Plant Risk Evaluator -- PRE™
Evaluation Report

Berberis thunbergii -- Georgia

2017 Farm Bill PRE Project

PRE Score: 15 -- Evaluate this plant further
Confidence: 73 / 100
Questions answered: 19 of 20 -- Valid (80% or more questions answered)

Privacy: Public
Status: Completed

Evaluation Date: April 15, 2017

This PDF was created on August 13, 2018

Plant Evaluated

Berberis thunbergii

Image by Sage Ross

Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Berberis thunbergii*) 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

Berberis thunbergii or Japanese barberry was introduced into the United States in the late 1800's and has been described as "one of the most widely known and planted exotic shrubs in the United States" (Silander and Klepeis, 1999). It's rapid spread throughout the northeastern states was due to its popularity as an ornamental. During the early 1900's Japanese barberry was being considered as an alternative to common barberry (Berberis vulgaris), which was being eradicated at the time due to it's recognition as a noxious weed. Researchers estimate Berberis thunbergii had become naturalized by 1920 in selected areas, and by the 1930's its distribution was spreading outward from its source of origin (Silander and Klepeis, 2009). However perceptions of the plant begun to change as early as the 1950's when it went from simply an exotic in the landscape to a serious invader of natural communities (Silander and Klepeis, 2009). The distribution of Japanese barberry in Georgia is unclear. Multiple references show records for only two counties (Dekalb, and Rabun), however many resources suggest the plant poses a significant threat to the northern half of the state. Distribution of Japanese Barberry in the southeast for "climate matching" states such as North Carolina and South Carolina also warrant concern for evaluating this plant as a potential invasive threat to Georgia. Lastly it may be important to note that there are cultivars of Berberis thunbergii that are reported to be sterile such as Berberis thunbergii 'Kobold'. This warrants more investigation, and could prove a good compromise for those interested in the plants hardy hedge like characteristics, but do not want to risk ornamental escape. As always the recommendation for sterile cultivars of potentially invasive parent species should be to trial these cultivars for numerous growing seasons to asses the reports of lowered fecundity. Here it should also be noted that some resources indicate that fruitless cultivars such as 'Red chief' and 'Golden devine' still produced fruit during plant trials, indicating (as stated above), long term plant trials are required to asses a cultivars sterility.

General Information

Status: Completed
Screener: Kylie Bucalo
Evaluation Date: April 15, 2017

Plant Information

Plant: *Berberis thunbergii*

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

Answer / Justification:

Taken from Silander and Klepeis et al. 1999. " Since 1910 it has become fully naturalized throughout most of the Northeast"

Reference(s):

- Silander, J. A., & Klepeis D. M. (1999). The invasion ecology of Japanese barberry (Berberis thunbergii) in the New England landscape. Biological invasions. 1, 189–201.

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

Answer / Justification:

EDD MapsS reference shows distribution matches region of concern (though many resources contradict whether or not the plant is yet to be found in Northern counties of Georgia). EDD MapsS also suggests distribution of Japanese Burberry in areas that are shown to match the region of concern via the climate match tool such as North Carolina and South Carolina. The datasheet report reference from the Invasive species Compendium also shows that Berberis thunbergii was introduced and naturalized in Europe, and more specifically south-western Germany. Plant right climate match tool identifies portions of south western Germany as a match to the region of concern (GA). I cannot gain access to the resource given for this distribution in Germany of Berberis thunbergii (öcker R, Dirk M, 1998. Distribution and spreading of alien trees and shrubs in south western Germany and contributions to germination biology. In: Starfinger U, Edwards K, Kowarik I, Williamson M, eds. Plant Invasions: Ecological Mechanisms and Human Responses. Leiden, The Netherlands: Backhuys Publishers, 285-297), so I am unable to confirm with 100% certainty that the climate match tool is highlighting the same area in Germany as the distribution given in the resource. Therefore my Confidence level is medium for this question. GISD references Germany distribution as well, long with Distribution in New South Wales, Australia. Northern parts of this Australian state are matched to our region of concern in the climate tool.

Reference(s):

- CABI (0). Berberis thunbergii (Japanese barberry) CABI invasive species compendium.
- EDDSMapS (0). Japanese barberry (Berberis thunbergii) - EDDMapS State Distribution.
- Global Invasive Species Database (0). GISD.

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

Answer / Justification:

Taken from Silander and Klepeis et al. 1999. " Since 1910 it has become fully naturalized throughout most of the Northeast, and has been characterized as an extremely invasive species".

Reference(s):

- Silander, J. A., & Klepeis D. M. (1999). The invasion ecology of Japanese barberry (Berberis thunbergii) in the New England landscape. Biological invasions. 1, 189–201.
- EDDSMapS (0). Berberis thunbergii- Invasive Plant Atlas New England.

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

Answer / Justification:

GISD lists the species as established and Invasive in North Carolina, which matches the region of concern according to the climate match map. Other websites show distribution into NC but do not mention its invasiveness, therefore CI is medium.

Reference(s):

- Global Invasive Species Database (0). GISD.

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

Answer / Justification:

Berberis vulgaris a non-native invasive is distributed in South Carolina, which matches the region of concern in the climate matching tool. Additionally some sources show distribution of Berberis vulgaris extending into North Carolina and Virginia, both which match the region of concern.

Reference(s):

- EDDSMapS (0). Berberis vulgaris- Invasive Plant Atlas of New England.
- USDA Plants Database (0). Plants Profile for Berberis vulgaris (common barberry)- USDA.

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

Answer / Justification:

This was hard to asses for this species. Many regions where it is distributed are a climate match to the region of concern. However it is to hard to ascertain the exact distribution and climate match beyond the level of country outside the US. I do not think I have enough information to conclusively say that over 50% of its distribution is a climate match to GA, but it may be fairly close. Distribution in the US is scattered across several matching states.

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

Answer / Justification:

Multiple resources stated this.

Reference(s):

- NPS (0). PCA Alien Plant Working Group - Japanese Barberry (Berberis thunbergii).
- Plant Conservation Alliance®s Alien Plant Working Group (0). PCA Fact sheet: Japanese Barberry.

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

- 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. Fire may be used to kill barberry and prevent future establishment, where the plant is present in fire adapted communities.

Reference(s):

- USDA Forest Service Forest Health Staff Newtown Square PA (0). Weed of the Week- Japanese Barberry- US Forest service.

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

Reference(s):

- [Anonymous] .

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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:

Almost all references gathered on Berberis thunbergii inferred this. Many references used the verbage "dense stands"

Reference(s):

- NPS (0). PCA Alien Plant Working Group - Japanese Barberry (Berberis thunbergii).
- Plant Conservation Alliance®s Alien Plant Working Group (0). PCA Fact sheet: Japanese Barberry.

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

Answer / Justification:

Japanese Barberry spreads predominately through seed dispersal, but can spread by vegetative expansion. Vegetative spread is through branches touching the ground that can root to form new plants. This is taken from this resource but many other resources also note this, and describe the vegetative spread as "creeping roots", or "root creepers" or "tip rooting branches".

Reference(s):

- NPS (0). PCA Alien Plant Working Group - Japanese Barberry (Berberis thunbergii).

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

Answer / Justification:

Plant Conservation Alliance Alien Plant Working Group fact sheet indicates that root fragments left in soil can sprout to form new plants, however this is not the main method of reproduction.

Reference(s):

- Plant Conservation Alliance®s Alien Plant Working Group (0). PCA Fact sheet: Japanese Barberry.

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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.

Reference(s):

- Silander, J. A., & Klepeis D. M. (1999). The invasion ecology of Japanese barberry (Berberis thunbergii) in the New England landscape. Biological invasions. 1, 189–201.
- NPS (0). PCA Alien Plant Working Group - Japanese Barberry (Berberis thunbergii).
- Plant Conservation Alliance®s Alien Plant Working Group (0). PCA Fact sheet: Japanese Barberry.

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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:

I could not find any resources stating number of seed per fruit data, the New England research focused more on effect of shading on fruit production. Here is is interesting to note that species produced fruit even in low level light conditions. However multiple resources use verbiage such as "large number of seeds". Additionally the fruits are present from maturation in late summer and persist through winter. Biology says yes, but I am speaking with no data on actual seed per fruit.

Reference(s):

- Silander, J. A., & Klepeis D. M. (1999). The invasion ecology of Japanese barberry (Berberis thunbergii) in the New England landscape. Biological invasions. 1, 189–201.
- NPS (0). PCA Alien Plant Working Group - Japanese Barberry (Berberis thunbergii).
- Plant Conservation Alliance®s Alien Plant Working Group (0). PCA Fact sheet: Japanese Barberry.

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

Answer / Justification:

Silander and Klepeis et.al. suggest that B.thunbergii requires a "specific cold stratification period for germination" and they suggest this may hamper the species efforts to spread to southern states. This indicates potential spread a possibility for the more northern counties in Georgia only, that can provide this stratification and germination temps.

Reference(s):

- Silander, J. A., & Klepeis D. M. (1999). The invasion ecology of Japanese barberry (Berberis thunbergii) in the New England landscape. Biological invasions. 1, 189–201.

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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 / Justification:

no information found

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: **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:

See question 14. The fruits are present from maturation in late summer and persist through winter.

Reference(s):

- Silander, J. A., & Klepeis D. M. (1999). The invasion ecology of Japanese barberry (Berberis thunbergii) in the New England landscape. Biological invasions. 1, 189–201.
- NPS (0). PCA Alien Plant Working Group - Japanese Barberry (Berberis thunbergii).
- Plant Conservation Alliance®s Alien Plant Working Group (0). PCA Fact sheet: Japanese Barberry.

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

Answer / Justification:

Although the primary form of dispersal is via birds in the Silander and Klepeis paper they asses efficacy of seed dispersal by auditing a forest tract where b.thunbergii is is distributed heterogenously. There results show that 92% of seedlings were underneath or within 1 m of the canopy of an adult shrub. They conclude that the dispersal of Japanese barberry is leptokurtic.

Reference(s):

- Silander, J. A., & Klepeis D. M. (1999). The invasion ecology of Japanese barberry (Berberis thunbergii) in the New England landscape. Biological invasions. 1, 189–201.
- NPS (0). PCA Alien Plant Working Group - Japanese Barberry (Berberis thunbergii).
- Plant Conservation Alliance®s Alien Plant Working Group (0). PCA Fact sheet: Japanese Barberry.

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

- 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:

Biotic disbursement is by birds.

Reference(s):

- [Anonymous] .

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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: **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 evidence of this found in the research

Reference(s):

- [Anonymous] .

Total PRE Score

PRE Score: 15 -- Evaluate this plant further
Confidence: 73 / 100
Questions answered: 19 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:

• John "Doc" Ruter	January 9, 2018
• Eamonn Leonard	December 7, 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.

Issue ID # 3207

Date Created: May 15, 2017 - 2:02pm
Date Updated: June 22, 2017 - 8:28am

Submitted by: Brian Jernigan

Status: Fixed
Type:
Severity: Minor
Scope: Q18. Are the plant’s propagules dispersed long distance (>100 m) by mammals or birds or via domestic animals?

Issue Description

What level of movement by birds would be considered enough to make this a yes?

Issue Resolution (Screener's Response to Issue)

The question indicates that long distance should be >100m. My answer to the question refers to the paper by Silander and Klepeis thats showed 92% of seedlings were found within 1 m of the canopy of the adult shrub, and therefore in this study they conclude that the dispersal of Japanese barberry is leptokurtic.

Issue ID # 3206

Date Created: May 15, 2017 - 1:52pm
Date Updated: June 22, 2017 - 8:23am

Submitted by: Brian Jernigan

Status: Fixed
Type:
Severity: Minor
Scope: Q17. Does this plant continuously produce seed for >3 months each year or does seed production occur more than once a year?

Issue Description

did not find a reference to the seed production occuing more than once a year, assuming the reviewer is looking at the lenght of time the fruit is on the plant.

Issue Resolution (Screener's Response to Issue)

Question 17 refers to an above question in the PRE (Q14) which gives the following information

"I could not find any resources stating number of seed per fruit data, the New England research focused more on effect of shading on fruit production. Here is is interesting to note that species produced fruit even in low level light conditions. However multiple resources use verbiage such as "large number of seeds". Additionally the fruits are present from maturation in late summer and persist through winter. Biology says yes, but I am speaking with no data on actual seed per fruit. "

The steakholder is correct in their assumption i used information on how long th fruit persists on the tree. I have added this info to the actual question comments rather than refering to another question.

Issue ID # 3205

Date Created: May 15, 2017 - 1:38pm
Date Updated: June 22, 2017 - 9:22am

Submitted by: Brian Jernigan

Status: Fixed
Type:
Severity: Minor
Scope: Q01. Has the species (or cultivar or variety, if applicable) become naturalized where it is not native?

Issue Description

invasiveness in the northeast is know, and potentially north Georgia, but not in southern Georgia, how does PRE address regional invasiveness?

Issue Resolution (Screener's Response to Issue)

I will pass on this info to Project coordinator. I think climate matching questions attempt to indicate regional invasiveness. Also having the same plant evaluated across multiple institutions in the US allows for a more regional approach. For example Buddleja davidii will be evaluated through PRE by representatives in both Texas and Califormia, and although some questions will be identical (mostly biology and taxonomy) some questions will have regional difference that allow the PRE result to reflect the plants likelihood of invasivess in that region only. Hope this answers your question.

Issue ID # 3204

Date Created: May 15, 2017 - 1:34pm
Date Updated: June 22, 2017 - 9:22am

Submitted by: Brian Jernigan

Status: Fixed
Type:
Severity: Minor
Scope: Plant Information

Issue Description

Cultivars have not been addressed, there is at least one that has been promoted as non-invasive that I believe should be noted

Issue Resolution (Screener's Response to Issue)

This field should be filled out only when a cultivar is the primary plant being evaluated. I will add a paragraph to the plant summary field to indicate the presence of sterile cultivars. This could be a good comprimise for GA, depending on plant trials. Please read the amended section and let me know if you want anything else added. is 'Kubold' the cv. you were sugesting?

here is the ref i used for the other two i mention

http://www.bioone.org/doi/abs/10.1614/IPSM-D-12-00029.1

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.