



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

Buddleja davidii 'Royal Red' -- Illinois

2017 Farm Bill PRE Project

PRE Score: 16 -- Reject (high risk of invasiveness)

Confidence: 67 / 100

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

Privacy: Public

Status: Submitted

Evaluation Date: August 30, 2017

This PDF was created on June 15, 2018



Plant Evaluated

Buddleja davidii 'Royal Red'



Image by Ptelea, Wikipedia user



Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Buddleja davidii* 'Royal Red') 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: Submitted

Screener: Emily Russell

Evaluation Date: August 30, 2017

Plant Information

Plant: *Buddleja davidii* 'Royal Red'

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

'Royal Red' differs from the species in flower color only (magenta); no differences in reproductive traits have been documented.

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

Answer / Justification:

Buddleja davidii has naturalized in North and South America, Europe, Africa, and Australia. There is no evidence that *Buddleja davidii* 'Royal Red' is significantly different than the species in reproductive traits and ability to naturalize. "B. davidii, by nature, establishes on frequently disturbed sites which provide source for satellite populations that can repopulate new and post-disturbance landscapes. As it is well known that species invasion via multiple loci is the most effective means of establishing non-indigenous species in a new environment (Mack et al., 2000), the continued presence of non-sterile B. davidii cultivars in urban, residential, and wild areas guarantees continued reintroduction into native areas (regardless of native control efforts)." (Tallent-Halsell)

Reference(s):

- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..
- Ebeling, S., & Tallent-Halsell N. (2009). *Buddleja davidii* (butterfly bush) Datasheet In: Invasive Species Compendium.
- USDA NRCS (2016). USDA PLANTS Database: *Buddleja davidii* (orange eye butterflybush).

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:

Buddleja davidii has naturalized in Korea, the eastern United States, and areas of eastern and northern Europe where there is a similar climate to Illinois. There is no evidence that *Buddleja davidii* 'Royal Red' is significantly different than the species in reproductive traits and ability to naturalize.

Reference(s):

- Ebeling, S., & Tallent-Halsell N. (2009). *Buddleja davidii* (butterfly bush) Datasheet In: Invasive Species Compendium.
 - USDA NRCS (2016). USDA PLANTS Database: *Buddleja davidii* (orange eye butterflybush).
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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 *screeners* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Buddleja davidii is classified as a quarantine weed in Oregon (except ODA approved sterile cultivars) and a noxious weed in Washington. In New Zealand it is estimated that the weed pest is displacing valued native species and costing the forestry industry \$0.5 to 2.9 million annually in control and lost production (USFS). It is also invasive in the United Kingdom. There is no evidence that *Buddleja davidii* 'Royal Red' is significantly different than the species in reproductive traits and ability to invade natural habitats.

Reference(s):

- Squirrell, J. (2015). *Buddleia, Buddleja davidii* - GB non-native species secretariat.
 - USDA Forest Service Forest Health Staff (2005). Weed of the Week: Butterfly Bush (*Buddleja davidii* Franch.).
 - Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
 - Ebeling, S., & Tallent-Halsell N. (2009). *Buddleja davidii* (butterfly bush) Datasheet In: Invasive Species Compendium.
 - USDA NRCS (2016). USDA PLANTS Database: *Buddleja davidii* (orange eye butterflybush).
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4. Is the species (or cultivar or variety) noted as being invasive in the US or world in a similar climate?

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

Answer / Justification:

Buddleja davidii has not been documented as an invasive species in a climate similar to Illinois. It is on a few invasive lists in the Mid-Atlantic as a species to watch.

Reference(s):

- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.
-

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

Answer / Justification:

There are 23 other species of *Buddleja* in the Global Compendium of weeds although *B. davidii* has by far the most number of citations. *Buddleja* generally seems to be invasive in climates that are warmer than Illinois.

Reference(s):

- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..
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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 *screeener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

Buddleja davidii 'Royal Red' is widely cultivated and will grow in many different climates.

Reference(s):

- GBIF Secretariat (2016). GBIF Backbone Taxonomy: *Buddleja davidii* Franch..
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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 *screeener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

"*Buddleja davidii* out-competes native floras producing dense monotypic thickets." The cultivar 'Royal Red' is not significantly different than the species in habit or reproduction.

Reference(s):

- Squirrell, J. (2015). *Buddleia*, *Buddleja davidii* - GB non-native species secretariat.
 - Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
 - USDA Forest Service Forest Health Staff (2005). Weed of the Week: Butterfly Bush (*Buddleja davidii* Franch.).
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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 *screeener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Buddleja davidii 'Royal Red' has a flammability ranking of "low" in the study below.

Reference(s):

- Long, A. J., Behm A., Zipperer W. C., Hermansen A., Maranghides A., & Mell W. (2006). Quantifying and ranking the flammability of ornamental shrubs in the southern United States. 2006 Fire Ecology and Management Congress Proceedings.
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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 *screeener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Buddleja davidii is palatable to cattle and goats and has evolved strategies to survive defoliation, but there is no evidence that it impacts grazing systems.

Reference(s):

- Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
-



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

Answer / Justification:

Growth habit in its native distribution in China is described as thickets. As an invasive species, "*Buddleja davidii* out-competes native floras producing dense monotypic thickets." The cultivar 'Royal Red' is not significantly different than the species in habit or reproduction.

Reference(s):

- Squirrell, J. (2015). *Buddleia, Buddleja davidii* - GB non-native species secretariat.
 - Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
 - USDA Forest Service Forest Health Staff (2005). Weed of the Week: Butterfly Bush (*Buddleja davidii* Franch.).
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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 *screeners* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

"Plants readily reproduce asexually from stem and root fragments (Miller, 1984; Smale, 1990). *B. davidii* individuals that have been disturbed by flooding and mechanical means have been observed regenerating from buried stems, stumps, and roots soon after the disruption (N. Tallent-Halsell, unpubl.). *B. davidii* debris, left after removal attempts, can regenerate, flower, and spread, if left in on site on floodplains (H. Turnbull, pers. comm.)"



Reference(s):

- Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
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12. If naturally detached fragments from this plant are capable of producing new plants, is this a common method of reproduction for the plant?

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

Answer / Justification:

"Plants readily reproduce asexually from stem and root fragments (Miller, 1984; Smale, 1990). *B. davidii* individuals that have been disturbed by flooding and mechanical means have been observed regenerating from buried stems, stumps, and roots soon after the disruption (N. Tallent-Halsell, unpubl.). *B. davidii* debris, left after removal attempts, can regenerate, flower, and spread, if left in on site on floodplains (H. Turnbull, pers. comm.)"

Reference(s):

- Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
-

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:

Buddleja davidii usually reproduces by seed.



Reference(s):

- Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
-

14. Does this plant produce copious viable seeds each year (> 1000)?

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

Answer / Justification:

"A single mature *Buddleja davidii* individual can produce millions of seeds." There is no evidence that the cultivar 'Royal Red' has reduced fecundity. 3 different cultivars of *B. davidii* (not including 'Royal Red') produced 144,000 to 1,094,000 seeds per plant in a Florida evaluation.

Reference(s):

- Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
 - Wilson, S. B., Mecca L. K., Gersony J. A., Thetford M., & Raymer J. S. (2004). Evaluation of 14 Butterfly Bush Taxa Grown in Western and Southern Florida: II. Seed Production and Germination. *HortTechnology*. 14, 612–618.
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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 *screeener* has a **Medium** confidence in this answer based on the available literature.



Answer / Justification:

"Previous germination trials revealed that no stratification is necessary for *B. davidii* and that seeds germinate at a high percentage with 12/12 h light/dark cycle at 10/20 degrees C." Germination rates in this study were 32-42% at sites in Germany and China. In a Florida evaluation, 3 cultivars of *B. davidii* (not including 'Royal Red') had germination rates of 12-32%.

Reference(s):

- Ebeling, S. Kathrin, Hensen I., & Auge H. (2008). The Invasive Shrub *Buddleja davidii* Performs Better in Its Introduced Range. *Diversity and Distributions*. 14, 225–233.
 - Wilson, S. B., Mecca L. K., Gersony J. A., Thetford M., & Raymer J. S. (2004). Evaluation of 14 Butterfly Bush Taxa Grown in Western and Southern Florida: II. Seed Production and Germination. *HortTechnology*. 14, 612–618.
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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 *screeener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

Buddleja davidii typically flowers at two years of age.

Reference(s):

- Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
-

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



Answer / Justification:

Buddleja davidii 'Royal Red' flowers from May through October in Illinois. Seed formation and ripening typically occurs within 3 weeks after flowering.

Reference(s):

- Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
 - Chicago Botanic Garden (2017). *Buddleja davidii* 'Royal Red' In: Chicago Botanic Garden Plant Finder.
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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: **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:

There are not reports of dispersal by animals.

Reference(s):

- [Anonymous] .
-

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

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



Answer / Justification:

Water could disperse *Buddleja* seeds long distances along sea coasts, flood plains, and riparian corridors. Maximum wind dispersal distance has not been determined, but is likely to be less than 100m. "Our results show that normal wind dispersal occurs on a scale (3 m-15 m) that is insufficient to explain the establishment of isolated populations. Alternative dispersal methods—unusually high wind events, birds, mammals, boots, and tires—require further study to explain butterfly bush long-distance invasion in non-riparian sites."

Reference(s):

- Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
 - Ream, J. (2006). Production and invasion of Butterfly bush (*Buddleja davidii*) in Oregon.
-

20. Are the plant's propagules frequently dispersed via contaminated seed (agriculture or wildflower packets), equipment, vehicles, boats or clothing/shoes?

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

Answer / Justification:

Buddleja seeds are dispersed by cars, trains, and equipment.

Reference(s):

- Tallent-Halsell, N. G., & Watt M. S. (2009). The Invasive *Buddleja davidii* (Butterfly Bush). *Botanical Review*. 75, 292–325.
-

Total PRE Score

PRE Score: 16 -- Reject (high risk of invasiveness)

Confidence: 67 / 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:

- Kim Shearer November 13, 2017

This evaluation has a total of 1 reviewer(s).



Evaluation Issues

The following section lists all public issues for this evaluation. Issues provide a way for stakeholder reviewers to communicate any concerns or suggestions they might have with the plant or evaluation. Please email PlantRight@suscon.org if additional action is required to resolve open issues.

Issue ID # 5856

Date Created: November 13, 2017 - 1:33pm

Date Updated: February 19, 2018 - 8:55pm

Submitted by: Kim Shearer

Status: Fixed

Type: Suggestion

Severity: Major

Scope: Q10. Does the plant produce impenetrable thickets, blocking or slowing movement of animals, livestock, or humans?

Issue Description

The same issue here as with the issue in Q7. The quote referring to the dense monotypic thickets needs to be supported by some evidence other than the two references listed.

Issue Resolution (Screener's Response to Issue)

The Tallent-Halsell reference contains multiple descriptions of thicket growth in both native and invasive *Buddleja* populations. Also added a USDA-FS reference to this answer.

Issue ID # 5855

Date Created: November 13, 2017 - 1:31pm

Date Updated: February 19, 2018 - 8:52pm

Submitted by: Kim Shearer



Status: Fixed

Type: Suggestion

Severity: Major

Scope: Q07. Does this plant displace native plants and dominate the plant community in areas where it has been established?

Issue Description

“...outcompetes native floras producing dense monotypic thickets...”

I see that the quote referenced above is found in the fact sheet published by Squirrel (2015); however, I cannot find the evidence for this in the references that Squirrel includes for the fact sheet. As for the 2009 Tallent-Halsell & Watt paper (also listed by Squirrel), nothing stated supports the quote referenced above:

- The authors note that *B. davidii* is self thinning “immediately following stand establishment.” This does not state anything about outcompeting native flora.
- “*B. davidii* seems to have both an inhibitory and facilitative influence on co-occurring native plants.”
- “Although *B. davidii* colonizes disturbed sites, whether it alters successional trajectories over the long term is yet undetermined.”

If there is evidence in a paper that supports the quoted statement above, then that should be referenced here.

Issue Resolution (Screener's Response to Issue)

"Despite its popularity as a landscape plant, *B. davidii* is considered problematic because of its ability to naturalize outside of gardens and rapidly invade and dominate disturbed natural areas across a wide range of physical conditions."

"Conversely, studies by Williams (1979) and Smale (1990) in Urewera National Park, North Island, New Zealand revealed that *B. davidii* quickly displaced primary native colonizers, both herbaceous, and woody species such as *Kunzea ericodes* on New Zealand floodplains."

"Leach (2007) and Ream (2006) reported that *B. davidii* has invaded riparian areas in Oregon and Washington, and has replaced riparian native *Salix* spp. and *Populus* spp. *B. davidii* encroachment along riparian corridors may affect salmon spawning habitat (H. Turnbull, pers. comm.)."

Also added another source for this answer.



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.