# NEW YORK
## NON-NATIVE PLANT INVASIVENESS RANKING FORM

| | | |
|---|---|---|
| Scientific name: | Phalaris arundinacea | USDA Plants Code: PHAR3 |
| Common names: | Reed canarygrass | |
| Native distribution: | Circumboreal | |
| Date assessed: | February 5, 2009; revised March 11, 2010 | |
| Assessors: | Steve Glenn, Gerry Moore | |
| Reviewers: | LIISMA SRC | |
| Date Approved: | 02-11-2009 | Form version date: 22 October 2008 |

**New York Invasiveness Rank:** High (Relative Maximum Score 70.00-80.00)

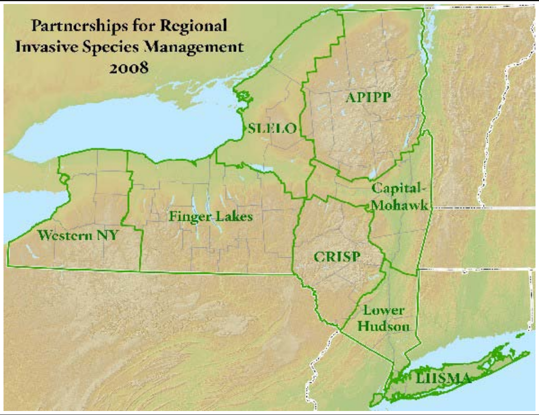
| **Distribution and Invasiveness Rank** (*Obtain from PRISM invasiveness ranking form*) | | | |
|---|---|---|---|
| | Status of this species in each PRISM: | Current Distribution | PRISM Invasiveness Rank |
| 1 | Adirondack Park Invasive Program | Not Assessed | Not Assessed |
| 2 | Capital/Mohawk | 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 | Common | High |
| 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 (30) | 20 |
| 2 | Biological characteristic and dispersal ability | 25 (25) | 21 |
| 3 | Ecological amplitude and distribution | 25 (25) | 21 |
| 4 | Difficulty of control | 10 (10) | 8 |
| | Outcome score | 100 (90)[b] | 70[a] |
| | Relative maximum score † | | 77.78 |
| | New York Invasiveness Rank § | High (Relative Maximum Score 70.00-80.00) | |

* 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

| A1.1. Has this species been documented to persist without cultivation in NY? (reliable source; voucher not required) | |
|---|---|
| ☒ | Yes – continue to A1.2 |
| ☐ | No – continue to A2.1 |
| 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:
Brooklyn Botanic Garden, 2009; Weldy & Werier, 2009

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):
History of establishment and suitable habitats (Brooklyn Botanic Garden, 2009).

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

Documentation:
Sources of information:
Brooklyn Botanic Garden, 2009.

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

Other potential or known suitable habitats within New York:
Creek bank, pond outlet, freshwater tidal marsh, waste ground

Documentation:
Sources of information:
Cordeiro, 2006; Brooklyn Botanic Garden, 2009

**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: 3

Documentation:
Identify ecosystem processes impacted (or if applicable, justify choosing answer A in the absence of impact information)
Reed canarygrass promotes silt deposition and consequent constriction of waterways.
Sources of information:
Cordeiro, 2006

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:
Can form dense, persistent, monotypic stands of creeping rhizomes in a thick sod layer (over 0.5 meters thick). One study (Kercher et al., 2004) suggests that Phalaris infestation can facilitate Phragmites infestation within the context of hydrologic disturbance. In these dense infestations it can eliminate layers below.
Sources of information:
Kercher et al., 2004; Cordeiro, 2006.

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 10

Documentation:
Identify type of impact or alteration:
Reed canarygrass can form dense, persistent, monotypic stands that exclude and displace native plant species. In NYS there are many occurrences of freshwater wetlands dominated by P. arundinacea with major impacts to on biodiversity, and likely associaed increases in other exotic species.
Sources of information:
Cordeiro, 2006; S. Young NYNHP Field Form Database.

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 U

Documentation:
Identify type of impact or alteration:
While no definitive studies have been located, montypic Phalaris stands would probably alter native animal foraging habits.
Sources of information:
Cordeiro, 2006.

Total Possible 30
Section One Total 20

*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

Documentation:
Describe key reproductive characteristics (including seeds per plant):
Various studies state seed produced, but not quantified; abundant vegetative spread by

creeping rhizomes.
Sources of information:
Cordeiro, 2006.

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:
Hydrochory- while the seeds inherently have no adaptation for long-distance dispersal; both rhizome fragments and seeds are dispersed via flowing water.
Sources of information:
Cordeiro, 2006.

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:
Reed canarygrass has a long agronomic history in the U.S. with forage cultivation occurring as early as the 1830s; also used for erosion control. Other human activities which might facilitate the spread of Phalaris is its use to mitigate nitrate pollution, road construction, ornamnetal plantings; indirect spread through yard waste disposal and soil movement.
Sources of information:
Lavoie et al., 2005; Cordeiro, 2006.

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

Documentation:

Evidence of competitive ability:
Perennial, fast growth. High net photosynthetic rates (Chen et al., 2006), has a high tolerance for varying nutrient and oxygen levels, and can live in fluctuating and submerged water successfully. Morphologic plasticity gives Phalaris advantages over other species. One study (Morrison & Molofsky, 1999) suggests that different growth strategies (differential aboveground and belowground biomass production) are probably common within populations of reed canary grass and may be important for allowing reed canary grass to successfully invade new habitats. Another study (Herr-Turoff & Zedler, 2007) found Phalaris grew as a sward with intermittent and early-season flooding but shifted to tussocks under constant flooding. Additional plasticity regarding histological differences between the folded and flat leaves may give Phalaris greater amplitude for invading dryer ecosystems (Wrobell et al., 2008).
Sources of information:
Morrison & Molofsky, 1999; Chen et al., 2006; Cordeiro, 2006; Herr-Turoff & Zedler, 2007; Wrobell et al., 2008.

## 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:
Reed canarygrass can form dense, persistent, monotypic stands froming a dense layer above shorter vegetation.
Sources of information:
Cordeiro, 2006.

## 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: 2

### Documentation:
Describe germination requirements:
Seeds germinate immediately after ripening with no known dormancy requirements. Germination rates increase significantly with light availability.
Sources of information:
Lindig-Cisneros & Zedler, 2002; Cordeiro, 2006.

## 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:
Phalaris canariensis is reported from NY, but not known as invasive. Phalaris minor has been reported from Pennsylvania and New Jersey but not known as invasive (is listed as invasive in the western US). Phalaris paradoxa has been reported from Pennsylvania, New Jersey, and Maryland, but not reported as invasive. USDA, 2009; Weldy & Werier, 2009.

| | |
|---|---|
| Total Possible | 25 |
| Section Two Total | 21 |

*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: 2

Documentation:
Identify reason for selection, or evidence of weedy history:
Various sources state that reed canarygrass can form monotypic stands, but sizes in northeasten North America largely not quantified, although some stands are clearly over 1/4 acre. In many counties across NYS there are numerous shallow emergent marshes dominated by large stands of P. arundinacea > 1/4 acre. Most of these appear to have natural or anthropogenic disturbance but not perhaps not other invasives species; more information is needed.
Sources of information:
Cordeiro, 2006; Minnesota DOT, 2008; authors' pers. obs.; T. Green, pers. obs.; S.Young NYNHP Field Form Database.

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: 6

Documentation:
Identify type of habitats where it occurs and degree/type of impacts:
See A2.3.
Sources of information:
Cordeiro, 2006; 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 2

Documentation:
Identify type of disturbance:
Reed canarygrass invasion is promoted by disturbances such as ditching of wetlands, stream channelization, deforestation of swamp forests, sedimentation, overgrazing, and intentional planting, but natural disturbances such as scouring floods and low water conditions also promote invasion. One study (Kercher et al., 2007) suggests that anthropogenic disturbances coinciding with increases in the gross supply of resources act synergistically to facilitate invasion of Phalaris.
Another study (Perkins & Wilson, 2005) found the cycle of beaver impoundment and abandonment both disrupts the native community and provides an ideal environment for Phalaris.
Sources of information:
Perkins & Wilson, 2005; Cordeiro, 2006; Kercher et al., 2007.

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 3

Documentation:
Describe what part of the native range is similar in climate to New York:
Native in Europe.
Sources of information:
Lavoie et al., 2005; Cordeiro, 2006.

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 4

Documentation:
Identify states and provinces invaded:
Recorded from all northeastern states and provinces.
Sources of information: See known introduced range in plants.usda.gov, and update with information from states and Canadian provinces.
USDA, 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: 4

**Documentation:**
Describe distribution:
Recorded from all 8 PRISMs; see A1.1.
Sources of information:
Brooklyn Botanic Garden, 2009; Weldy & Werier, 2009

Total Possible: 25
Section Three Total: 21

## *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:
Seed banking can occur in soil for years with an extensive seedbank but survival in water is limited to 1-2 years only.
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:
Reed canarygrass spreads by creeping rhizomes. A system of apical dominance may operate in reed canarygrass rhizomes, resulting in a persistent rhizome bud bank (Annen, 2008).
Sources of information:
Cordeiro, 2006; Annen, 2008.

### 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:
A combination of management strategies over several years will yield the best results. Control is generally difficult due to the rhizomatous nature of the species and may require herbicide treatment for several years. Removal by hand-pulling is practical only for small stands and requires a large time commitment (e.g. > 5 years). Grazing and cutting may be effective controls (again, long-term) but only in fields and croplands. In wetlands permits would be requires to effect removal.

Non-selective herbicides like glyphosate are most effective for small infestations, although commercial glyphosate-based herbicides are often enhanced by surfactants. When measured in the growing season after treatment, the mid-May herbicide application reduced P. arundinacea to 25% of control levels, but both late August and late September herbicide applications were significantly more effective, and reduced P. arundinacea to 10% of control levels.

Lowering of water levels followed by restoration of water levles may control this species.

Fire is only effective when root-burn occurs, and this is unlikely because water or mud often covers the rhizomes (a system of apical dominance may operate in reed canarygrass rhizomes, resulting in a persistent rhizome bud bank (Annen, 2008)). One study (McWilliams et al., 2007) found Phalaris "less abundant" after fall burning.

Currently, there are no biological control methods.

Alternative control methods for small infestations include covering the site with black plastic or mulch (after mowing).

One study (Perry et al., 2004) found that manipulating resource availability may be a promising approach to management in marshlands- lowering soil inorganic N to < 30 mg kg-1 (low-N soils might be achieved via carbon enrichment, vegetation harvests and reduced N inputs) in restored wetlands might allow establishment of sedge meadow communities to suppress Phalaris invasions.

Another study found a combination of tillage and/or plant growth regulator pretreatments have potential for enhancing the effects of Vantage (R) herbicide on reed canarygrass (Annen, 2008).

Another integrated approach of glyphosate treatments followed by spring seeding of native species, and a followup application of the grass-specific herbicide sethoxydim in the third year had mixed results (Wilcox et al., 2007).

A multiyear field experiment (Reinhardt-Adams & Galatowitsch, 2006) to evaluate effects of burning and herbicide application timings on P. arundinacea populations found that burning did not reduce P. arundinacea biomass but reduced the P. arundinacea seed bank.

Additionally, glyphosate applications in late August and late September were more effective than in mid-May.

One assessment of the control strategies (Lavergne & Molofsky, 2006) concluded that the most successful strategies require both physical and chemical methods, coupled with hydrological management. Moreover, management must switch from isolated efforts of stand eradication to a landscape approach, emphasizing infestation prevention and accounting for surrounding human activities and the socio-economic context.
Sources of information:
Perry et al., 2004; Cordeiro, 2006; Lavergne & Molofsky, 2006; Reinhardt-Adams & Galatowitsch, 2006; McWilliams et al., 2007; Wilcox et al., 2007; Annen, 2008.

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

| | |
|---|---|
| **Total for 4 sections Possible** | 90 |
| **Total for 4 sections** | 70 |

## 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: 'Strawberries and cream', 'Feesey's', 'Varieagata'

**References for species assessment:**

Annen, C. A. 2008. Effects of tillage and growth regulator pretreatments on reed canarygrass (Phalaris arundinacea L.) control with sethoxydim. Natural Areas Journal. 28(1):6-13.

Brooklyn Botanic Garden. 2009. AILANTHUS database. [Accessed on February 5, 2009].

Chen, J. Y., Y. Zhu, W. M. Li, & L. Xu. 2006. Photosynthetic and transpiration features of turf grasses under drought. Xibei Zhiwu Xuebao. 26(8):1638-1643.

Cordeiro, J. 2006. Phalaris arundinacea. U.S. Invasive Species Impact Rank (I-Rank). NatureServe Explorer. <www.natureserve.org>. [Accessed on February 5, 2009].

Herr-Turoff, A.& J. B. Zedler. 2007. Does morphological plasticity of the Phalaris arundinacea canopy increase invasiveness? Plant Ecology. 193(2):265-277.

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