



***Plant Risk Evaluator -- PRE™
Evaluation Report***

Pyrus calleryana 'Bradford' -- Illinois

2017 Farm Bill PRE Project

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

Confidence: 74 / 100

Questions answered: 19 of 20 -- Valid (80% or more questions answered)

Privacy: Public

Status: Completed

Evaluation Date: August 23, 2017

This PDF was created on June 20, 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.

General Information

Status: Completed

Screener: Emily Russell

Evaluation Date: August 23, 2017

Plant Information

Plant: *Pyrus calleryana* 'Bradford'

If the plant is a cultivar, how does its behavior differs from its parent's?

'Bradford' was the first selection of *Pyrus calleryana* to become commercially available in the United States in 1962. 'Bradford' was selected at the USDA Plant Introduction Station in Glenn Dale, Maryland. The crown is pyramidal with densely packed branches which are prone to structural problems and breakage, more so than later cultivars. 'Bradford', however, is the most fireblight-resistant cultivar. It is thornless, unlike the species, but is often grafted onto seedling rootstock in the nursery trade. It is self-incompatible but does produce fertile fruit after pollination by other cultivars. One study suggests 'Bradford' is among the top 3 parents of naturalized populations of *Pyrus calleryana* (Hardiman 2010). Any differences between cultivars are lost by the second generation, so this evaluation will use traits of the species, naturalized populations, and the horticultural cultivar as appropriate.

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

Answer / Justification:

The cultivar 'Bradford' is not capable of reproducing on its own due to self-incompatibility. It is however capable of crossing with other cultivars to produce offspring, and these offspring have naturalized across the eastern United States. *Pyrus calleryana* has also naturalized in Australia.

Reference(s):

- Hardiman, N. A., & Culley T. M. (2010). Reproductive success of cultivated *Pyrus calleryana* (Rosaceae) and establishment ability of invasive, hybrid progeny. *American Journal of Botany*. 97, 1698–1706.
- USDA NRCS (2017). USDA PLANTS Database: *Pyrus calleryana* (Callery pear).
- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.

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



Answer / Justification:

The cultivar 'Bradford' is not capable of reproducing on its own due to self-incompatibility. It is however capable of crossing with other cultivars to produce offspring, and these offspring have naturalized across the Eastern United States, including Illinois. In an Ohio study, 'Bradford' was among the top three most common parents of naturalized plants sampled (Hardiman 2010).

Reference(s):

- Hardiman, N. A., & Culley T. M. (2010). Reproductive success of cultivated *Pyrus calleryana* (Rosaceae) and establishment ability of invasive, hybrid progeny. *American Journal of Botany*. 97, 1698–1706.
 - USDA NRCS (2017). USDA PLANTS Database: *Pyrus calleryana* (Callery pear).
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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 *screeener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

Pyrus calleryana is listed as invasive in at least 26 states in the US. Individual cultivars themselves are not invasive, but the combination of cultivars within an area can create a situation in which invasive plants are produced.

Reference(s):

- Hardiman, N. A., & Culley T. M. (2010). Reproductive success of cultivated *Pyrus calleryana* (Rosaceae) and establishment ability of invasive, hybrid progeny. *American Journal of Botany*. 97, 1698–1706.
 - Mid-Atlantic Exotic Pest Plant Council (2005). Mid-Atlantic Exotic Pest Plant Council Plant List.
 - Midwest Invasive Plant Network (2015). Midwest Invasive Plant List.
-



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

Answer / Justification:

Pyrus calleryana is listed as invasive in Illinois, Indiana, Ohio, Missouri, and Maryland. Individual cultivars themselves are not invasive, but the combination of cultivars within an area can create a situation in which invasive plants are produced.

Reference(s):

- Mid-Atlantic Exotic Pest Plant Council (2005). Mid-Atlantic Exotic Pest Plant Council Plant List.
 - Midwest Invasive Plant Network (2015). Midwest Invasive Plant List.
-

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

Answer / Justification:

Pyrus communis and *Pyrus betulifolia* are listed in the Invasive Plant Atlas of the US, but neither appear to be significant invasive species in a climate similar to Illinois.

Reference(s):

- Swearingen, J., & Barger C. (0). common pear: *Pyrus communis* (Rosales: Rosaceae): Invasive Plant Atlas of the United States.
-



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

Answer / Justification:

Pyrus calleryana distribution in the southern and western United States, Africa, Australia, and southern China are not a climate match with Illinois.

Reference(s):

- 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 *screeners* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

"Because of its rapid growth and preference for high light environments, *P. calleryana* can potentially impede the establishment of late- to middle-stage successional species in disturbed sites." "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. A single tree can spread rapidly by seed and vegetative means forming a sizeable patch within several years. Its success as an invader results from its capacity to produce copious amounts of seed that are dispersed by birds and possibly small mammals, seedlings that germinate and grow rapidly in disturbed areas and a general lack of natural controls like insects and diseases, with the exception of fire blight."



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.
 - Texas Invasives (0). Texas Invasives - *Pyrus calleryana*.
-

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

Answer / Justification:

There is no evidence for promotion of fire or changing of fire regimes.

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

Answer / Justification:

Wild plants often produce thorns along stems and branches in both the native and introduced range to combat herbivory. The species is thorny in its native habitat though the 'Bradford' cultivar is thornless. F1 hybrids have the potential to become thorny though. This poses a moderate threat to animals or humans when the plant forms dense thickets.



Reference(s):

- Vincent, M. A. (2005). On the Spread and Current Distribution of *Pyrus calleryana* in the United States. *Castanea*. 70, 20–31.
 - 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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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 *screeener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

"*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."

"Callery pear often produces thorny thickets as it escapes into marginal and disturbed areas, and appears to be reproducing readily in the wild." "It often forms dense thickets, and these are often thorny, since thornless cultivars appear to retain genes for thorniness that may be expressed as genes recombine in their progeny."

Reference(s):

- Vincent, M. A. (2005). On the Spread and Current Distribution of *Pyrus calleryana* in the United States. *Castanea*. 70, 20–31.
 - 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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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 *screeener* has a **High** confidence in this answer based on the available literature.



Answer / Justification:

The species resprouts from any existing trunk or root system. "A single tree can spread rapidly by seed and vegetative means forming a sizeable patch within several years."

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.
 - Texas Invasives (0). Texas Invasives - *Pyrus calleryana*.
-

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

Answer / Justification:

Although suckering is indicated, it does not seem common for fragments to detach and form new individuals.

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



Answer / Justification:

'Bradford' would not produce viable seed on its own due to self-incompatibility. However, "different genotypes growing near each other (e.g., within about 300 ft.) can cross-pollinate and produce fruit with viable seed. Also, cultivars are often grafted onto seed-grown rootstocks with varying genotypes; if the plant produces shoots from the rootstock (which it often does), then these shoots and the graft can pollinate one another." It is documented that Bradford can produce abundant viable seed: "Averaged across all cultivars, 56% of seeds were viable...all cultivars appear to be highly productive as maternal parents" Second generation hybrids between cultivars had no difference in seed production or seed size.

Reference(s):

- Hardiman, N. A., & Culley T. M. (2010). Reproductive success of cultivated *Pyrus calleryana* (Rosaceae) and establishment ability of invasive, hybrid progeny. *American Journal of Botany*. 97, 1698–1706.
 - 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.
 - Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.
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14. Does this plant produce copious viable seeds each year (> 1000)?

Answer / Justification:

Though at least one source cites "its capacity to produce copious amounts of seed," there are not estimates of the number of seeds produced by each plant to know if it is >1000.

Reference(s):

- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.
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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 *screeners* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

'Bradford' had 68% germination after 45 days of cold stratification in a study comparing reproductive success of cultivated *Pyrus calleryana*.

Reference(s):

- Hardiman, N. A., & Culley T. M. (2010). Reproductive success of cultivated *Pyrus calleryana* (Rosaceae) and establishment ability of invasive, hybrid progeny. *American Journal of Botany*. 97, 1698–1706.
-

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

Answer / Justification:

Pyrus calleryana can set seed at 3 years of age.

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.
-



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

Answer / Justification:

Fruits mature in late autumn (August to October). Flowers are produced in March and April. There is often a second flowering in September to October in drought or disease-stressed trees.

Reference(s):

- Vincent, M. A. (2005). On the Spread and Current Distribution of *Pyrus calleryana* in the United States. *Castanea*. 70, 20–31.
 - 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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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 *screeners* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

Fruits are consumed by a variety of birds. "Its success as an invader results from its capacity to produce copious amounts of seed that are dispersed by birds and possibly small mammals..."



Reference(s):

- Hardiman, N. A., & Culley T. M. (2010). Reproductive success of cultivated *Pyrus calleryana* (Rosaceae) and establishment ability of invasive, hybrid progeny. *American Journal of Botany*. 97, 1698–1706.
 - 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.
 - Texas Invasives (0). Texas Invasives - *Pyrus calleryana*.
-

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

Answer / Justification:

It is unlikely that the heavy fruits of *Pyrus calleryana* would be dispersed by wind or water.

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

Answer / Justification:

There is no evidence for accidental dispersal by humans.



Reference(s):

- [Anonymous] .
-

Total PRE Score

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

Confidence: 74 / 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:

- Kim Shearer November 13, 2017
- Linda Mackechnie November 12, 2017
- Christopher Evans October 31, 2017
- Tom Buechel August 29, 2017

This evaluation has a total of 4 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.