Plant Risk Evaluator -- PRE™
Evaluation Report

Miscanthus sinensis 'Morning Light' -- Illinois

2017 Farm Bill PRE Project

PRE Score: 17 -- Reject (high risk of invasiveness)
Confidence: 62 / 100
Questions answered: 20 of 20 -- Valid (80% or more questions answered)

Privacy: Public
Status: Submitted

Evaluation Date: April 19, 2017

This PDF was created on June 15, 2018

Plant Evaluated

Miscanthus sinensis 'Morning Light'

Image by Missouri Botanical Garden

Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Miscanthus sinensis 'Morning Light'*) 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.

General Information

Status: Submitted
Screener: Emily Russell
Evaluation Date: April 19, 2017

Plant Information

Plant: *Miscanthus sinensis 'Morning Light'*

If the plant is a cultivar, how does its behavior differs from its parent's?
The leaf blades of 'Morning Light' are narrower than the species, and have a white margin not present in the species. The habit of 'Morning Light' is a little smaller and more upright than the species, and the cultivar is said to grow more slowly. 'Morning Light' blooms later than the species which may reduce seeding, especially in colder climates with a shorter growing season.

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 **Low** confidence in this answer based on the available literature.

Answer / Justification:

"Miscanthus sinensis has been a popular garden ornamental for more than a century and is now found in gardens in many warm temperate areas of the world. Naturalized populations have established from garden escapes in North America, Latin America, New South Wales in Australia and sporadically in Western Europe." Miscanthus sinensis 'Morning Light' is capable of producing viable seed that can travel great distances, and it has been one of the most popular and widely planted cultivars for many years. Evidence is lacking that 'Morning Light' did not contribute to naturalized populations.

Reference(s):

- Riches, C. (2008). Miscanthus sinensis (eulalia) Datasheet In: Invasive Species Compendium.
- Meyer, M.H.. (2015). Ornamental Uses of Miscanthus.
- Quinn, L. D., Allen D. J., & J. Stewart R. (2010). Invasiveness potential of Miscanthus sinensis: implications for bioenergy production in the United States. GCB Bioenergy. 2, 310–320.
- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..
- Madeja, G., Umek L., & Havens K. (2012). Differences in seed set and fill of cultivars of Miscanthus grown in USDA cold hardiness zone 5 and their potential for invasiveness. Journal of Environmental Horticulture. 30, 42.
- The University of Georgia Center for Invasive Species and Ecosystem Health (2017). Illinois Invasive Plant List.
- Dougherty, R. Fitzgerald (2013). Ecology and niche characterization of the invasive ornamental grass Miscanthus sinensis.

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 **Low** confidence in this answer based on the available literature.

Answer / Justification:

Miscanthus sinensis is invasive in Illinois and across the Eastern United States. Miscanthus sinensis 'Morning Light' is capable of producing viable seed that can travel great distances, and it has been one of the most popular and widely planted cultivars for many years. Evidence is lacking that 'Morning Light' did not contribute to invasive populations.

Reference(s):

- The University of Georgia Center for Invasive Species and Ecosystem Health (2017). Illinois Invasive Plant List.
- Riches, C. (2008). Miscanthus sinensis (eulalia) Datasheet In: Invasive Species Compendium.
- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..
- Madeja, G., Umek L., & Havens K. (2012). Differences in seed set and fill of cultivars of Miscanthus grown in USDA cold hardiness zone 5 and their potential for invasiveness. Journal of Environmental Horticulture. 30, 42.
- Quinn, L. D., Allen D. J., & J. Stewart R. (2010). Invasiveness potential of Miscanthus sinensis: implications for bioenergy production in the United States. GCB Bioenergy. 2, 310–320.
- Meyer, M.H.. (2015). Ornamental Uses of Miscanthus.
- Dougherty, R. Fitzgerald (2013). Ecology and niche characterization of the invasive ornamental grass Miscanthus sinensis.

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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:

Miscanthus sinensis is invasive in Illinois and across the Eastern United States. Miscanthus sinensis 'Morning Light' is capable of producing viable seed that can travel great distances, and it has been one of the most popular and widely planted cultivars for many years. Evidence is lacking that 'Morning Light' did not contribute to invasive populations.

Reference(s):

- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..
- Madeja, G., Umek L., & Havens K. (2012). Differences in seed set and fill of cultivars of Miscanthus grown in USDA cold hardiness zone 5 and their potential for invasiveness. Journal of Environmental Horticulture. 30, 42.
- Quinn, L. D., Allen D. J., & J. Stewart R. (2010). Invasiveness potential of Miscanthus sinensis: implications for bioenergy production in the United States. GCB Bioenergy. 2, 310–320.
- Meyer, M.H.. (2015). Ornamental Uses of Miscanthus.
- The University of Georgia Center for Invasive Species and Ecosystem Health (2017). Illinois Invasive Plant List.
- Riches, C. (2008). Miscanthus sinensis (eulalia) Datasheet In: Invasive Species Compendium.
- Dougherty, R. Fitzgerald (2013). Ecology and niche characterization of the invasive ornamental grass Miscanthus sinensis.

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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:

Miscanthus sinensis is invasive in Illinois and across the Eastern United States. Miscanthus sinensis 'Morning Light' is capable of producing viable seed that can travel great distances, and it has been one of the most popular and widely planted cultivars for many years. Evidence is lacking that 'Morning Light' did not contribute to invasive populations.

Reference(s):

- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..
- Madeja, G., Umek L., & Havens K. (2012). Differences in seed set and fill of cultivars of Miscanthus grown in USDA cold hardiness zone 5 and their potential for invasiveness. Journal of Environmental Horticulture. 30, 42.
- Quinn, L. D., Allen D. J., & J. Stewart R. (2010). Invasiveness potential of Miscanthus sinensis: implications for bioenergy production in the United States. GCB Bioenergy. 2, 310–320.
- Meyer, M.H.. (2015). Ornamental Uses of Miscanthus.
- The University of Georgia Center for Invasive Species and Ecosystem Health (2017). Illinois Invasive Plant List.
- Riches, C. (2008). Miscanthus sinensis (eulalia) Datasheet In: Invasive Species Compendium.
- Dougherty, R. Fitzgerald (2013). Ecology and niche characterization of the invasive ornamental grass Miscanthus sinensis.

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

- 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:

Miscanthus sinensis is invasive in Illinois and across the Eastern United States. Miscanthus sacchariflorus is also an invasive species.

Reference(s):

- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..
- The University of Georgia Center for Invasive Species and Ecosystem Health (2017). Illinois Invasive Plant List.
- Riches, C. (2008). Miscanthus sinensis (eulalia) Datasheet In: Invasive Species Compendium.

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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:

Miscanthus sinensis 'Morning Light' grows in many different climates.

Reference(s):

- [Anonymous] .

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: **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:

Miscanthus sinensis displaces native plants where it is established. Evidence is lacking that Miscanthus sinensis "Morning Light' did not contribute to these populations.

Reference(s):

- Waggy, M. A. (2011). Miscanthus sinensis. In: Fire Effects Information System.

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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 **High** confidence in this answer based on the available literature.

Answer / Justification:

Miscanthus sinensis is highly flammable, is noted for promoting fire in areas where it has established, and may even respond favorably to fire. There is no evidence that Miscanthus sinensis 'Morning Light' is different from the species in flammability and response to fire.

Reference(s):

- Waggy, M. A. (2011). Miscanthus sinensis. In: Fire Effects Information System.

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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 **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Miscanthus sinensis is palatable to livestock. There are not reports of health risks to humans (other than cuts from handling the sharp leaf blades) or animals/fish.

Reference(s):

- Waggy, M. A. (2011). Miscanthus sinensis. In: Fire Effects Information System.

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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:

Reports of Miscanthus sinensis creating impenetrable thickets blocking human or animal movement were not found in the literature.

Reference(s):

- [Anonymous] .

Reproductive Strategies (Questions 11 - 17)

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

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

Answer / Justification:

Miscanthus sinensis propagates by rhizomes and by tillering in its native habitat. Though it shows less vigor than the species, Miscanthus sinensis 'Morning Light' also has the ability to spread vegetatively. In most garden situations, it spreads slowly to form a large clump, then may die out in the middle as it continues to expand outward.

Reference(s):

- Riches, C. (2008). Miscanthus sinensis (eulalia) Datasheet In: Invasive Species Compendium.
- Waggy, M. A. (2011). Miscanthus sinensis. In: Fire Effects Information System.

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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 **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Fragments of Miscanthus sinensis rhizomes easily produce new plants, but fragmentation is not a frequent natural occurence.

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 **High** confidence in this answer based on the available literature.

Answer / Justification:

Viable seed set can vary widely among different climates and across different years, but it is not uncommon for Miscanthus sinensis 'Morning Light' to produce viable seed.

Reference(s):

- Madeja, G., Umek L., & Havens K. (2012). Differences in seed set and fill of cultivars of Miscanthus grown in USDA cold hardiness zone 5 and their potential for invasiveness. Journal of Environmental Horticulture. 30, 42.
- Wilson, S. B., & Knox G. W. (2006). Landscape Performance, Flowering, and Seed Viability of 15 Japanese Silver Grass Cultivars Grown in Northern and Southern Florida. HortTechnology. 16, 686–693.
- Meyer, M.H., & Tchida C.L. (1999). Miscanthus Anderss. produces viable seed in four USDA hardiness zones. Journal of Environmental Horticulture. 17, 137-140.

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

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

Answer / Justification:

There is evidence that Miscanthus sinensis 'Morning Light' is capable of producing copious viable seeds, but there is not evidence that plants do so each year. In a 2006 Florida study, there was a mean of 72 inflorescences per plant with 82.5% seed viability in northern Florida, but plants performed poorly in southern Florida and did not set enough seed to test. In a recent Illinois study, a mean of 1,936 seeds per plant were found in 2010, but 0 seeds were found in 2007. 'Morning Light' is a late-flowering cultivar which may not have time to complete its life cycle before frost in colder climates. Self-incompatibility may also play a role in isolated plantings.

Reference(s):

- Madeja, G., Umek L., & Havens K. (2012). Differences in seed set and fill of cultivars of Miscanthus grown in USDA cold hardiness zone 5 and their potential for invasiveness. Journal of Environmental Horticulture. 30, 42.
- Wilson, S. B., & Knox G. W. (2006). Landscape Performance, Flowering, and Seed Viability of 15 Japanese Silver Grass Cultivars Grown in Northern and Southern Florida. HortTechnology. 16, 686–693.
- Meyer, M.H., & Tchida C.L. (1999). Miscanthus Anderss. produces viable seed in four USDA hardiness zones. Journal of Environmental Horticulture. 17, 137-140.

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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 **High** confidence in this answer based on the available literature.

Answer / Justification:

Miscanthus sinensis 'Morning Light' had 90% germination of viable seed in a Florida study in 2006.

Reference(s):

- Wilson, S. B., & Knox G. W. (2006). Landscape Performance, Flowering, and Seed Viability of 15 Japanese Silver Grass Cultivars Grown in Northern and Southern Florida. HortTechnology. 16, 686–693.

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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.

Reference(s):

- [Anonymous] .

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 **Low** confidence in this answer based on the available literature.

Answer / Justification:

Seeds of Miscanthus sinensis 'Morning Light' could potentially be spread by attaching to animals. However, there are not descriptions of this phenomenon available in the literature.

Reference(s):

- [Anonymous] .

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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 **High** confidence in this answer based on the available literature.

Answer / Justification:

Miscanthus sinensis seeds are primarily dispersed by wind. In a study of long-distance dispersal of Miscanthus sinensis, a small percentage of seeds were captured 300 and 400 meters from their source plant. There is no evidence that 'Morning Light' seeds are different than the species in their ability to be carried by wind. Water dispersal is also possible for plants growing along streams.

Reference(s):

- Quinn, L. D., Matlaga D. P., J. Stewart R., & Davis A. S. (2011). Empirical Evidence of Long-Distance Dispersal in Miscanthus sinensis and Miscanthus × giganteus. Invasive Plant Science and Management. 4, 142–150.
- Riches, C. (2008). Miscanthus sinensis (eulalia) Datasheet In: Invasive Species Compendium.

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

- 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:

"In a suitable habitat and climate it [M. sinensis] can be spread accidentally beyond gardens as rhizomes discarded in garden waste or contaminated soil. Pieces of rhizome 4 cm long can be used to propagate the species and smaller fragments may well give rise to feral stands." No other evidence of dispersal by humans, though seeds could potentially attach to clothing.

Reference(s):

- Riches, C. (2008). Miscanthus sinensis (eulalia) Datasheet In: Invasive Species Compendium.

Total PRE Score

PRE Score: 17 -- Reject (high risk of invasiveness)
Confidence: 62 / 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:

This evaluation does not have any reviewers.

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.

Issue ID # 3209

Date Created: May 15, 2017 - 4:24pm
Date Updated: June 19, 2017 - 2:20pm

Submitted by: Clair Ryan

Status: Fixed
Type:
Severity: Major
Scope: Evaluation as a whole

Issue Description

The phrase "evidence is lacking that 'Morning Light' did not contribute to naturalized populations," is used several times in the evaluation. Based on my understanding of the PRE evaluation protocol, the burden of proof is supposed to be the other way around - i.e. a finding of no evidence related to the specific cultivar is supposed to default to a "no" answer. There's no question that Miscanthus sinensis as a species naturalizes and is invasive in comparable climates, but it is doubtful that enough study has been done on the contributions of specific cultivars to naturalized populations to difinitively say that 'Morning Light' has naturalized and is invasive (though the point is well taken that studies demonstrate the potential of this cultivar to set significant amounts of seed in Illinois).

Issue Resolution (Screener's Response to Issue)

I also found this to be a complicated and difficult issue for this evaluation: there is no definitive proof that the cultivar 'Morning Light' has contributed to naturalized populations of Miscanthus sinensis. Unless someone researches the genetics, the true answer may never be known. In the Evaluation Notes, I explained some of these difficulties and wrote "Since it is clear that the species is invasive, the burden of proof rests on the cultivar to show that it is not." This assumption is not part of the PRE protocol, but PRE is still in beta and is exploring how to evaluate cultivars. This reviewer feels that a cultivar should not be treated as though it is a different species entirely: it can be assumed to be almost the same as the parent species with minor differences which are usually aesthetic (an obvious exception is if it was bred for sterility). Also, with a known invasive species, it is irresponsible to wait for positive proof for each cultivar. I understand this is a particularly contentious issue for Miscanthus, which is a popular and

economically important landscaping plant. However, I stand by my review and feel it is as accurate as possible based on the available information.

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.