual reproduction). | 0 |
|----|--|---|

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- B. Limited reproduction (fewer than 10 viable seeds per plant AND no vegetative reproduction; if viability is not known, then maximum seed production is less than 100 seeds per plant and no vegetative reproduction) 1
- C. Moderate reproduction (fewer than 100 viable seeds per plant - if viability is not known, then maximum seed production is less than 1000 seeds per plant - OR limited successful vegetative spread documented) 2
- D. Abundant reproduction with vegetative asexual spread documented as one of the plants prime reproductive means OR more than 100 viable seeds per plant (if viability is not known, then maximum seed production reported to be greater than 1000 seeds per plant.) 4
- U. Unknown

Score

Documentation:

Describe key reproductive characteristics (including seeds per plant):

Moderate seed production (less than one thousand per plant) , but abundant vegetative spread via rhizomes.

Sources of information:

Small, 1954; Oliver, 2007.

2.2. Innate potential for long-distance dispersal (e.g. bird dispersal, sticks to animal hair, buoyant fruits, pappus for wind-dispersal)

- A. Does not occur (no long-distance dispersal mechanisms) 0
- B. Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations) 1
- C. Moderate opportunities for long-distance dispersal (adaptations exist for long-distance dispersal, but studies report that 95% of seeds land within 100 meters of the parent plant) 2
- D. Numerous opportunities for long-distance dispersal (adaptations exist for long-distance dispersal and evidence that many seeds disperse greater than 100 meters from the parent plant) 4
- U. Unknown

Score

Documentation:

Identify dispersal mechanisms:

Rhizomes of these species can be transported via offshore currents. Also theorized that the seeds of *C. kobomugi* are salt water tolerant and could be carried away by ocean currents to new locations.

Sources of information:

Stalter, 1980; Oliver, 2007; Wootton, 2007.

2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sales, use as forage/revegetation, spread along highways, transport on boats, contaminated compost, land and vegetation management equipment such as mowers and excavators, etc.)

- A. Does not occur 0
- B. Low (human dispersal to new areas occurs almost exclusively by direct means and is infrequent or inefficient) 1
- C. Moderate (human dispersal to new areas occurs by direct and indirect means to a moderate extent) 2
- D. High (opportunities for human dispersal to new areas by direct and indirect means are numerous, frequent, and successful) 3
- U. Unknown

Score

Documentation:

Identify dispersal mechanisms:

Possibly used as a packing material and subsequently escaping via shipwrecks (this disputed

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and alternately theorized to spread via ship ballast by Wootton, 2007) . *Carex kobomugi* was previously deliberately planted for dune stabilization, although this practice has now been discontinued.

Sources of information:

Flora of North America Editorial Committee, 2002; McGough et al., 2003; Oliver, 2007; Wootton, 2007.

2.4. Characteristics that increase competitive advantage, such as shade tolerance, ability to grow on infertile soils, perennial habit, fast growth, nitrogen fixation, allelopathy, etc.

- A. Possesses no characteristics that increase competitive advantage 0
- B. Possesses one characteristic that increases competitive advantage 3
- C. Possesses two or more characteristics that increase competitive advantage 6
- U. Unknown

Score

Documentation:

Evidence of competitive ability:

Perennial, tolerant of infertile soils. All *Carex* spp. are perennial (Flora of North America Editorial Committee, 2002). *Carex kobomugi* was found to be extremely tolerant to sandblasting by coastal winds (Yura & Ogura, 2006).

New Jersey appears to be one of the few places in the world where *C macrocephala* grows in close proximity to *C kobomugi*, suggesting the possibility of hybridization between these species in the future- hybrids have the potential to be more invasive than their parent species (Wootton, 2007).

Sources of information:

Flora of North America Editorial Committee, 2002; Yura & Ogura, 2006; Wootton, 2007.

2.5. Growth vigor

- A. Does not form thickets or have a climbing or smothering growth habit 0
- B. Has climbing or smothering growth habit, forms a dense layer above shorter vegetation, forms dense thickets, or forms a dense floating mat in aquatic systems where it smothers other vegetation or organisms 2
- U. Unknown

Score

Documentation:

Describe growth form:

Not reported to form thickets or have a climbing or smothering growth habit. In studies of New Jersey populations, *Carex kobomugi* formed maximum shoot densities reaching over 500 per square meter. *Carex macrocephala* was found to have less density (maximum stem densities rarely exceeding 40 per square meter) and less impact on communities where it grows; although this was caveated by the possibility of population age-dependant growth patterns.

Sources of information:

Wootton et al., 2005; Wootton, 2007.

2.6. Germination/Regeneration

- A. Requires open soil or water and disturbance for seed germination, or regeneration from vegetative propagules. 0
- B. Can germinate/regenerate in vegetated areas but in a narrow range or in special conditions 2
- C. Can germinate/regenerate in existing vegetation in a wide range of conditions 3
- U. Unknown (No studies have been completed)

Score

Documentation:

Describe germination requirements:

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One early study of a *C. kobomugi* NJ population found no germination (Small, 1954). Studies of *C. kobomugi* in its native range suggest that seed-coat impermeability and embryo immaturity are possible causes of the dormant state in seeds of *C. kobomugi*; more than 50% of the seeds of *C. kobomugi* germinated when they were scarified and stratified (Ishikawa et al., 1993).
Sources of information:
Small, 1954; Ishikawa et al., 1993.

2.7. Other species in the genus invasive in New York or elsewhere

- | | | |
|----|---------|---|
| A. | No | 0 |
| B. | Yes | 3 |
| U. | Unknown | |

Score 0

Documentation:

Species:
Several non-native species of *Carex* (e.g. *C. acutiformis*, *arenaria*, *caryophyllea*, *distans*, *divisa*, *divulsa*, *extensa*, *flacca*, *panicea*, *muricata*, *spicata*, *sylvatica*) have been reported as naturalized in the northeastern and mid-Atlantic United States, but none have been determined to be invasive (Flora of North America Editorial Committee, 2002; USDA, 2003).

Total Possible	25
Section Two Total	17

3. ECOLOGICAL AMPLITUDE AND DISTRIBUTION

3.1. Density of stands in natural areas in the northeastern USA and eastern Canada (use same definition as Gleason & Cronquist which is: "The part of the United States covered extends from the Atlantic Ocean west to the western boundaries of Minnesota, Iowa, northern Missouri, and southern Illinois, south to the southern boundaries of Virginia, Kentucky, and Illinois, and south to the Missouri River in Missouri. In Canada the area covered includes Nova Scotia, Prince Edward Island, New Brunswick, and parts of Quebec and Ontario lying south of the 47th parallel of latitude")

- | | | |
|----|--|---|
| A. | No large stands (no areas greater than 1/4 acre or 1000 square meters) | 0 |
| B. | Large dense stands present in areas with numerous invasive species already present or disturbed landscapes | 2 |
| C. | Large dense stands present in areas with few other invasive species present (i.e. ability to invade relatively pristine natural areas) | 4 |
| U. | Unknown | |

Score 4

Documentation:

Identify reason for selection, or evidence of weedy history:
Over 22 acres of *Carex kobomugi* populations were delineated in an 2005 Ocean Co., NJ study- an increase in area of 780% since 1985 - although individual patch sizes are not cited.
Sources of information:
Wootton et al., 2005; author's (Moore's) pers. obs..

3.2. Number of habitats the species may invade

- | | | |
|----|---|---|
| A. | Not known to invade any natural habitats given at A2.3 | 0 |
| B. | Known to occur in two or more of the habitats given at A2.3, with at least one a natural habitat. | 1 |
| C. | Known to occur in three or more of the habitats given at A2.3, with at least two a natural | 2 |

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- habitat.
- D. Known to occur in four or more of the habitats given at A2.3, with at least three a natural habitat. 4
- E. Known to occur in more than four of the habitats given at A2.3, with at least four a natural habitat. 6
- U. Unknown

Score

Documentation:

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

See A2.3.

Sources of information:

Small, 1954; Stalter, 1980; Flora of North America Editorial Committee, 2002; Oliver, 2007; Wootton, 2007

3.3. Role of disturbance in establishment

- A. Requires anthropogenic disturbances to establish. 0
- B. May occasionally establish in undisturbed areas but can readily establish in areas with natural or anthropogenic disturbances. 2
- C. Can establish independent of any known natural or anthropogenic disturbances. 4
- U. Unknown

Score

Documentation:

Identify type of disturbance:

These species native habitats - dunes and beaches- are inherently disturbed habitats. One study concluded that seed burial by sand was considered to be important for seedling establishment.

Sources of information:

Yamanaka et al., 2000.

3.4. Climate in native range

- A. Native range does not include climates similar to New York 0
- B. Native range possibly includes climates similar to at least part of New York. 1
- C. Native range includes climates similar to those in New York 3
- U. Unknown

Score

Documentation:

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

Japan, Korea, northern China, northeastern Russia.

Sources of information:

Flora of North America Editorial Committee, 2002; Oliver, 2007.

3.5. Current introduced distribution in the northeastern USA and eastern Canada (see question 3.1 for definition of geographic scope)

- A. Not known from the northeastern US and adjacent Canada 0
- B. Present as a non-native in one northeastern USA state and/or eastern Canadian province. 1
- C. Present as a non-native in 2 or 3 northeastern USA states and/or eastern Canadian provinces. 2
- D. Present as a non-native in 4–8 northeastern USA states and/or eastern Canadian provinces, and/or categorized as a problem weed (e.g., “Noxious” or “Invasive”) in 1 northeastern state or eastern Canadian province. 3
- E. Present as a non-native in >8 northeastern USA states and/or eastern Canadian provinces, and/or categorized as a problem weed (e.g., “Noxious” or “Invasive”) in 2 northeastern states or eastern Canadian provinces. 4
- U. Unknown

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Score

3

Documentation:

Identify states and provinces invaded:

DE, CT, MA, MD, NJ, NY, RI, VA

Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.

Flora of North America Editorial Committee, 2002; U.S.D.A., 2009.

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

- | | | |
|----|--|---|
| A. | Present in none of the PRISMs | 0 |
| B. | Present in 1 PRISM | 1 |
| C. | Present in 2 PRISMs | 2 |
| D. | Present in 3 PRISMs | 3 |
| E. | Present in more than 3 PRISMs or on the Federal noxious weed lists | 4 |
| U. | Unknown | |

Score

U

Documentation:

Describe distribution:

Carex kobomugi reported from NY state per Flora of North America Editorial Committee, 2002, but no specific PRISM cited; no NY records for C. macrocephala from Weldy & Werier, 2008 nor Brooklyn Botanic Garden, 2009.

Sources of information:

Flora of North America Editorial Committee, 2002; Weldy & Werier, 2008; Brooklyn Botanic Garden, 2009.

Total Possible	21
Section Three Total	13

4. DIFFICULTY OF CONTROL

4.1. Seed banks

- | | | |
|----|--|---|
| A. | Seeds (or vegetative propagules) remain viable in soil for less than 1 year, or does not make viable seeds or persistent propagules. | 0 |
| B. | Seeds (or vegetative propagules) remain viable in soil for at least 1 to 10 years | 2 |
| C. | Seeds (or vegetative propagules) remain viable in soil for more than 10 years | 3 |
| U. | Unknown | |

Score

2

Documentation:

Identify longevity of seed bank:

Found to form large seed banks in its native range. Evidence for viability longer than one year but not for greater than ten years.

Sources of information:

Yamanaka et al., 2000; Oliver, 2007.

4.2. Vegetative regeneration

- | | | |
|----|---|---|
| A. | No regrowth following removal of aboveground growth | 0 |
| B. | Regrowth from ground-level meristems | 1 |
| C. | Regrowth from extensive underground system | 2 |
| D. | Any plant part is a viable propagule | 3 |

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U. Unknown

Score

2

Documentation:

Describe vegetative response:
Rhizomes readily form new plants.
Sources of information:
Small, 1954; McGough et al., 2003.

4.3. Level of effort required

- | | | |
|----|---|---|
| A. | Management is not required: e.g., species does not persist without repeated anthropogenic disturbance. | 0 |
| B. | Management is relatively easy and inexpensive: e.g. 10 or fewer person-hours of manual effort (pulling, cutting and/or digging) can eradicate a 1 acre infestation in 1 year (infestation averages 50% cover or 1 plant/100 ft ²). | 2 |
| C. | Management requires a major short-term investment: e.g. 100 or fewer person-hours/year of manual effort, or up to 10 person-hours/year using mechanical equipment (chain saws, mowers, etc.) for 2-5 years to suppress a 1 acre infestation. Eradication is difficult, but possible (infestation as above). | 3 |
| D. | Management requires a major investment: e.g. more than 100 person-hours/year of manual effort, or more than 10 person hours/year using mechanical equipment, or the use of herbicide, grazing animals, fire, etc. for more than 5 years to suppress a 1 acre infestation. Eradication may be impossible (infestation as above). | 4 |
| U. | Unknown | |

Score

4

Documentation:

Identify types of control methods and time-term required:
Eradication of *Carex kobomugi* in North America has proven difficult. Mechanical means of removal using backhoes and sifters have met with partial success in small stands only. Care must be taken to remove all parts of the root system when digging, as any remaining rhizome parts are likely to grow into new plants. Removal of larger stands via application of chemicals (Roundup) to individual plants has been reported to be more successful. A minimum of two applications, along with spot treatments, are prescribed for complete eradication. Careful monitoring of the treated beds is also suggested, in order to spot any newly emergent plants. Ecological sensitivity (e.g., presence of endangered species) of the areas makes removal efforts difficult at times of the year.
Sources of information:
McGough et al., 2003; Wootton, 2007.

Total Possible	10
Section Four Total	8

Total for 4 sections Possible	86
Total for 4 sections	59

C. STATUS OF CULTIVARS AND HYBRIDS:

At the present time (May 2008) there is no protocol or criteria for assessing the invasiveness of cultivars independent of the species to which they belong. Such a protocol is needed, and individuals with the appropriate expertise should address this issue in the future. Such a protocol will likely require data on cultivar fertility and identification in both experimental and natural settings.

Hybrids (crosses between different parent species) should be assessed individually and separately from the parent species wherever taxonomically possible, since their invasiveness may differ from that of the parent species. An exception should be made if the taxonomy of the species and hybrids are uncertain,

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and species and hybrids can not be clearly distinguished in the field. In such cases it is not feasible to distinguish species and hybrids, and they can only be assessed as a single unit.

Some cultivars of the species known to be available:

References for species assessment:

Brooklyn Botanic Garden. 2009. AILANTHUS database. [Accessed on 21 January 2009].

Flora of North America Editorial Committee. 2002. Flora of North America. Volume 23. Cyperaceae. Oxford Univ. Press, New York. 608 pp.

Ishikawa, S. I., Furukawa, A., Okuda, T., & T. Oikawa. 1993. Germination requirements in *Carex kobomugi* (Sea Isle). *Journal of Plant Research*. 106(1083):245-248.

Lea, C. and G. McLaughlin. 2005. Factsheet: Asiatic sand sedge. *Carex kobomugi* Ohwi. Plant Conservation Alliance's Alien Plant Working Group. Weeds Gone Wild: Alien Plant Invaders of Natural Areas. <<http://www.nps.gov/plants.alien>> [Accessed 21 Jan. 2009.]

McGough, A., Bevaart, K., Ondreika, J., Patel, P., & L. Wootton. 2003. Effectiveness of low-impact management strategies for eradication of *Carex kobomugi* (Asian sand sedge) from dune communities within New Jersey's coastal parks. 5-page Extended Abstract. In: Coastal Zone 2003 Conference Proceedings.

Oliver, L. 2007. *Carex kobomugi*. U.S. Invasive Species Impact Rank (I-Rank). NatureServe Explorer. <www.natureserve.org>. [Accessed on 21 January 2009].

Small, J. A. 1954. *Carex Kobomugi* at Island Beach, New Jersey. *Ecology*. 35(2):289-291.

Stalter, R. 1980. *Carex kobomugi* Ohwi at Sandy Hook, New Jersey. *Bulletin of the Torrey Botanical Club*. 107(3):431-432.

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NEW YORK NON-NATIVE PLANT INVASIVENESS RANKING FORM

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