Plant Risk Evaluator -- PRE™
Evaluation Report

Pyrus calleryana 'Bradford' -- Georgia

2017 Farm Bill PRE Project

PRE Score: 18 -- Reject (high risk of invasiveness)
Confidence: 61 / 100
Questions answered: 19 of 20 -- Valid (80% or more questions answered)

Privacy: Public
Status: Submitted

Evaluation Date: May 20, 2017

This PDF was created on August 13, 2018

Plant Evaluated

Pyrus calleryana 'Bradford'

Image by David Stephens, Bugwood.org

Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Pyrus calleryana 'Bradford'*) 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

The evaluation for this cultivar was challenging as there are many ambiguities in the resources between whether the resource was detailing information about the parent species (Callery pear or Pyrus callerana) or cultivar (Bradford pear or Pyrus calleryana 'Bradford'). This is primarily because of the way the cultivar's are produced (grafting scions onto rootstock) and the fact that the Bradford cultivar was one of the first to be grafted and sold in the US around 1962 and therefore is one of the more dominant cultivars in the landscape. Additionally challenges arise when describing either the parents species or cultivars naturalization and invasiveness because of the complex ways in which they can or cannot reproduce. GENERALLY individual cultivars themselves are not invasive, but different cultivars can hybridize when located in close proximity and create a situation in which invasive plants can be produced. "Therefore the plants that spread in natural areas are not cultivars. They are sexually reproducing populations consisting of multiple genotypes that recombine every generation" (https://www.nps.gov/plants/alien/pubs/midatlantic/pyca.htm). Therefore some of the answers (particularly q 1-6) become hard to answer for the parent species or the 'Bradford' cultivar. Overall whilst researching this plant it is recommended that Bradford pear and any cultivar of Callery pear should be used with caution in the region of concern, because even though they are self incompatible it has been shown that abundant fruit set has been found in many cultivars growing in urban areas due to hybridization between cultivars. As more cultivars are introduced the likelihood of seed production continues. Lastly it seems that despite its risk of invasiveness the cultivar has other issues which prevent it being a good landscape choice. Multiple resources report that the Bradford cultivar has issues with its upright growth and narrow branch angles giving rise to limb breakage. So despite its evaluation here it seems that this cultivar has more inherent issues that negates consideration for selling. The outcome of this PRE is indicative of the threat this cultivar possess given the frequency at which it has been planted in the south east as an urban street tree and its ability to escape cultivation via hybridization and outcrossing. I have personally witnessed the abundance of these street trees both in downtown Atlanta and outer perimeter suburban areas.

General Information

Status: Submitted
Screener: Kylie Bucalo
Evaluation Date: May 20, 2017

Plant Information

Plant: *Pyrus calleryana 'Bradford'*

If the plant is a cultivar, how does its behavior differs from its parent's?
The 'Bradford' cultivar was created by grafting cuttings (scions) of a thornless plant onto rootstock of P. calleryana. and therefore the cultivar is thornless, although some references conflict on this. Secondly Bradford pear seems to differ in its growth habit. This cultivar is often described as having a more dense growth habit suitable for urban areas, with many vertical limbs that are closely packed around the trunk, with narrow crotch angles. This habit contributed to the cultivars problems with limb breakage in windy and snowy areas. Lastly the plant produces sterile fruits because they do not self pollinate, however can hybridize with other cultivars to produce fertile fruit. This is however NOT different to the parent species, or other members of the Rosaceae famliy.

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

Answer / Justification:

Used parent species information. CL set to medium. USDA distribution map shows P. calleryana present across the southeast, and as far west as Texas, and also extending North as far as Maryland and New Jersey. Excerpts from Culley and Hardiman (2007): "In recent years, Callery pear seedlings have begun to appear in many natural areas in the eastern United States". "Wild P. calleryana is found in natural areas in at least 26 states"

Reference(s):

- USDA Plants Database (0). Plants Profile for Pyrus calleryana (Callery pear)_USDA.
- Culley, T. M., & Hardiman N. A. (2007). The Beginning of a New Invasive Plant: A History of the Ornamental Callery Pear in the United States. Bioscience. 57, 956–964.

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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:

Parent species used. CL set to medium. USDA distribution map shows P. calleryana present across the southeast, and as far west as Texas, and also extending North as far as Maryland and New Jersey. Many of these states are a climate match for the region of concern.

Reference(s):

- USDA Plants Database (0). Plants Profile for Pyrus calleryana (Callery pear)_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:

Bradford Pear is considered invasive in Maryland (MBOT resource) Excerpt from Culley and Hardiman (2007) "P. calleryana itself or the cultivar ‘Bradford’ is listed as invasive on plant lists in six states (Alabama, Georgia, North Carolina, Maryland, New Jersey, and Pennsylvania) and is on watch lists in four others (Tennessee, New York, South Carolina, and Oklahoma). Callery pears are also spreading from cultivation in Delaware and Arkansas, and in southwestern Ohio, Callery pear saplings and trees have been found in several urban parks that adjoin residential areas where cultivated ornamental pears are widely planted. In Australia, Callery pear is considered a potential environmental weed"

Reference(s):

- Missouri Botanical Garden PlantFinder (0). Pyrus calleryana 'Bradford' - Plant FinderMBOT.
- Culley, T. M., & Hardiman N. A. (2007). The Beginning of a New Invasive Plant: A History of the Ornamental Callery Pear in the United States. Bioscience. 57, 956–964.

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

Answer / Justification:

Bradford Pear is invasive in Maryland. Maryland is a climate match for the region of concern. The GEPPC ranks Pyrus Calleryana 'Bradford' as a category 3 plant, which is described as "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". Additionally NC state describes the cultivar as an "invasive aggressive tree, that will invade disturbed areas and displace native plant communities". NC is a match for the region of concern. Excerpt from Culley and Hardiman (2007) "P. calleryana itself or the cultivar ‘Bradford’ is listed as invasive on plant lists in six states (Alabama, Georgia, North Carolina, Maryland, New Jersey, and Pennsylvania) and is on watch lists in four others (Tennessee, New York, South Carolina, and Oklahoma). Callery pears are also spreading from cultivation in Delaware and Arkansas, and in southwestern Ohio, Callery pear saplings and trees have been found in several urban parks that adjoin residential areas where cultivated ornamental pears are widely planted. In Australia, Callery pear is considered a potential environmental weed"

Reference(s):

- North Carolina State University (0). Callery 'Bradford' Pear_NCSU.EDU.
- Missouri Botanical Garden PlantFinder (0). Pyrus calleryana 'Bradford' - Plant FinderMBOT.
- Georgia Exotic Pest Plant Council (0). List of Non-Native Invasive Plants in Georgia - Georgia Exotic Pest Plant Council.

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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:

Pyrus communis is listed as an invasive species by the East Central Florida Cooperative Invasive Species Management (CISMA) group. Parts of this state are a climate match for the region.

Reference(s):

- FloridaInvasives.org (0). EDDMapS Florida - Species Information - Florida Invasive Species Partnership_CISMA.

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

- 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:

U.S distribution of P.calleryana given by USDA is an almost 100% complete match with the PRE climate match tool. If using the range given by the IFAS resource (which shows a much broader distribution) it is still > 50% match within the U.S. Using the GBIF resource for International occurrences of P.calleryana, Occurences in Australia are a match at >50%, Occurrences in Spain look like a match at >50%, no match for Africa, and >50% match for its natural range in China. Overwhelming Yes for this answer.

Reference(s):

- USDA Plants Database (0). Plants Profile for Pyrus calleryana (Callery pear)_USDA.
- Watson, E. F. Gilman, & G. D. (2015). Pyrus calleryana 'Bradford': 'Bradford' Callery Pear_IFAS.EDU.
- GBIF (0). Pyrus calleryana Decne. - gbif.

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

Answer / Justification:

Parent species used. CL set to medium. Excerpt from NPS resource "Once established Callery pear forms dense thickets that push out other plants including native species that can’t tolerate the deep shade or compete with pear for water, soil and space".

Reference(s):

- NPS (0). Callery Pear (Pyrus calleryana)_NPS.GOV.

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

Answer / Justification:

No due to lack of evidence.

Reference(s):

- [Anonymous] .

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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:

There is no evidence of this. They do produce thorny thickets but i am not sure of this warrants a yes answer, as I'm not sure I would describe them as "spines that cause serious damage." Could be changed if stakeholder disagrees.

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

Answer / Justification:

Parent species used. CL set to medium. Excerpt from NPS resource "Once established Callery pear forms dense thickets that push out other plants including native species that can’t tolerate the deep shade or compete with pear for water, soil and space". Excerpt from Culley and Hardiman (2007) "P. calleryana can also form dense, thorny thickets, especially from the root sprouts of abandoned trees. These thickets, which are impenetrable to humans, may provide cover for birds and small mammals."

Reference(s):

- NPS (0). Callery Pear (Pyrus calleryana)_NPS.GOV.
- Culley, T. M., & Hardiman N. A. (2007). The Beginning of a New Invasive Plant: A History of the Ornamental Callery Pear in the United States. Bioscience. 57, 956–964.

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:

Can produce root suckers. Corrected via reviewers comments.

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: **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] .

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

Answer / Justification:

I have answered this question No, as I felt it was fair to reflect in the evaluation that this cultivar and the parent species are both self incompatible and should produce sterile seed. This question is debatable and could easily switch to a Yes, given that seed production is the USUAL means of reproduction if a non-self cross is made. Additionally seed can be produced if the grafted rootstock sprouts and fertillizes the scion (and vice vera), fertile seed would be produced.

Reference(s):

- NPS (0). Callery Pear (Pyrus calleryana)_NPS.GOV.
- Culley, T. M., & Hardiman N. A. (2007). The Beginning of a New Invasive Plant: A History of the Ornamental Callery Pear in the United States. Bioscience. 57, 956–964.

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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:

In the following questions (14-17) i chose to answer the questions assuming the cutivar was outcrossed and fertilized fruits were produced. If the cultivar is out crossed and fertile seeds are produced they are described as "copious" in the NPS resource. CL set to Low as none of the other resources use this verbage.

Reference(s):

- NPS (0). Callery Pear (Pyrus calleryana)_NPS.GOV.

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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 / Justification:

answer field left blank

Reference(s):

- [Anonymous] .

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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.

Answer / Justification:

Pyrus calleryana is a perennial tree that begins flowering at approximately three years of age. If out crossed to a non self cultivar it is assumed fertile seeds could be produced.

Reference(s):

- Culley, T. M., & Hardiman N. A. (2007). The Beginning of a New Invasive Plant: A History of the Ornamental Callery Pear in the United States. Bioscience. 57, 956–964.

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

Answer / Justification:

Fruits take several months to develop and remain on the tree until they mature in early to late autumn (August to October).

Reference(s):

- Culley, T. M., & Hardiman N. A. (2007). The Beginning of a New Invasive Plant: A History of the Ornamental Callery Pear in the United States. Bioscience. 57, 956–964.

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:

When seed is produced it is dispersed by birds.

Reference(s):

- NPS (0). Callery Pear (Pyrus calleryana)_NPS.GOV.
- Missouri Botanical Garden PlantFinder (0). Pyrus calleryana 'Bradford' - Plant FinderMBOT.
- Watson, E. F. Gilman, & G. D. (2015). Pyrus calleryana 'Bradford': 'Bradford' Callery Pear_IFAS.EDU.
- Culley, T. M., & Hardiman N. A. (2007). The Beginning of a New Invasive Plant: A History of the Ornamental Callery Pear in the United States. Bioscience. 57, 956–964.

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

Answer / Justification:

There is no evidence of this.

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

Answer / Justification:

There is no evidence of this.

Reference(s):

- [Anonymous] .

Total PRE Score

PRE Score: 18 -- Reject (high risk of invasiveness)
Confidence: 61 / 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:

• David Coyle	February 21, 2018
• Stewart Chandler	January 15, 2018
• John "Doc" Ruter	January 9, 2018
• Timothy Daly	January 2, 2018
• Michael Yanny	December 6, 2017

This evaluation has a total of 5 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 # 6338

Date Created: February 21, 2018 - 8:02pm
Date Updated: March 26, 2018 - 3:18am

Submitted by: David Coyle

Status: Fixed
Type: Suggestion
Severity: Major
Scope: Q11. Does this species (or cultivar or variety) reproduce and spread vegetatively?

Issue Description

This plant does spread vegetatively through root suckers.

Issue Resolution (Screener's Response to Issue)

Changed answer to question to represent reviewers comments

Issue ID # 6275

Date Created: January 9, 2018 - 11:43am
Date Updated: February 16, 2018 - 11:22am

Submitted by: John "Doc" Ruter

Status: Fixed
Type: Suggestion
Severity:

Minor

Scope: Q11. Does this species (or cultivar or variety) reproduce and spread vegetatively?

Issue Description

Trees that have been cleared with mechanical equipment will sprout from the roots if disturbed, so not "reproducing" in a strict sense

Issue Resolution (Screener's Response to Issue)

The help section for this question indicates what should be a "yes" and what should be a "no" (below in italics). I think it should stay as a no given the parameters below and the feedback from the revier that sprouting occurs after mechanical damage.

Please note: Neither growth from the root crown in herbaceous species after damage; nor an indication that a species can be propagated vegetatively by horticultural means (e.g., manual division, softwood cuttings) provides sufficient evidence to answer the question yes.

*Answer **yes** if there is evidence of the plant's ability to spread vegetatively from its original location. If the plant is simply persisting, merely re-sprouting but not spreading, then the question should be answered **no**.*

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.