Plant Risk Evaluator -- PRE™
Evaluation Report

Arundo donax -- Georgia

2017 Farm Bill PRE Project

PRE Score: 13 -- Evaluate this plant further
Confidence: 71 / 100
Questions answered: 20 of 20 -- Valid (80% or more questions answered)

Privacy: Public
Status: Submitted

Evaluation Date: July 16, 2017

This PDF was created on July 06, 2018

Plant Evaluated

Arundo donax

Image by Forest & Kim Starr

Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Arundo donax*) 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

Arundo donax is a globally distributed grass that has become naturalized and invasive in many regions. Its primary form of spread is through vegetative reproduction, where new plants arise from either rhizome growth or as clones that form when fragments travel through waterways. It is thought that seed production is not common or does not happen out of the plants native range. This PRE evaluation score is interesting and perhaps highlights a need to address weighting of questions that are related to a plants reproduction. In this case, A.donax, which is known as an aggressive invader that can multiply quickly and displace/ outcompete native plants, was given a low PRE score because it does not rely on seed for reproduction, and therefore scored a NO on Q's 13-17. I think this heavily skews the outcome of the PRE to a more favorable score for serious invaders that spread through vegetative means. Lastly, most southeastern resources suggest plantings of A.donax are not yet invasive but may pose a serious threat in neighboring areas. Even though the PRE gave a score of 13 the screener believes this species is too high of a risk for further ornamental plantings, given its serious invasive nature throughout other parts of the world, its ability to spread vigorously, its persistence after management, and its ability to easily spread via water, plant fragments, and garden waste.

General Information

Status: Submitted
Screener: Kylie Bucalo
Evaluation Date: July 16, 2017

Plant Information

Plant: *Arundo donax*

Regional Information

Region Name: Georgia

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

Answer / Justification:

from CABI- "It is now widely dispersed into all similar climates of the world, and has also become naturalized and invasive in many regions, including southern Africa, sub-tropical USA (below 300 m altitude), Mexico, the Caribbean, South America and Pacific islands (Hafliger and Scholtz, 1981)." Additionally giant reed is labelled as a Noxious weed in California and is one of the most serious and widespread invasive species in the state.

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.
- USDA Plants Database (0). Plants Profile for Arundo donax (giant reed)_USDA.

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

Answer / Justification:

A.donax has been introduced into several states within the southeastern USA, including Alabama, and Florida which are matches for the region of concern.

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.
- Alabama Invasive Plant Council (0). Arundo donax_Alabama Invasive Plant Council.
- USDA Plants Database (0). Plants Profile for Arundo donax (giant reed)_USDA.

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

Answer / Justification:

CABI resource lists 30 different countries where Arundo donax is listed as invasive. From Alabama Invasive plant council resource- "Giant reed has become an invasive threat to riparian, wetland and coastal areas of the Southwest (Else, 1996;Bell, 1997; Wijte et al. 2005). It has also invaded areas of the Caribbean (Kairo et al. 2003), Hawaii and other Pacific Islands as well as several habitats in Australia (Dudley, 2005)." CABI- "It is listed as one of the 100 world's worst invasive alien species (ISSG, 2011)".

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.
- Alabama Invasive Plant Council (0). Arundo donax_Alabama Invasive Plant Council.

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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: **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:

A.donax is considered a category 3 plant by GAEPPC which is described as an "Exotic plant that is a minor problem in Georgia natural areas, or is not yet known to be a problem in Georgia but is known to be a problem in adjacent states". AL Invasive plant council suggests although A. donax is present in many southeastern states "Anecdotal references suggest that, in general, ornamental plantings of giant reed in the Southeast have not been highly invasive. However, localized and scattered infestations of giant reed are present across the Southeast and the invasive potential, especially with added sources of introduction, is unknown." However CABI resource lists A. donax as invasive in many southern states including Georgia. I have marked this as a no, but put low confidence level because of conflicting resources. Climate matches could be made to countries in the pacific (areas of Qld in Australia for example where A.donax is listed as a noxius weed) but without geolocation it is hard to define if its an exact match as only portions of QLD, and Australia for theat matter are highlighted as a match to the region of concern.

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.
- Alabama Invasive Plant Council (0). Arundo donax_Alabama Invasive Plant Council.
- Georgia Invasive Species Task Force (0). List of Non-native Invasive Plants in Georgia - Georgia Invasive Species Task Force- LIST.

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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:

Could not find any information on this. Arundo pliniana has very few occurrences in GBIF, and none are in US or climate matching regions.

Reference(s):

- [Anonymous] .

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

Answer / Justification:

A. donax has 25,918 occurences in GBIF, making it an abundant and widespread plant. In the US, occurrences are scattered from east to west coast along the bottom half of the country, making it a

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

Answer / Justification:

A.donax outcompetes natives for water and soil space, but does not smother or cover like a vine.

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.
- Alabama Invasive Plant Council (0). Arundo donax_Alabama Invasive Plant Council.

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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:

From CABI- " A. donax is highly flammable and can change fire regimes in invaded areas (USDA-ARS, 2014)." Also from CABI- "A. donax is an extremely flammable plant even when green. The thick stands ignite quickly and easily, and through their extensive placement, can double the available fuel for wildfires which can spread rapidly through entire riparian systems, often near urbanized areas. Post-fire regeneration of even greater quantities of A. donax can then occur (Scott, 1994)."

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.

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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: **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:

Other researchers have noted that Arundo can clog waterways.

Reference(s):

- CABI (0). Arundo donax (giant reed) - CABI datasheet.

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

- 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:

Dense stands are formed. CABI "A. donax is an aggressive species with an ability to reproduce quickly, allowing it to out-compete native plant species. It displaces native plants and wildlife as a consequence of the massive stands it forms but the exact mechanism of competition is not yet known".

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.

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:

Excerpt from CABI "Population expansion thus occurs almost exclusively through vegetative reproduction in most reported cases, either from underground rhizome extension of a colony or from plant fragments carried downstream, to become rooted and form new clones (Else, 1996). Root formation can also occur where an attached culm has fallen over and is in contact with the substrate, and such layering has now been proposed as a more common means of reproduction in invasive stands in the USA than either via rhizome extension or plant fragments (Boland, 2006). Much of the cultivation of A. donax is therefore initiated by planting rhizomes that root and sprout readily. Wild stands in the USA have reportedly yielded over 20 t of oven-dry biomass per ha (Perdue, 1958)."

Reference(s):

- [Anonymous] .

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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: **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:

Yes. One of the known pathway vectors for the spread of A.donax is through incorrect dispersal of garden waste. Plants or parts of plants can regenerate when not disposed of properly. From CABI "It is available via the nursery trade and spreads as a garden escapee and through the disposal of garden waste."

Reference(s):

- [Anonymous] .

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

- 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:

No. its primary mechanism of spread is through vegetative reproduction. Excerpt from Alabama Invasive plant council- "Giant reed blooms during the summer and fall; however, there is no record of viable seed production in the US (Bell, 1997; Wijte et al., 2005). This species is capable of producing viable (wind-dispersed) seed in its native habitat, although the extent of successful sexual reproduction is unclear (Lewa ndowski et al., 2003). Research regarding the mechanism of seed sterility and the potential for production of viable seed in the US has yet to be conducted. "

Reference(s):

- Alabama Invasive Plant Council (0). Arundo donax_Alabama Invasive Plant Council.

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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:

See above.

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.
- Alabama Invasive Plant Council (0). Arundo donax_Alabama Invasive Plant Council.

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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: **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:

Little is known about seed production and germination, but as this is not the main form of reproduction, answered the question NO. Excerpt from CABI- "Very little information is available in the literature regarding the biology of A. donax. Although plants have been grown in scattered locations from seed collected in Asia, it is reported that A. donax does not produce viable seeds in most areas where it is apparently well-adapted. The importance of sexual reproduction to the species, as well as seed viability, dormancy, germination and seedling establishment have yet to be well studied. Population expansion thus occurs almost exclusively through vegetative reproduction in most reported cases, either from underground rhizome extension of a colony or from plant fragments carried downstream, to become rooted and form new clones (Else, 1996)."

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.

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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: **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:

See question 13.

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

Answer / Justification:

See question 13.

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: **No**, which contributes **0** points to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available 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 not provided a confidence score on this question. Consider creating an issue on PRE so the screener can become aware of this detail.

Answer / Justification:

Both. CABI- "In its native range, wind dispersal of seeds is facilitated by having a dense seed head on the end of a tall, flexible stem, presumably sending the seeds some distance. Established plants may expand by rhizome extension roughly 0.5 m per year. More research is needed to determine the importance of sexual reproduction and whether viable seeds are in fact produced in this species. In its introduced range, vegetative propagation is key to its establishment in new locations, and is essentially an intra-basin and downstream phenomenon with rhizome fragments dispersing along watercourses, particularly post flooding." Mostly answering a YES to this for the water dispersal of fragmented plants and their ability to travel down waterways.

Reference(s):

- CABI (0). Arundo donax (giant reed)_CABI.
- Alabama Invasive Plant Council (0). Arundo donax_Alabama Invasive Plant Council.

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

Answer / Justification:

From CABI- "It may be spread locally by agricultural machinery and as a contaminant in soil and crop seeds."

Reference(s):

- [Anonymous] .

Total PRE Score

PRE Score: 13 -- Evaluate this plant further
Confidence: 71 / 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:

- Steve Moore August 30, 2017

This evaluation has a total of 1 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.