Plant Risk Evaluator -- PRE™
Evaluation Report

Lygodium japonicum -- Georgia

2017 Farm Bill PRE Project

PRE Score: 20 -- Reject (high risk of invasiveness)
Confidence: 60 / 100
Questions answered: 18 of 20 -- Valid (80% or more questions answered)

Privacy: Public
Status: Submitted

Evaluation Date: October 23, 2017

This PDF was created on August 13, 2018

Plant Evaluated

Lygodium japonicum

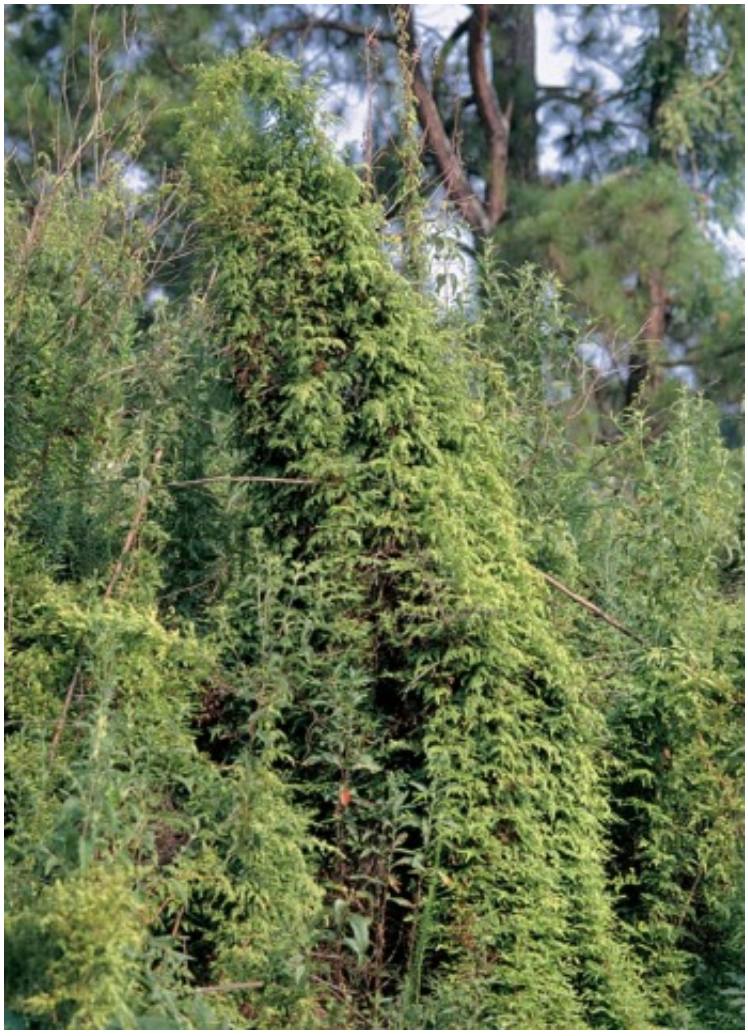

Image by James H. Miller, USDA Forest Service

Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Lygodium japonicum*) 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

Lygodium japonicum, commonly know as the japanese climbing fern, is a perennial fern that reach heights of up to 30 m (90 ft.). L. japonicum has a thin, yet strong rhizomatous vine that appears green, black, or orange in color. The fronds are opposite, compound, long, and typically triangular in shape. The fronds contain fertile segments which bear sporangia and produce thousands of wind-dispersed spores. The japanese climbing fern is native to eastern Asia, but is highly invasive to areas that are climatically similar, such as the Southeastern United States. This species can completely smother natural vegetation-outcompeting native species, causing habitat disruption, and changing fire behavior. Active research is still being done to find the best means of removal for L. japonicum. Control measures from CABI state that: "Finding a biocontrol suitable for this species will be difficult due to the sympatric, native species L. palmatum... Chemical control of L. japonicum has been studied in a number of ecosystems in the southeastern USA. Lockhart (2005) recommends cutting or pulling vines and spraying piles of foliage to minimize non-target damage. Researchers and land managers have come to a consensus that treatments using glyphosate are effective. Recommended concentrations do vary".

General Information

Status: Submitted
Screener: Lila Uzzell
Evaluation Date: October 23, 2017

Plant Information

Plant: *Lygodium japonicum*

Regional Information

Region Name: Georgia

Climate Matching Map

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

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

Evaluation Questions

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

Invasive History and Climate Matching (Questions 1 - 6)

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

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

Answer / Justification:

"Outside of its natural range L. japonicum has become naturalized in the USA in at least nine southeastern states (EDDMapS, 2015; USDA-NRCS, 2015) including Hawaii (Wilson, 2002)."

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).
- GBIF (2017). Lygodium japonicum (Thunb.) Sw..

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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:

L. japonicum is noted as being naturalized in the Southeastern US, South Africa, and Australia.

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).

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

Answer / Justification:

L. japonicum is listed by the USDA as being weedy or invasive in the U.S., according to FLEPPC and STATE. The Georgia EPPC lists this species as a category 1 plant: "Category 1 - Exotic plant that is a serious problem in Georgia natural areas by extensively invading native plant communities and displacing native species." https://plants.usda.gov/core/profile?symbol=LYJA

Reference(s):

- Georgia Exotic Pest Plant Council (2017). List of Non-Native Invasive Plants in Georgia - Georgia Exotic Pest Plant Council.

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:

States in the US with a similar climate to Georgia and list this species as invasive include: FL, CA, NC, SC, TX, and AL. The Global Compendium of Weeds lists this species as invasive "globally" but does not specify specific regions.

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).
- Randall, R. (2012). A Global Compendium of Weeds. 2nd Edition..

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

Answer / Justification:

The Global Compendium of Weeds lists L. microphyllum as invasive in the Eastern US.

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: **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:

L. japonicum is native to China and Japan, and is also found in South Africa. "Within its natural range L. japonicum typically occupies moist habitats but favours regions with a defined dry season...Where introduced in the USA, L. japonicum occupies a broad range of natural and disturbed habitats. While L. japonicum has a strong preference for moist soils it can sometimes occupy xeric sites (van Loan, 2006b). It is invasive in floodplain forests, swamps, marshes, river and stream banks, pine flatwoods, hammocks, upland woodlands, lakeshores and low woods".

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).
- GISD (2017). GISD.

Impact on Native Plants and Animals (Questions 7 - 10)

7. Does this plant displace native plants and dominate (overtop or smother) the plant community in areas where it has established?

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

Answer / Justification:

L. japonicum is a vine-like fern that can grow up to 30m tall, smothering shrubs, herbaceous plants, and trees. L. japonicum can completely displace native species, and when given enough time can dominate a natural habitat. "It has also been determined that L. japonicum is hardier than native species in low light environments allowing it to thrive and expand when natives cannot"

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).
- GISD (2017). GISD.

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

Answer / Justification:

"When large vines or populations burn, fires can easily spread into canopy trees from the ground. Fires may also be able to penetrate into wetland areas that would otherwise be barriers". This highly affects local fire ecology, and creates "ladder fuels" that lead to incidences of crown fires.
http://www.iucngisd.org/gisd/speciesname/Lygodium+japonicum
http://www.cabi.org/isc/datasheet/31783

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).
- GISD (2017). GISD.

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

Answer / Justification:

This plant seems to be particularly harmful to native plants, affecting ecosystem change/ habitat alteration. Though there is no information on this plant's risk to humans and animals, it would indirectly affect animals via habitat alteration. I will answer no to this question since there is no evidence of this plant directly impacting humans/animals.

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).

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

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

Answer / Justification:

This plant tends to create impenetrable thickets: "L. japonicum invasions can range from very sparse, with small numbers of individuals, to dense monocultures. The fronds trellis into trees, creating a novel strata of biomass between the ground and as much as 30 m into tree canopies. This creates changes in light levels and fuel levels." Though this vine-like fern is capable of covering entire trees, there is no evidence of this fern blocking or slowing the movement of animals.

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).

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:

CABI states that L. japonicum is a rhizomatous vine that is vegetatively propagated.

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).

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

Answer / Justification:

More references are needed to answer this question. I would assume that it is a common method, given L. japonicum's vine-like nature. However, references only state that the common method of reproduction is spread by spores.

Reference(s):

- GISD (2017). GISD.
- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).
- Byrd, Jr, D.. John D., & Westbrooks D.. Randy (2017). IPAMS - Species Information - Lygodium japonicum - Japanese climbing fern.

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

Answer / Justification:

Lygodium japonicum has the ability to self-fertilize. Outcrossed L. japonicum have higher seed viability than those that self-fertilize, but even self-fertilized plants only have about 20% of spores that are abnormal.

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).

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

Answer / Justification:

lack of information.

Reference(s):

- [Anonymous] .

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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:

lack of information.

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:

"Sporophytes could reach sexual maturity within five weeks of germination".

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).

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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:

"Spore production can take place all year round in warmer climates, but in colder areas it typically occurs from June-November and peaks in October".

Reference(s):

- Bradley, K. A. (2017). Lygodium japonicum (Japanese climbing fern).

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:

Though wind is the most common means of dispersal, animals and humans frequently carry spores.

Reference(s):

- GISD (2017). GISD.

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

Answer / Justification:

Spores are most commonly dispersed by wind, but can also be dispersed through equipment tires, shoes, etc.

Reference(s):

- Byrd, Jr, D.. John D., & Westbrooks D.. Randy (2017). IPAMS - Species Information - Lygodium japonicum - Japanese climbing fern.

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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: **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:

Though it is not the most common means of dispersal, L. japonicum propagules can be dispersed via equipment tires, clothing, and shoes.

Reference(s):

- Byrd, Jr, D.. John D., & Westbrooks D.. Randy (2017). IPAMS - Species Information - Lygodium japonicum - Japanese climbing fern.
- GISD (2017). GISD.

Total PRE Score

PRE Score: 20 -- Reject (high risk of invasiveness)
Confidence: 60 / 100
Questions answered: 18 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:

- Professor Allan Armitage December 21, 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.

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.