

NEW YORK NON-NATIVE PLANT INVASIVENESS RANKING FORM

Scientific name:	Phragmites australis ssp. australis	USDA Plants Code: PHAU7
Common names:	Common reed	
Native distribution:	Eurasia, Africa	
Date assessed:	January 21, 2009; edited June 5, 2009	
Assessors:	Gerry Moore	
Reviewers:	LIISMA SRC	
Date Approved:	28 January 2009	Form version date: 25 August 2008

New York Invasiveness Rank: Very High (Relative Maximum Score >80.00)

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


Invasiveness Ranking Summary (see details under appropriate sub-section)		Total (Total Answered*) Possible	Total
1	Ecological impact	40 (40)	37
2	Biological characteristic and dispersal ability	25 (25)	22
3	Ecological amplitude and distribution	25 (25)	25
4	Difficulty of control	10 (10)	8
	Outcome score	100 (100) ^b	92 ^a
	Relative maximum score †		92.00
	New York Invasiveness Rank §	Very High (Relative Maximum Score >80.00)	

* 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

<p>A1.1. Has this species been documented to persist without cultivation in NY? (reliable source; voucher not required)</p> <p><input checked="" type="checkbox"/> Yes – continue to A1.2</p> <p><input type="checkbox"/> No – continue to A2.1</p> <p>A1.2. In which PRISMs is it known (see inset map)?</p> <p><input checked="" type="checkbox"/> Adirondack Park Invasive Program</p> <p><input checked="" type="checkbox"/> Capital/Mohawk</p> <p><input checked="" type="checkbox"/> Catskill Regional Invasive Species Partnership</p> <p><input checked="" type="checkbox"/> Finger Lakes</p> <p><input checked="" type="checkbox"/> Long Island Invasive Species Management Area</p> <p><input checked="" type="checkbox"/> Lower Hudson</p> <p><input checked="" type="checkbox"/> Saint Lawrence/Eastern Lake Ontario</p> <p><input checked="" type="checkbox"/> Western New York</p>	 <p style="font-size: small;">Partnerships for Regional Invasive Species Management 2008</p>
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Documentation:

Sources of information:

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

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)

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):

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

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

Documentation:

Sources of information:

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2008.

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> <p><input type="checkbox"/> Salt/brackish waters</p> <p><input type="checkbox"/> Freshwater tidal</p> <p><input type="checkbox"/> Rivers/streams</p> <p><input type="checkbox"/> Natural lakes and ponds</p> <p><input type="checkbox"/> Vernal pools</p> <p><input type="checkbox"/> Reservoirs/impoundments*</p>	<p>Wetland Habitats</p> <p><input checked="" type="checkbox"/> Salt/brackish marshes</p> <p><input checked="" type="checkbox"/> Freshwater marshes</p> <p><input type="checkbox"/> Peatlands</p> <p><input checked="" type="checkbox"/> Shrub swamps</p> <p><input type="checkbox"/> Forested wetlands/riparian</p> <p><input checked="" type="checkbox"/> Ditches*</p> <p><input checked="" type="checkbox"/> Beaches and/or coastal dunes</p>	<p>Upland Habitats</p> <p><input checked="" type="checkbox"/> Cultivated*</p> <p><input type="checkbox"/> Grasslands/old fields</p> <p><input type="checkbox"/> Shrublands</p> <p><input type="checkbox"/> Forests/woodlands</p> <p><input type="checkbox"/> Alpine</p> <p><input checked="" type="checkbox"/> Roadsides*</p>
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Other potential or known suitable habitats within New York:

Documentation:

Sources of information:

Brooklyn Botanic Garden, 2008; LIISMA SRC pers. obs.

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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 7

Documentation:	
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)	
Stands increase the fire frequency in marshes due to the dry material that persists above ground. The extensive biomass produced by large stands increases the accretion of sediment and can lead to drying out of wetlands. Dense stands also limit light availability. Uncertain if changes are irreversible.	
Sources of information:	
Marks et al., 1971; Reimer, 1973; Lindsay, 2000; Hudon, 2004; Cordeiro, 2006; author's personal obs.	

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 10

Documentation:	
Identify type of impact or alteration:	
Stands can be incredibly dense eliminating all layers below.	
Sources of information:	
Roman et al., 1984; Lindsey 2000; Marks et al., 2001; Richburg et al., 2001; Hudon 2004; Cordeiro, 2006; author's personal obs.	

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

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- species exotic to the natural community)
U. Unknown

Score

10

Documentation:
Identify type of impact or alteration:
Stands can be so dense that they eradicate most or all native plant species formerly occurring in the area.
Sources of information:
Hauber, 1991; Chamber et al., 1999; Marks et al., 2001; Meyer et al., 2001; Cordeiro, 2006; author's personal obs.

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

10

Documentation:
Identify type of impact or alteration:
Can breed with the native *Phragmites australis* ssp. *americanus*. Indeed the native subspecies is rare in much of its range, including New York. More data are needed on degree of breeding between the native and non-native subspecies. *Phragmites* in general is viewed as providing less valuable wildlife habitat than the native plant species it displaces. It provided low quality habitats for larval and juvenile fish.
Sources of information:
Hauber, 1991; Marks et al., 2001; Meyer et al., 2001; author's pers. obs.

Total Possible

40

Section One Total

37

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
- 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

4

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Documentation: Describe key reproductive characteristics (including seeds per plant): Abundant seed production (100s of seeds per plants) and extensive vegetative spread. Sources of information: Alvarez et al., 2005; Hudon et a., 2005; Cordeiro, 2006; author's personal obs.	
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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 4

Documentation: Identify dispersal mechanisms: Species readily dispersed long distances along water corridors. Transport of seeds on animals is also possible. Seeds also are eaten by some birds. Rhizomes pieces can also be dispersed. Sources of information: Wilcox, 1989; Richburg et al., 2001; Farnsworth et al., 2003; Cordeiro, 2006; author's personal obs.	
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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 3

Documentation: Identify dispersal mechanisms: Small seeds can readily be transported by boats, railroads and other forms of travel through stands. Sources of information: Cordeiro, 2006; authors' personal obs.	
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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 6

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Documentation: Evidence of competitive ability: Perennial, ability to grow on poor soils; fast growing; secretes gallic acid, a potent phytotoxin. Sources of information: Cordeiro, 2006; Rudrappa et al. 2009; authors' personal obs.	
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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 2

Documentation: Describe growth form: Forms dense thickets. Sources of information: Cordeiro, 2006; authors' personal obs.	
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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 3

Documentation: Describe germination requirements: Plant will germinate in a wide range of conditions of existing conditions. Regeneration also occurs in a wide range of conditions. Can persist as small inconspicuous seedlings for 1-2 years until conditions become favorable. Sources of information: Ekstam & Forseby, 1999; Alvarez et al., 2005; Hudon et al., 2005; Cordeiro, 2006; author's personal obs.	
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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: No other invasive Phragmites in New York.	
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	Total Possible	25
	Section Two Total	22

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

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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

Documentation:
 Identify reason for selection, or evidence of weedy history:
 Forms large stands in marshes with few or no other invasives.
 Sources of information:
 Cordeiro, 2006; author's personal 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 habitat. 2
- 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:
 Brooklyn Botanic Garden, 2009.

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:
 Can establish in freshwater marshes that lack any appreciable disturbance. Readily establishes in disturbed marshes.
 Sources of information:
 Roman et al., 1984; Farensworth et al., 2003; Cordeiro, 2006; author's personal obs.

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

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Documentation:

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

Europe; temperate Asia.

Sources of information:

Brooklyn Botanic Garden, 2009.

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

Score

Documentation:

Identify states and provinces invaded:

In all states and provinces in the Northeast.

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

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

Documentation:

Describe distribution:

See A1.1

Sources of information:

Weldy & Werier, 2005; Brooklyn Botanic Garden, 2009.

Total Possible
Section Three Total

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

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- 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:
Seeds remain viable for longer than one year; evidence lacking for viability longer than 10 years; rhizomes can remain viable for up to six years.
Sources of information:
Cordeiro, 2006.

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
- U. Unknown

Score 2

Documentation:

Describe vegetative response:
Regrowth from extensive underground rhizome system.
Sources of information:
Cordeiro, 2006; author's personal obs.

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 ft²). 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:
Removal methods include burning, grazing, flooding, mechanical, and chemical. Removal of dense stands requires major investment of time -- more than 100 hours in a year and over 5 years of monitoring and re-removal due to seed bank and rhizomes.
Sources of information:
Osterborck, 1984; Cordeiro, 2006; author's personal obs.

Total Possible 10
Section Four Total 8

Total for 4 sections Possible 100
Total for 4 sections 92

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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, 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:

Ailstock, M. S., T. W. Suman and D. H. Williams. 1990. Environmental impacts, treatment, methodologies and mangement criteria for establishment of a statewide policy for the control of the marsh plant *Phragmites*; year two. Maryland Department of Natural Resources report. 27 pp. + appendices.

Alvarez, M.G., F. Tron, and A. Mauchamp. 2005. Sexual versus asexual colonization by *Phragmites australis*: 25-year reed dynamics in a Mediterranean marsh, southern France. *Wetlands*, 25(3): 639-647.

Amsberry, L., M.A. Baker, P.J. Ewanchuk, and M.D. Bertness. 2000. Clonal integration and the expansion of *Phragmites australis*. *Ecological Applications*, 10(4): 1110-1118.

Beall, D. L. 1984. Brigantine Division - Marsh vegetation rehabilitation - chemical control of phragmites. USFWS, 8 p.

Bjork, J. 1967. Ecological investigation of *Phragmites communis* -studies in theoretic and applied limnology. *Folia limnologica Scandinavica* 14. Lund, Sweden 248 pp.

Boar, R. R., C. E. Crook and B. Moss. 1989. Regression of *Phragmites australis* reed swamps and recent changes of water chemistry in the Norfolk Broadland, England. *Aquatic Botany* 35: 41-55.

Bongiorno, S. F., J. R. Trautman, T. J. Steinke, S. Kawa-Raymond and D. Warner. 1984. A study of restoration in Pine Creek Salt Marsh, Fairfield, Connecticut. In F. J. Webb (ed.) *Proceedings of the 11th Annual Conference in Wetlands Restoration and Creation*. Hillsborough Community College, Tampa, FL.

Boone, J., E. Furbish and K. Turner. 1987. Control of *Phragmites communis*: results of burning, cutting, and covering with plastic in a North Carolina marsh. CPSU technical report 41, National Park Service. 15 pp.

Brooklyn Botanic Garden. 2008. AILANTHUS database. [Accessed on January 21, 2009.]

Chambers, R.M., L.A. Meyerson, and K. Saltonstall. 1999. Expansion of *Phragmites australis* into tidal wetlands of North America. *Aquatic Botany*, 64: 261-273.

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- Cordeiro, J. 2006. *Phragmites australis*. U.S. Invasive Species Impact Rank (I-Rank). NatureServe Explorer. <www.natureserve.org>. [Accessed on Jan 21, 2009.]
- Cross, D. H. and K. L. Fleming. 1989. Control of *Phragmites* or common reed. U. S. Fish and Wildlife Leaflet 13.4.12. 5pp.
- Czarapata, E. J. 2005. Invasive Plants of the Upper Midwest. The University of Wisconsin Press. Madison, WI. 215 pp.
- Den, H., C.J. Kvet, and H. Sukopp. 1989. Reed. A common species in decline. *Aquatic Botany*, 35: 1-4.
- Ekstam, B. and A. Forseby. 1999. Germination response of *Phragmites australis* and *Typha latifolia* to diurnal fluctuations in temperature. *Seed Science Research*, 9(2): 157-163.
- Farnsworth, E.J. and L.A. Meyerson. 2003. Comparative ecophysiology of four wetland plant species along a continuum of invasiveness. *Wetlands*, 23(4): 750-762.
- Graneli, W. 1989. Influence of standing litter on shoot production in reed, *Phragmites australis* (Cav.) Trin. Ex Steudel. *Aquatic Botany* 35:99-109.
- Hanson, S.R., D.T. Osgood, and D.J. Yozzo. 2002. Nekton use of a *Phragmites australis* marsh on the Hudson River, New York, USA. *Wetlands*, 22(2): 326-337.
- Hara, T., J. van der Toorn and J. H. Mook. 1993. Growth dynamics and size structure of shoots of *Phragmites australis*, a clonal plant. *Journal of Ecology* 81:47-60.
- Haslam, S. M. 1968. The biology of reed (*Phragmites communis*) in relation to its control. Pp. 382-387 in Proceedings of the 9th BR. Weed Control Congress. pp. 382-387
- Haslam, S. M. 1970. The performance of *Phragmites communis* Trin. in relation to water supply. *Annals of Botany N. S.* 34:867-877.
- Haslam, S. M. 1971. Community regulation in *Phragmites communis* Trin. I. monodominant stands. *Journal of Ecology* 59:65-73.
- Haslam, S. M. 1971. The development and establishment of young plants of *Phragmites communis* Trin. *Annals of Botany N. S.* 35:1059-1072.
- Haslam, S. M. 1972. *Phragmites communis* Trin. biological flora of the British Isles. *Journal of Ecology*, 60: 585-610.
- Hauber, D.P., D.A. White, S.P. Powers, and F.R. DeFrancesch. 1991. Isozyme variation and correspondence with unusual infrared reflectance patterns in *Phragmites australis* (Poaceae). *Plant Systematics and Evolution*, 178: 1-8.
- Hayden, A. 1947. Notes on destructive factors operating among the emergent plants of the Ruthven area in the summer of 1947. Quarterly Report Iowa Cooperative Wildlife Research Unit. 44:331-343.
- Hellings, S.E. and J.L. Gallagher. 1992. The effects of salinity and flooding on *Phragmites australis*. *Journal of Applied Ecology*, 29: 41-49.

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- Hocking, P.J., C.M. Finlayson. and A.J. Chick. 1983. The biology of Australian weeds. 12. *Phragmites australis* (Cav.) Trin. ex Steud. *Journal of the Australian Institute of Agricultural Science*, 49: 123-132.
- Howard, R., D. G. Rhodes, J. W. Simmers. 1978. a review of the biology and potential control techniques for *Phragmites australis*. U. S. Army Engineer Waterway Experiment Station, Vicksburg, MS. 80 pp.
- Hudon, C. 2004. Shift in wetland composition and biomass following low-level episodes in the St. Lawrence River: looking into the future. *Canadian Journal of Fisheries and Aquatic Sciences*, 61: 603-617.
- Hudon, C., P. Gagnon, and M. Jean. 2005. Hydrological factors controlling the spread of common reed (*Phragmites australis*) in the St. Lawrence River (Quebec, Canada). *Ecoscience*, 12(3): 347-357.
- Jones, W. L., and W. C. Lehman. 1987. *Phragmites* control and revegetation following aerial applications of glyphosate in Delaware. In W. R. Whitman and W. H. Meredith (eds.). *Waterfowl and Wetlands Symposium*. Delaware Department of Natural Resources and Environmental Control, Dover, Delaware.
- Jontos, Robert Jr. and Christopher P. Allan. 1984. Test salt to control *Phragmites* in salt marsh restoration (Connecticut). *Restoration and Management Notes* 2(1):32.
- Kim, K. S., Y. S. Moon and C. K. Lim. 1985. Effect of NaCl on germination of *Atriplex gmelini* and *Phragmites communis* (in Korean with English abstract). *Korean Journal of Botany* 28:253-259.
- Lefor, M. W. 1993. Wetland biologist, University of Connecticut. Letter to John M. Randall. March 1993.
- Lehman, W. C. 1984. Project Benchmark. Ecological factors governing growth of phragmites and preliminary investigation of phragmites control with glyphosate. DE Div. of Fish and Wildlife. 30 pp.
- Lindsay, A., M.A. Baker, P.J. Ewanchuk, and M.D. Bertness. 2000. Clonal integration and the expansion of *Phragmites australis*. *Ecological Applications*, 10: 1110-1118.
- Lynch, J. J., T. O'Neill and D. E. Lay. 1947. Management and significance of damage by geese and muskrats to gulf coast marshes. *Journal of Wildlife Management* 11:50-76.
- Marks, M., B. Lapin, and J. Randall. 1994. *Phragmites australis* (*P. communis*): threats, management, and monitoring. *Natural Areas Journal*, 14(4): 285-294.
- Marks, M., B. Lapin, and J. Randall. 2001. Element stewardship abstract for *Phragmites australis*. The Nature Conservancy, Arlington, Virginia. unpaginated.
- Mason, H. L. 1969. A flora of the marshes of California. University of California Press, Berkeley. 878 pp.
- Matoh, T., N. Matsushita and E. Takahashi. 1988. Salt tolerance of the reed plant *Phragmites communis*. *Physiologia Planarum* 72:8-14.
- McKee, K. L., I. A. Mendelssohn, and D. M. Burdick. 1989. Effect of long-term flooding on root metabolic response in five freshwater marsh plant species. *Canadian Journal of Botany* 67:3446-3452.
- McNabb, C.D. and T.R. Batterson. 1991. Occurrence of the comon reed, *Phragmites australis*, along roadsides in lower Michigan. *Michigan Academician*, 23: 211-220.

NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM

- Metzler, K. and R. Rozsa. 1987. Additional notes on the tidal wetlands of the Connecticut River. Connecticut Botanical Society Newsletter, 15: 1-6.
- Meyer, D.L., J.M. Johnson, and J.W. Gill. 2001. Comparison of nekton use of *Phragmites australis* and *Spartina alterniflora* marshes in the Chesapeake Bay, USA. Marine Ecology- Progress Series, 209: 71-84.
- Mook, J. H. and J. Van der Toorn. 1982. The influence of environmental factors and management on stands of *Phragmites australis*. II. Effects on yield and its relationships with shoot density. J. Appl. Ecol. 19:501-517.
- Niering, W. A. and R. S. Warren. 1977. Our dynamic tidal marshes: vegetation changes as revealed by peat analysis. Connecticut Arboretum Bulletin 12. 22 pp.
- Norris, L., J.E. Perry, and K.J. Havens. 2002. A summary of methods for controlling *Phragmites australis*. Virginia Institute of Marine Science Wetlands Program Technical Report, 02-2: 1-8.
- Ostendorp, W. 1989. 'Die-back' of reeds in Europe - a critical review of literature. Aquatic Botany, 35: 5-26.
- Ostendorp, W. 1991. Damage by episodic flooding to *Phragmites* reeds in a prealpine lake: proposal of a model. Oecologia 86:119-124.
- Osterbrock, A. J. 1984. *Phragmites australis*. The problem and potential solutions. Ohio Field Office, Stewardship. 8 pp.
- Penko, J. M. 1985. Ecological studies of *Typha* in Minnesota: *Typha*-insect interactions, and the productivity of floating stands. M.S. Thesis, University of Minnesota.
- Penko, J. M. 1993. Ecologist, U. S. Army Corps of Engineers, Waltham, MA. Letter to John M. Randall. April 1993.
- Perry, J.E. and J.W. Stanhope. 2002. Site identification and recommendations for control of *Phragmites australis* on Colonial National Historic Park, Virginia, USA. Final report prepared for Colonial NHP, NPS, USDI, Yorktown, Virginia. 19 pp. + figs.
- Pintera, A. 1971. Some observations on mealy plum aphid, *Hyalopterus pruni* Geoffi, occurring on reeds. Hidrobiologia (Bucharest) 12:293-295.
- Pokorny, B. 1971. Flies of the genus *Lipara* meigen on common reed. Hidrobiologia (Bucharest) 12:287-292.
- Poole, J. 1985. Botanist, Texas Natural Heritage Program, The Nature Conservancy. Letter to Marianne Marks. March 1985.
- Raicu, P., S. Staicu, V. Stoian and T. Roman. 1972. *Phragmites communis* Trin. complement in the Danube Delta. Hidrobiologia 39:83-89
- Rawinski, T. 1985. Common reed (*Phragmites australis*) in a select group of New York/New England natural areas, an overview. Eastern Heritage Task Force, The Nature Conservancy. 6 pp.

NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM

- Reimer, D.N. 1973. Effects of rate, spray volume, and surfactant on the control of *Phragmites* with glyphosate. *Proceedings of the Northeast Weed Science Society*, 27: 101-104.
- Ricciuti, E. R. 1983. The all too common, common reed. *Audubon Magazine*. Sept. 1983. p. 65-66.
- Rice, D., J. Rooth, and J.C. Stevenson. 2000. Colonization and expansion of *Phragmites australis* in upper Chesapeake Bay tidal marshes. *Wetlands*, 20(2): 280-299.
- Rice, P.M. 2005. Fire as a tool for controlling nonnative invasive plants. Report prepared for Center for Invasive Plant Management. Bozeman, Montana. 52 pp. Available at:
<http://www.weedcenter.org/management/tools.htm#burning>.
- Richburg, J.A., W.A. Petterson III, and F. Lowenstein. 2001. Effects of road salt and *Phragmites australis* invasion on the vegetation of a western Massachusetts calcareous lake-basin fen. *Wetlands*, 21(2): 247-255.
- Rodewald-Rudescu, L. 1974. *Das Schilfrohr. Die Binnengewasser*, No. 27. E. Schweizerbart'sche Verlagbuchhanlung, Stuttgart, Germany. 294 pp.
- Roman, C.T., W.A. Niering, and R.S. Warren. 1984. Salt marsh vegetation change in response to tidal restriction. *Environmental Management*, 8: 141-150.
- Rudrappa, T., Y.S. Choi, D.F. Levia, D.R. Legates, K.H. Lee and H.P. Bais. *Phragmites australis* root secreted phytotoxin undergoes photo-degradation to execute severe phytotoxicity. *Plant Signaling & Behavior*, 2009; 4 (6): 506-513
- Saltonstall, K. 2002. Cryptic invasion by a non-native genotype of the common reed, *Phragmites australis*, into North America. *Proceedings of the National Academy of Science*, 99(4): 2445-2449.
- Saltonstall, K. 2003. A rapid method for identifying the origin of North American *Phragmites* populations using RFLP analysis. *Wetlands*, 23(4): 1043-1047.
- Saltonstall, K., P.M. Peterson, and R.J. Soreng. 2004. Recognition of *Phragmites australis* subsp. *americanus* (Poaceae: Arundinoideae) in North America: evidence from morphological and genetic analyses. *Sida* 21(2): 683-692.
- Skuhravy, V. 1978. Invertebrates: destroyers of the common reed. pp. 376-388. in D. Dykyjova and J. Kvet (editors) *Pond Littoral Ecosystems Structure and Functioning*. Springer-Verlag.
- Sorrie, B. 1985. Botanist, Massachusetts Natural Heritage Program. Letter to Marianne Marks. April 1985.
- Stark, H. and M. Dienst. 1989. Dynamics of lakeside reed belts at Lake Constance (Untersee) from 1984 to 1987. *Aquatic Botany* 35:63-70.
- Sukopp, H. and B. Markstein. 1989. Changes of the reed beds along the Berlin Havel, 1962-1987. *Aquatic Botany* 35:27-39.
- The Nature Conservancy. 2001. Map: TNC Ecoregions of the United States. Modification of Bailey Ecoregions. Online . Accessed May 2003.

NEW YORK
NON-NATIVE PLANT INVASIVENESS RANKING FORM

- Thompson, D.J. and J.M. Shay. 1985. The effects of fire on *Phragmites australis* in the Delta Marsh, Manitoba. *Canadian Journal of Botany* 63:1964-1869.
- Thompson, D.J. and J.M. Shay. 1989. First-year response of a *Phragmites* marsh community to seasonal burning. *Canadian Journal of Botany*, 67: 1448-1455.
- Tscharntke, T. 1988. Variability of the grass *Phragmites australis* in relation to the behavior and mortality of the gall-inducing midge *Giraudiella inclusa* (Diptera, Cecidomyiidae). *Oecologia* 76:504-512.
- Tucker, G.C. 1990. The genera of Arundinoideae (Gramineae) in the southeastern United States. *Journal of the Arnold Arboretum*, 71: 145-177.
- United States Department of Agriculture, National Resources Conservation Service. 2008. The PLANTS Database. National Plant Data Center, Baton Rouge, Louisiana. <plants.usda.gov>. [Accessed on January 21, 2009.]
- van Deursen, E. J. M. and H. J. Drost. 1990. Defoliation and treading by cattle of reed *Phragmites australis*. *J. Appl. Ecol.* 27:284-297.
- van der Merff, M., J. W. Simmers and S. H. Kay. 1987. Biology, management and utilization of common reed *Phragmites australis*. U. S. Army report, Contract number DAJA45-86-M-0482. 101 pp.
- van der Toorn, J. and J. H. Mook. 1982. The influence of environmental factors and management on stands of *Phragmites australis*. I. Effects of burning, frost and insect damage on shoot density and shoot size. *J. Appl. Ecol* 19:477-499.
- Warren, R.S., P.E. Fell, J.L. Grimsby, E.L. Buck, G.C. Rilling, and R.A. Fertik. 2001. Rates, patterns, and impacts of *Phragmites australis* expansion and effects of experimental *Phragmites* control on vegetation, macroinvertebrates, and fish within tidelands of the Lower Connecticut River. *Estuaries*, 24: 90-107.
- Weisner, W. E. B. and W. Graneli. 1989. Influence of substrate conditions on the growth of *Phragmites australis* after a reduction in oxygen transport to below-ground parts. *Aquatic Botany* 35:71-80.
- Weldy, T. and D. Werier. 2005. New York Flora Atlas. [S.M. Landry, K.N. Campbell, and L.D. Mabe (original application development), Florida Center for Community Design and Research. University of South Florida]. New York Flora Association, Albany, New York. <atlas.nyflora.org/>. [Accessed on January 21, 2009.]

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References for ranking form:

- Carlson, Matthew L., Irina V. Lapina, Michael Shephard, Jeffery S. Conn, Roseann Densmore, Page Spencer, Jeff Heys, Julie Riley, Jamie Nielsen. 2008. Invasiveness ranking system for non-native plants of Alaska. Technical Paper R10-TPXX, USDA Forest Service, Alaska Region, Anchorage, AK XX9. Alaska Weed Ranking Project may be viewed at: http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm.
- Heffernan, K.E., P.P. Coulling, J.F. Townsend, and C.J. Hutto. 2001. Ranking Invasive Exotic Plant Species in Virginia. Natural Heritage Technical Report 01-13. Virginia Dept. of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia. 27 pp. plus appendices (total 149 p.).
- Morse, L.E., J.M. Randall, N. Benton, R. Hiebert, and S. Lu. 2004. An Invasive Species Assessment Protocol: Evaluating Non-Native Plants for Their Impact on Biodiversity. Version 1. NatureServe, Arlington, Virginia. <http://www.natureserve.org/getData/plantData.jsp>
- Randall, J.M., L.E. Morse, N. Benton, R. Hiebert, S. Lu, and T. Killeffer. 2008. The Invasive Species Assessment Protocol: A Tool for Creating Regional and National Lists of Invasive Nonnative Plants that Negatively Impact Biodiversity. *Invasive Plant Science and Management* 1:36–49
- Warner, Peter J., Carla C. Bossard, Matthew L. Brooks, Joseph M. DiTomaso, John A. Hall, Ann M. Howald, Douglas W. Johnson, John M. Randall, Cynthia L. Roye, Maria M. Ryan, and Alison E. Stanton. 2003. Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands. Available online at www.caleppc.org and www.swvma.org. California Exotic Pest Plant Council and Southwest Vegetation Management Association. 24 pp.
- Williams, P. A., and M. Newfield. 2002. A weed risk assessment system for new conservation weeds in New Zealand. *Science for Conservation* 209. New Zealand Department of Conservation. 1-23 pp.