Plant Risk Evaluator -- PRE™
Evaluation Report

Pennisetum alopecuroides -- Illinois

2017 Farm Bill PRE Project

PRE Score: 16 -- Reject (high risk of invasiveness)
Confidence: 63 / 100
Questions answered: 20 of 20 -- Valid (80% or more questions answered)

Privacy: Public
Status: Submitted

Evaluation Date: September 4, 2017

This PDF was created on June 15, 2018

Plant Evaluated

Pennisetum alopecuroides

Image by André Karwath

Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Pennisetum alopecuroides*) in an effort to understand the invasive history, reproductive strategies, and the impact, if any, on the region's native plants and animals. This research reflects the data available at the time this evaluation was conducted.

Summary

Pennisetum alopecuroides (Cenchrus purpurascens) appears to present a high risk of invasiveness in Illinois. The plant produces copious viable seeds which can be moved great distances by multiple means. Promoting fire and invading pastures could have a significant impact on other plants and animals, though evidence for these impacts is speculative. Populations in the wild in the US seem to be relatively recent. It's noted as an emerging invasive in the Mid-Atlantic states. Only one city and county in Virginia are currently listing it as invasive. Pennisetum alopecuroides therefore presents a risk and should be closely monitored in Illinois. A sterile cultivar would be a safer choice for this beautiful and popular ornamental grass.

General Information

Status: Submitted
Screener: Emily Russell
Evaluation Date: September 4, 2017

Plant Information

Plant: *Pennisetum alopecuroides*

Regional Information

Region Name: Illinois

Climate Matching Map

To answer four of the PRE questions for a regional evaluation, a climate map with three climate data layers (Precipitation, UN EcoZones, and Plant Hardiness) is needed. These maps were built using a toolkit created in collaboration with GreenInfo Network, USDA, PlantRight, California-Invasive Plant Council, and The Information Center for the Environment at UC Davis.

Click here to see the generated climate matching map for this region. This climate match database is hosted by GreenInfo Network and publicly accessible.

Evaluation Questions

These questions are based in an original article published at the University of California, Davis, and can be found on the PLOS One website, here: https://doi.org/10.1371/journal.pone.0121053

Invasive History and Climate Matching (Questions 1 - 6)

1. Has the species (or cultivar or variety, if applicable; applies to subsequent "species" questions) become naturalized where it is not native?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

Pennisetum alopecuroides is naturalized in the Caucasus, New Zealand, and in the following states: New York, Maryland, Delaware, Virginia, Pennsylvania, Ohio, Michigan, Illinois, Arkansas, North Carolina, Colorado and Texas.

Reference(s):

- USDA-Grin (2016). Cenchrus purpurascens Thunb. In: Taxonomy - GRIN-Global Web v 1.9.8.2.
- Longbottom, W. D., Naczi R. F. C., & Knapp W. M. (2016). Flowering Plant Species New to Delaware and Maryland. Bartonia. 5–19.
- Howell, C. J., & Terry J. A. (2016). The creation of a New Zealand weed atlas. Science for Conservation. Department of Conservation, Wellington, New Zealand. 21.
- Reznicek, A.. A., Voss E.. G., & Walters B.. S. (2011). Cenchrus purpurascens - Michigan Flora.
- Virginia Botanical Associates (2017). Digital Atlas of the Virginia Flora - Cenchrus purpurascens Thunb..
- Kartesz, J. T. (2015). The Biota of North America Program (BONAP).

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2. Is the species (or cultivar or variety) noted as being naturalized in the US or world in a similar climate?

- Answer: **Yes**, which contributes **2** points to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

Pennisetum alopecuroides is naturalized in Illinois as well as the Caucasus, the Midwestern and Mid-Atlantic United States, which share a climate with Illinois.

Reference(s):

- USDA-Grin (2016). Cenchrus purpurascens Thunb. In: Taxonomy - GRIN-Global Web v 1.9.8.2.
- Longbottom, W. D., Naczi R. F. C., & Knapp W. M. (2016). Flowering Plant Species New to Delaware and Maryland. Bartonia. 5–19.
- Reznicek, A.. A., Voss E.. G., & Walters B.. S. (2011). Cenchrus purpurascens - Michigan Flora.
- Virginia Botanical Associates (2017). Digital Atlas of the Virginia Flora - Cenchrus purpurascens Thunb..
- Kartesz, J. T. (2015). The Biota of North America Program (BONAP).

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3. Is the species (or cultivar or variety) noted as being invasive in the U.S. or world?

- Answer: **Yes**, which contributes **2** points to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

Pennisetum alopecuroides is listed as invasive in New Zealand and in Virginia in Arlington County and Alexandria. Confidence is low because it is only listed as a potential or emerging threat elsewhere in the mid-Atlantic United States and descriptions of damage are lacking.

Reference(s):

- Simmons, R.H.. (2012). Invasive exotic plants that threaten parks and natural areas in Alexandria.
- Mastalerz, A., & Frey M. (2012). Invasive Plant Alert: Fountain Grass Pennisetum alopecuroides (L.) Spreng..
- Zell, G. (2012). Non-native invasive plants of Arlington County, Virginia.
- Howell, C. J., & Terry J. A. (2016). The creation of a New Zealand weed atlas. Science for Conservation. Department of Conservation, Wellington, New Zealand. 21.

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4. Is the species (or cultivar or variety) noted as being invasive in the US or world in a similar climate?

- Answer: **Yes**, which contributes **3** points to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

Arlington County and Alexandria, Virginia, which share a climate with Illinois, list P. alopecuroides as invasive. Confidence is low because it is only listed as a potential or emerging threat elsewhere in the Mid-Atlantic United States and descriptions of damage are lacking. In Delaware and Maryland: "We have found this plant along numerous roadsides. Some populations persist for many years and others are present for only a year or two."

Reference(s):

- Simmons, R.H.. (2012). Invasive exotic plants that threaten parks and natural areas in Alexandria.
- Mastalerz, A., & Frey M. (2012). Invasive Plant Alert: Fountain Grass Pennisetum alopecuroides (L.) Spreng..
- Zell, G. (2012). Non-native invasive plants of Arlington County, Virginia.
- Longbottom, W. D., Naczi R. F. C., & Knapp W. M. (2016). Flowering Plant Species New to Delaware and Maryland. Bartonia. 5–19.

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5. Are other species of the same genus (or closely related genera) invasive in a similar climate?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Several species of Pennisetum are serious invasive threats in warmer climates around the world, but no citations were found for invasion of other Pennisetum species in a similar climate.

Reference(s):

- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..

6. Is the species (or cultivar or variety) found predominately in a climate matching the region of concern?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

Pennisetum alopecuroides is a widespread species that will grow in many climates, including tropical climates much warmer than Illinois.

Reference(s):

- USDA-Grin (2016). Cenchrus purpurascens Thunb. In: Taxonomy - GRIN-Global Web v 1.9.8.2.
- GBIF Secretariat (2016). GBIF Backbone Taxonomy: Pennisetum alopecuroides (L.) Spreng..

Impact on Native Plants and Animals (Questions 7 - 10)

7. Does this plant displace native plants and dominate (overtop or smother) the plant community in areas where it has established?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

Evidence is lacking that Pennisetum alopecuroides dominates the plant community.

Reference(s):

- [Anonymous] .

8. Is the plant noted as promoting fire and/or changing fire regimes?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Pennisetum spp. are recognized as highly flammable with capability of promoting fire and changing historic fire regimes. Confidence is lowered to medium because this answer relies on characteristics of the genus.

Reference(s):

- Victorian Resources Online, Agriculture Victoria (2017). Swamp foxtail grass (Pennisetum alopecuroides).
- Blackmore, M., & Vitousek P. M. (2000). Cattle Grazing, Forest Loss, and Fuel Loading in a Dry Forest Ecosystem at Pu'u Wa'aWa'a Ranch, Hawai'i. Biotropica. 32, 625–632.
- Brooks, M. L. (2008). Plant invasions and fire regimes.
- Fire Performance Plant Selector (2010). Pennisetum spp. — Fire Performance Plant Selector.

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9. Is the plant a health risk to humans or animals/fish? Has the species been noted as impacting grazing systems?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

No health risks to humans. Has potential to impact grazing, but there is not strong evidence. A Victoria, Australia impact assessment found that P. alopecuroides: "Competes with more desirable pasture species (Burbidge 1966 and Burbidge 1968) and spreads 'rapidly over cultivated pastures and has caused the deterioration of grasslands in S. Japan in recent years' (Akiyama et al. 1989). It is a pest in degraded pastures (Csurhes, Edwards 1998)"

Reference(s):

- Victorian Resources Online, Agriculture Victoria (2017). Swamp foxtail grass (Pennisetum alopecuroides).

10. Does the plant produce impenetrable thickets, blocking or slowing movement of animals, livestock, or humans?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

There is no evidence P. alopecuroides produces impenetrable thickets.

Reference(s):

- [Anonymous] .

Reproductive Strategies (Questions 11 - 17)

11. Does this species (or cultivar or variety) reproduce and spread vegetatively?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

P. alopecuroides is a clump-forming grass. "The root system is fibrous and short-rhizomatous."

Reference(s):

- Hilty, J. (2016). Chinese Fountain Grass (Pennisetum alopecuroides).

12. If naturally detached fragments from this plant are capable of producing new plants, is this a common method of reproduction for the plant?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

P. alopecuroides does not commonly fragment.

Reference(s):

- [Anonymous] .

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13. Does the species (or cultivar or variety) commonly produce viable seed?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

P. alopecuroides primarily reproduces via seed.

Reference(s):

- Liu, Z.., Li X.., Li R.., Jiang D.., & Cao C.. (2003). A comparative study on seed germination of 15 grass species in Keeqin Sandyland.. Ying yong sheng tai xue bao = The journal of applied ecology. 14, 1416–1420.
- Wilson, S. B., & Knox G. W. (2009). Landscape Performance of Green Fountain Grass Alternatives Grown in Northern and Southern Florida. HortTechnology. 19, 471–476.
- Voigt, T. B., & Reicher Z. J. (2009). Selectively Controlling Escaped Fountain Grass in Cool-Season Turf. ats. 6,

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14. Does this plant produce copious viable seeds each year (> 1000)?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

A Victoria, Australia impact assessment found: "High fruit/seed abundance (USDA 2006). A clump can display multiple inflorescences (Burnie et al 1998). Each seed head appears to have 10’s – 100’s of seeds (Koyama 1987) Therefore probably capable of producing 1000-2000 seeds potentially more." In a Florida evaluation, P. alopecuroides had 59-152 inflorescences. Confidence is lowered because there are not estimates of seed production in a climate similar to Illinois, though it has been shown to seed aggressively into turf grass here.

Reference(s):

- Victorian Resources Online, Agriculture Victoria (2017). Swamp foxtail grass (Pennisetum alopecuroides).
- Wilson, S. B., & Knox G. W. (2009). Landscape Performance of Green Fountain Grass Alternatives Grown in Northern and Southern Florida. HortTechnology. 19, 471–476.
- USDA NRCS (2017). USDA PLANTS Database: Pennisetum alopecuroides (Chinese fountaingrass).
- Voigt, T. B., & Reicher Z. J. (2009). Selectively Controlling Escaped Fountain Grass in Cool-Season Turf. ats. 6,

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15. Is there significant germination (>25%) of seeds the next growing season, with no requirement of an infrequent environmental condition for seeds to germinate (i.e. fire) or long dormancy period?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

"Pennisetum alopecuroides had a germination rate of over 80%" (Liu). "Showed considerable germinability in the initial test but the germinability was greatly enhanced by moist chilling." (Washitani)

Reference(s):

- Washitani, I.., & Masuda M.. (1990). A Comparative Study of the Germination Characteristics of Seeds from a Moist Tall Grassland Community. Functional Ecology. 4, 543–557.
- Liu, Z.., Li X.., Li R.., Jiang D.., & Cao C.. (2003). A comparative study on seed germination of 15 grass species in Keeqin Sandyland.. Ying yong sheng tai xue bao = The journal of applied ecology. 14, 1416–1420.

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16. Does this plant produce viable seed within the first three years (for an herbaceous species) to five years (for a woody species) after germination?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Reference(s):

- [Anonymous] .

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17. Does this plant continuously produce seed for >3 months each year or does seed production occur more than once a year?

- Answer: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

"The blooming period occurs during late summer or early fall, lasting about 2-3 weeks."

Reference(s):

- Hilty, J. (2016). Chinese Fountain Grass (Pennisetum alopecuroides).

Dispersal (Questions 18 - 20)

18. Are the plant's propagules frequently dispersed long distance (>100 m) by mammals or birds or via domestic animals?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

"Because of the long bristles on the spikelets, the grains of this grass may be dispersed in part by animals" (Hilty). "The seeds are dispersed in soft burr-like structures and are easily blown about by the wind. They may also float on water and readily become attached to livestock, other animals, clothing, machinery and other vehicles."

Reference(s):

- Hilty, J. (2016). Chinese Fountain Grass (Pennisetum alopecuroides).
- The State of Queensland Department of Agriculture and Fisheries (2016). Cenchrus purpurascens Factsheet from Environmental Weeds of Australia for Biosecurity Queensland Edition.

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19. Are the plant's propagules frequently dispersed long distance (>100 m) by wind or water?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

"The seeds are dispersed in soft burr-like structures and are easily blown about by the wind. They may also float on water and readily become attached to livestock, other animals, clothing, machinery and other vehicles."

Reference(s):

- The State of Queensland Department of Agriculture and Fisheries (2016). Cenchrus purpurascens Factsheet from Environmental Weeds of Australia for Biosecurity Queensland Edition.

20. Are the plant's propagules frequently dispersed via contaminated seed (agriculture or wildflower packets), equipment, vehicles, boats or clothing/shoes?

- Answer: **Yes**, which contributes **1** points to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

"The wind generated by passing motor vehicles may blow the grain-bearing spikelets up and down roadways." (Hilty) "The seeds are dispersed in soft burr-like structures and are easily blown about by the wind. They may also float on water and readily become attached to livestock, other animals, clothing, machinery and other vehicles. Long distance dispersal can also occur in contaminated agricultural produce (e.g. pasture seeds, gain and wool)."

Reference(s):

- Hilty, J. (2016). Chinese Fountain Grass (Pennisetum alopecuroides).
- The State of Queensland Department of Agriculture and Fisheries (2016). Cenchrus purpurascens Factsheet from Environmental Weeds of Australia for Biosecurity Queensland Edition.

Total PRE Score

PRE Score: 16 -- Reject (high risk of invasiveness)
Confidence: 63 / 100
Questions answered: 20 of 20 -- Valid (80% or more questions answered)

PRE Score Legend

The PRE Score is calculated by adding the point totals for each (answered) question.
< 13 : accept (low risk of invasiveness)
13 - 15 : evaluate further
> 15 : reject (high risk of invasiveness)

Questions Answered Legend

It is important to answer at least 16 questions to consider a PRE Score as "valid".
>= 16 : valid (80% or more questions answered)
<= 15 : invalid (not enough questions answered)

Organization Ownership and Content Privacy

Organization: 2017 Farm Bill PRE Project
Content Privacy: Public

Evaluation Reviewers

The PRE approach is to base decisions on science and make decisions by consensus of diverse horticultural stakeholders. The literature review and process of answering PRE's questions are based on science; the decisions of which plants to prioritize are based on consensus. To ensure this process is in place and that PRE is collaborative, volunteer stakeholders are recruited from each region to review evaluations. The following experts in their profession (plant science, conservation, or horticultural trade) have participated as volunteer PRE reviewers for this evaluation:

• Shannon McEnerney	December 21, 2017
• Richard Hawke	September 18, 2017

This evaluation has a total of 2 reviewer(s).

Evaluation Issues

The following section lists all public issues for this evaluation. Issues provide a way for stakeholder reviewers to communicate any concerns or suggestions they might have with the plant or evaluation. Please email PlantRight@suscon.org if additional action is required to resolve open issues.

There are currently no issues associated with this evaluation.

About PRE and this Plant Evaluation Report

The PlantRight Plant Risk Evaluator -- PRE is an online database and platform enabling those involved in non-native, terrestrial plant production to know before they grow if a plant poses a regional invasive risk. This tool offers many benefits, and we encourage you to visit the PRE website (https://pre.ice.ucdavis.edu) for more information.

If you are a nursery trade association, or involved in the research, development or distribution of horticultural plants we invite you to join the PRE community. If you are a plant scientist, affiliated with a horticultural college or botanic garden, and would like to learn more about becoming a PRE Screener, please drop us an email, PlantRight@suscon.org, requesting a PRE Account.

PRE beta funding is provided by Sustainable Conservation (http://www.suscon.org/) and a USDA Farm Bill grant.