Plant Risk Evaluator -- PRE™
Evaluation Report

Euonymus alatus 'Compactus' -- Illinois

2017 Farm Bill PRE Project

PRE Score: 19 -- Reject (high risk of invasiveness)
Confidence: 81 / 100
Questions answered: 20 of 20 -- Valid (80% or more questions answered)

Privacy: Public
Status: Completed

Evaluation Date: September 20, 2017

This PDF was created on June 15, 2018

Plant Evaluated

Euonymus alatus 'Compactus'

Image by Missouri Botanical Garden

Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Euonymus alatus 'Compactus'*) 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

Euonymus alatus is invasive in Illinois and across the Midwest, Mid-Atlantic, and New England. The species and all cultivars, including 'Compactus', are prohibited in Massachusetts, Maine, New Hampshire, and Vermont. 'Compactus' produces copious viable seed, which germinates readily in the second growing season after dispersal. Birds consume the fruit and move the seeds long distances. Dense thickets are documented in natural areas with significant negative impacts on native plant communities. This evaluation confirms that 'Compactus' burning bush is not a safe choice for Illinois landscapes.

General Information

Status: Completed
Screener: Emily Russell
Evaluation Date: September 20, 2017

Plant Information

Plant: *Euonymus alatus 'Compactus'*

If the plant is a cultivar, how does its behavior differs from its parent's?
"This selection is a standard in the nursery trade and one of the most common landscape plants. The mature size is smaller than the species, but the plant still is large and may grow to 10' tall. The wings on the stems are much reduced, and this may be the origin of the cultivar name. Fall color and fruiting are as per the species. The use of this plant in the landscape can be monotonous, though it is a reliable performer." (UCONN)

Regional Information

Region Name: Illinois

Climate Matching Map

To answer four of the PRE questions for a regional evaluation, a climate map with three climate data layers (Precipitation, UN EcoZones, and Plant Hardiness) is needed. These maps were built using a toolkit created in collaboration with GreenInfo Network, USDA, PlantRight, California-Invasive Plant Council, and The Information Center for the Environment at UC Davis.

Click here to see the generated climate matching map for this region. This climate match database is hosted by GreenInfo Network and publicly accessible.

Evaluation Questions

These questions are based in an original article published at the University of California, Davis, and can be found on the PLOS One website, here: https://doi.org/10.1371/journal.pone.0121053

Invasive History and Climate Matching (Questions 1 - 6)

1. Has the species (or cultivar or variety, if applicable; applies to subsequent "species" questions) become naturalized where it is not native?

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

Answer / Justification:

The species Euonymus alatus is naturalized across the Eastern United States. "'Compactus' is recognized as the main source of invasive burning bush plants." (Finneseth) It has been widely planted for decades and may be the most popular commercial cultivar of Euonymus alatus.

Reference(s):

- Kartesz, J. T. (2015). The Biota of North America Program (BONAP).
- Finneseth, C., Geneve R., & Dunwell W. (2007). Fruit Production in 'Compactus' and 'Rudy Haag' Burning Bush.

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

Answer / Justification:

Euonymus alatus is naturalized in Illinois, the Midwest, Mid-Atlantic, Northeast, and Ontario, which contain areas that are a climate match.

Reference(s):

- Kartesz, J. T. (2015). The Biota of North America Program (BONAP).

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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:

Euonymus alatus is invasive in Illinois and across the Midwest, Mid-Atlantic, and New England. Cultivars, including 'Compactus', are prohibited in Massachusetts, Maine, New Hampshire, and Vermont.

Reference(s):

- Maine Department of Agriculture, Conservation and Forestry (2017). CRITERIA FOR LISTING INVASIVE TERRESTRIAL PLANTS.
- NH Department of Agriculture, Markets & Food, Division of Plant Industry (2017). Fact Sheet: Prohibited Invasive Plant Species Rules, Agr 3800.
- Vermont Agency of Agriculture, Food & Markets (2013). Quarantine # 3 - Noxious Weeds.
- Massachusetts Department of Agricultural Resources (2009). Massachusetts Prohibited Plant List.
- Midwest Invasive Plant Network (2015). Midwest Invasive Plant List.
- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.

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

Answer / Justification:

Euonymus alatus is invasive in Illinois and across the Midwest, Mid-Atlantic, and New England. Euonymus alatus 'Compactus' is prohibited in Maine and Vermont, parts of which share a climate with Illinois.

Reference(s):

- Midwest Invasive Plant Network (2015). Midwest Invasive Plant List.
- Maine Department of Agriculture, Conservation and Forestry (2017). CRITERIA FOR LISTING INVASIVE TERRESTRIAL PLANTS.
- Vermont Agency of Agriculture, Food & Markets (2013). Quarantine # 3 - Noxious Weeds.
- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.

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

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

Answer / Justification:

Euonymus fortunei is invasive in Illinois, Indiana, Missouri and Ohio.

Reference(s):

- Midwest Invasive Plant Network (2015). Midwest Invasive Plant List.

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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:

Native distribution in Korea and Hokkaido, Japan, match the climate of Illinois. Occurrences in GBIF in the Eastern United States and Northern Europe match. Occurrences in Central China, Southern Japan, Central Europe, and a few sparse occurrences in the Western United States do not match. In the US, the vast majority of states listing Euonymus alatus as invasive match the climate of Illinois.

Reference(s):

- GBIF (0). Euonymus alatus (Thunb.) Siebold_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 **High** confidence in this answer based on the available literature.

Answer / Justification:

"It shades out native herbs and crowds out native shrubs." (USFS) "It threatens a variety of habitats including forests, coastal scrublands and prairies where it forms dense thickets, displacing many native woody and herbaceous plant species. Hundreds of seedlings are often found below the parent plant in what is termed a 'seed shadow.'" (Swearingen)

Reference(s):

- US Forest Service (0). Weed of the week_Euonymus alatus.
- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.

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

Answer / Justification:

According to FEIS, effects of Euonymus alatus on fire regimes are unknown and more research is needed. However, John Taft of the Illinois Natural History Survey notes: "While no specific research may examine Euonymus alatus and its effects on fire and fire effects, any invasive shrub in the Midwest that infests natural communities that rely on fire for the maintenance of structure and species richness, particularly in the typically species rich ground stratum, can be assumed to have an impact. By shading the ground layer, E. alatus would limit effectiveness of prescribed fire by reducing fuel levels." (see issues)

Reference(s):

- Fryer, J. L. (2009). Euonymus alatus - Fire Effects Information System.

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9. Is the plant a health risk to humans or animals/fish? Has the species been noted as impacting grazing systems?

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

Answer / Justification:

All parts of Euonymus alatus 'Compactus' are toxic to humans if ingested in large quantities. It is also poisonous to cats, dogs, and horses. However, there are not reports of Euonymus poisoning in the literature after years of invasion, so this doesn't seem to be a common hazard.

Reference(s):

- Plants.ces.ncsu.edu (0). Euonymus alatus 'Compactus'_NC stateKB.

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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 thickets of Euonymus alatus are described in the literature, and hundreds of seedlings have been found beneath parent plants. The cultivar 'Compactus' can also reach 10 feet high.

Reference(s):

- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.
- Ebinger, J., Newman J., & Nyboer R. (1984). Naturalized Winged Wahoo in Illinois. Natural Areas Journal. 4, 26–29.

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:

Euonymus alatus tolerates hard pruning and will re-sprout from a cut stump. It also colonizes slowly by root suckers.

Reference(s):

- Fryer, J. L. (2009). Euonymus alatus - Fire Effects Information System.
- US Forest Service (0). Weed of the week_Euonymus alatus.

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12. If naturally detached fragments from this plant are capable of producing new plants, is this a common method of reproduction for the plant?

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

Answer / Justification:

No evidence of reproducing from fragments in the wild.

Reference(s):

- [Anonymous] .

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

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

Answer / Justification:

Seed is the primary means of reproduction.

Reference(s):

- Brand, M. H., Lubell J. D., & Lehrer J. M. (2012). Fecundity of Winged Euonymus Cultivars and Their Ability to Invade Various Natural Environments. HortScience. 47, 1029–1033.
- Finneseth, C., Geneve R., & Dunwell W. (2007). Fruit Production in ‘Compactus’ and ‘Rudy Haag’ Burning Bush.

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

Answer / Justification:

In a Connecticut fecundity study, Euonymus alatus 'Compactus' produced an average of 6090 seeds per plant. (Brand)

Reference(s):

- Brand, M. H., Lubell J. D., & Lehrer J. M. (2012). Fecundity of Winged Euonymus Cultivars and Their Ability to Invade Various Natural Environments. HortScience. 47, 1029–1033.
- Finneseth, C., Geneve R., & Dunwell W. (2007). Fruit Production in ‘Compactus’ and ‘Rudy Haag’ Burning Bush.

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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:

Euonymus alatus 'Compactus' has substantial rates of germination in the second growing season, preferring multiple cycles of warm and cold stratification. This slightly delayed germination still occurs at high rates and does not seem to be slowing the spread of the plant into natural areas. It is possible that passing through the digestive tract of birds provides some scarification and may allow germination in the first spring, but this unconfirmed.

Reference(s):

- Ranney, T. G., Eaker T. A., & Mowrey J. A. (2007). Assessing Fertility among Cultivars of Winged Euonymus. Procceedings of the Southern Nursery Conference. 52, 352–354.
- Brand, M. H., Lubell J. D., & Lehrer J. M. (2012). Fecundity of Winged Euonymus Cultivars and Their Ability to Invade Various Natural Environments. HortScience. 47, 1029–1033.
- USDA Forest Service (2008). USDA FS Agriculture Handbook 727 - The Woody Plant Seed Manual.

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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:

Brand et al. reported high levels of seed production on 6-year-old plants. It seems reasonable to assume that these same plants were likely flowering and setting seed to some degree the previous year as 5-year-old plants.

Reference(s):

- Brand, M. H., Lubell J. D., & Lehrer J. M. (2012). Fecundity of Winged Euonymus Cultivars and Their Ability to Invade Various Natural Environments. HortScience. 47, 1029–1033.

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

Answer / Justification:

Bloom time is May and June.

Reference(s):

- Missouri Botanical Garden PlantFinder (0). Euonymus alatus 'Compactus' - Plant Finder_MOBOTKB.

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

Answer / Justification:

The seeds are dispersed long distances by birds.

Reference(s):

- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.
- Brand, M. H., Lubell J. D., & Lehrer J. M. (2012). Fecundity of Winged Euonymus Cultivars and Their Ability to Invade Various Natural Environments. HortScience. 47, 1029–1033.
- Fryer, J. L. (2009). Euonymus alatus - Fire Effects Information System.

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

Answer / Justification:

There is no evidence of accidental dispersal by humans.

Reference(s):

- [Anonymous] .

Total PRE Score

PRE Score: 19 -- Reject (high risk of invasiveness)
Confidence: 81 / 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 Worth	December 22, 2017
• John Taft	September 25, 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 # 6213

Date Created: December 22, 2017 - 10:09am
Date Updated: February 19, 2018 - 7:36pm

Submitted by: Steve Worth

Status: Fixed
Type: Comment
Severity: Major
Scope: Plant Information

Issue Description

There is no doubt the Euonymus alatus compacta displays invasive characteristics, although again it seems that the problem is worse further east. The only case to be made in its favor is that it remains a very popular plant and is a top 5 seller in terms of shrub sales in our area. Homeowners and commercial landscapers both like using it for its desirable ornamental characteristics. Contractors should be educated in where to use this plant. I think that EAC is still a useful and desirable plant if planted in a location that minimizes the risk of escapability.

Issue Resolution (Screener's Response to Issue)

Thank you for the comment.

Issue ID # 5027

Date Created: September 25, 2017 - 12:07pm
Date Updated: December 10, 2017 - 1:38pm

Submitted by: John Taft

Status: Fixed
Type: Suggestion
Severity: Minor
Scope: Q08. Is the plant noted as promoting fire and/or changing fire regimes?

Issue Description

While no specific research may examine *Euonymus alatus* and its effects on fire and fire effects, any invasive shrub in the Midwest that infests natural communities that rely on fire for the maintenance of structure and species richness, particularly in the typically species rich ground stratum, can be assumed to have an impact. By shading the ground layer, *E. alatus* would limit effectiveness of prescribed fire by reducing fuel levels.

Issue Resolution (Screener's Response to Issue)

Changed answer to yes with medium confidence, and included quote from John Taft.

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.