Plant Risk Evaluator -- PRE™
Evaluation Report

Paulownia tomentosa -- Washington

2022 Western IPM Grant Project

PRE Score: 15 -- Moderate Potential Risk
Confidence: 75 / 100
Questions answered: 20 of 20 -- Valid (80% or more questions answered)

Privacy: Public
Status: Completed

Evaluation Date: August 7, 2022

This PDF was created on May 23, 2025

This project was funded in part by the USDA National Institute of Food and Agriculture through the Western Integrated Pest Management Center, grant number 2018-70006-28881.

Plant Evaluated

Paulownia tomentosa

Image by Jean-Pol GRANDMONT

Evaluation Overview

A PRE™ screener conducted a literature review for this plant (*Paulownia tomentosa*) 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

Paulownia tomentosa is a fast-growing deciduous tree to 70 ft. Native to central and western China, the species was introduced to Europe prior to 1850 and soon after to North America where it has been planted widely as an ornamental. More recently developing markets for P. tomentosa timber products and the species' use in mine reclamation have contributed to its spread. P. tomentosa’s showy, fragrant flowers appear before the leaves in spring. A single mature tree can produce millions of viable seeds, which generally remain in capsules on the tree until being released in the fall when the tiny, winged seeds are dispersed on the wind for distances up to several miles. Seedling establishment is strongly linked to disturbance such as wildfire or flooding. P. tomentosa is intolerant of shade, which limits its long-term viability in closed-canopy forest systems; however, the species has been shown to persist in perpetually open and/or disturbed sites such as roadsides and railroad rights-of-way, ridgelines, rocky soils, and riparian areas. P. tomentosa has escaped cultivation in most of the eastern and midwestern United States and uncultivated establishment has been reported in the Pacific Northwest from Multnomah County, OR, to King County, WA. Given it's reproductive and ecological characteristics, Paulownia tomentosa appears to represent an incipient invasive threat in the habitats and community types described above.

General Information

Status: Completed
Screener: Jim Evans
Evaluation Date: August 7, 2022

Plant Information

Plant: *Paulownia tomentosa*

Regional Information

Region Name: Washington

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 on an article published by PLOS One, which can be found 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** point(s) to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

P. tomentosa is native to central and western China. Many sources document reproduction outside of cultivation in Europe and in eastern North America (Essl 2007, USDA Plants Database, Innes 2009). In the Pacific Northwest the species has been documented as adventive in 10 locations from Multonomah and Yamhill Counties, OR, to King County, WA (WTU 2022).

Reference(s):

- Essl, F. (2007). From ornamental to detrimental? The incipient invasion of Central Europe by Paulownia tomentosa. Preslia 79: 377–389. 79, 377–389.
- Innes, R. J. (2009). Paulownia tomentosa.
- USDA Plants Database (0). Paulownia tomentosa (Thunb.) Sieb. & Zucc. ex Steud. .
- WTU herbarium database (2022). Paulownia tomentosa (Thunb.) Sieb. & Zucc. ex Steud. . 2022,

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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** point(s) to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

The PlantRight climate match tool indicates that P. tomentosa's distribution in western Oregon and in the Appalachian Mountains from New England to Alabama, and most of the species' distribution in Europe is a match with the climate of Washington.

Reference(s):

- [Anonymous] (0). PlantRight.

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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** point(s) to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

P. tomentosa is recognized as an invader across many of the mid-Atlantic and midwestern states of the U.S. (Kuppinger 2010, Rebbeck 2012).

Reference(s):

- Chongpinitchai, A., & Williams R. (2021). The response of the invasive princess tree (Paulownia tomentosa) to wildland fire and other disturbances in an Appalachian hardwood forest.. Global Ecology and Conservation. 29,
- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.
- Kuppinger, D., Jenkins M., & White P. (2010). Predicting the post-fire establishment and persistence of an invasive tree species across a complex landscape. Biological Invasions. 12, 3473–3484.
- Rebbeck, J. (2012). Fire management and woody invasive plants in oak ecosystems. Proceedings of the 4th Fire in Eastern Oak Forests Conference. 142-155.

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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** point(s) to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

The PlantRight climate match tool indicates that P. tomentosa's distribution in the Appalachian Mountains from New England to Alabama, and most of the species distribution in Europe is a match with the climate of Washington. P. tomentosa is invasive in several Appalachian states. In Tennessee, where P. tomentosa competes with native plants on rocky cliffs and in scoured riparian zones, the species is listed as an 'Established Threat' in natural areas. In Connecticut the species is "prohibited from importation, movement, sale, purchase, transplanting, cultivation and distribution."

Reference(s):

- [Anonymous] (0). PlantRight.
- Tennessee Invasive Plants Council (2022). TN-IPC Invasive Plant Lists..
- Connecticut Invasive Plant Council (2018). Connecticut Invasive Plant List.

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

- Answer: **No**, which contributes **0** point(s) to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

P. tomentosa belongs to the monogeneric family Paulowniaceae. Neither the Flora of North America nor the Invasive Plant Atlas lists any other Paulownia species in North America. None of the other literature reviewed for this report suggested that there was another invasive Paulownia species elsewhere.

Reference(s):

- Freeman, C., Rabeler R., & Elisens W. (2018). Paulowniaceae. 2011,
- The University of Georgia Center for Invasive Species and Ecosystem Health (2017). princesstree, Paulownia tomentosa N/A Scrophulariales: Scrophulariaceae.

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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** point(s) to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

Extensive portions of P. tomentosa's introduced range along the eastern seaboard and midwestern U.S, in the Mediterranean and Black Sea regions, and the species' native range do not match Washington's climate.

Reference(s):

- [Anonymous] (0). PlantRight.

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** point(s) to the total PRE score.
- The *screener* has a **Very High** confidence in this answer based on the available literature.

Answer / Justification:

The species has the capacity to compete with and replace native species in communities that are naturally open, such as open woodlands, ridgelines, rocky soils, and streambanks (Williams 1993)

Reference(s):

- Kuppinger, D., Jenkins M., & White P. (2010). Predicting the post-fire establishment and persistence of an invasive tree species across a complex landscape. Biological Invasions. 12, 3473–3484.
- Williams, C. (1993). Age structure and importance of naturalized Paulownia tomentosa in a central Virginia streamside forest. Castanea. 58, 243-249.

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8. Is the plant noted as promoting fire and/or changing fire regimes?

- Answer: **No**, which contributes **0** point(s) to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

While P. tomentosa responds positively to fire, its wood is light, porous, and of low combustibility

Reference(s):

- Innes, R. J. (2009). Paulownia tomentosa.

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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** point(s) to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

Rationale: None of the considerable amount of literature available on P. tomentosa suggests that it presents any health risk to humans or animals.

Reference(s):

- [Anonymous] .

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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** point(s) to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

None of the considerable amount of literature available on P. tomentosa suggests that that it forms thickets or in any way impedes movement.

Reference(s):

- [Anonymous] .

Reproductive Strategies (Questions 11 - 17)

11. Does this species (or cultivar or variety) reproduce and spread vegetatively?

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

Answer / Justification:

P. tomentosa sprouts prolifically from adventitious buds on lateral roots. Vertical stems from lateral roots can grow as much as 15 feet in their first season.

Reference(s):

- Chongpinitchai, A., & Williams R. (2021). The response of the invasive princess tree (Paulownia tomentosa) to wildland fire and other disturbances in an Appalachian hardwood forest.. Global Ecology and Conservation. 29,
- Swearingen, J., Slattery B., Reshetiloff K., & Zwicker S. (2010). Plant Invaders of Mid-Atlantic Natural Areas. 168.
- Innes, R. J. (2009). Paulownia tomentosa.

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** point(s) to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

None of the available literature mention this as an important avenue of spread for P. tomentosa.

Reference(s):

- [Anonymous] .

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

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

Answer / Justification:

Laboratory studies have found germination rates in P. tomentosa seeds as high as 98%. Rates varied depending on treatment (pH, stratification, storage conditions) but were generally highest in treatments that most closely resembled average field conditions.

Reference(s):

- Kuppinger, D., White P., & Jenkins M. (2006). Predicting the invasion and survival of the exotic species Paulownia tomentosa following burning in pine and oak-pine forests.
- Turner, G., Lau R., & Young D. (1988). Effect of Acidity on Germination and Seedling Growth of Paulownia tomentosa. Journal of Applied Ecology. 25, 561-567.
- Carpenter, S., & Smith N. (1979). Germination of Paulownia Seeds after Stratification and Dry Storage. Tree Planters Notes. 30(4), 4-6.
- Longbrake, A. (2001). Ecology and invasive potential of Paulownia tomentosa (Scrophulariaceae) in a hardwood forest landscape. College of Arts and Sciences. Ph.D, 174.

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

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

Answer / Justification:

A single capsule may contain more than 2,000 seeds (Bonner 2008); a large tree may produce millions of seeds annually.

Reference(s):

- Bonner, F. (2008). Paulownia tomentosa (Thunb.) Siev. & Zucc. ex Steud.; royal paulownia. Woody Plant Seed Manual. 772-773.

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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** point(s) to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

Observation of P. tomentosa establishing in undisturbed sites is rare. In most environments P. tomentosa requires fire or another large-scale disturbance to provide enough light to stimulate germination and facilitate establishment. (Longbrake 2001, Kuppinger et al. 2010). Given the high rates of germination in laboratory studies (up to 98%; Carpenter & Smith 1979, Turner et al 1988, and others) and the enormous quantity of seeds produced by mature individuals, seed germination would not be expected to be limiting given suitable conditions (i.e., sunny w/ bare soil; Longbrake 2001, Kuppinger et al. 2010).

Reference(s):

- Kuppinger, D., Jenkins M., & White P. (2010). Predicting the post-fire establishment and persistence of an invasive tree species across a complex landscape. Biological Invasions. 12, 3473–3484.
- Turner, G., Lau R., & Young D. (1988). Effect of Acidity on Germination and Seedling Growth of Paulownia tomentosa. Journal of Applied Ecology. 25, 561-567.
- Carpenter, S., & Smith N. (1979). Germination of Paulownia Seeds after Stratification and Dry Storage. Tree Planters Notes. 30(4), 4-6.
- Longbrake, A. (2001). Ecology and invasive potential of Paulownia tomentosa (Scrophulariaceae) in a hardwood forest landscape. College of Arts and Sciences. Ph.D, 174.

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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** point(s) to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

Rebbeck (2012) reports seed production in P. tomentosa within 3-5 years.

Reference(s):

- Rebbeck, J. (2012). Fire management and woody invasive plants in oak ecosystems. Proceedings of the 4th Fire in Eastern Oak Forests Conference. 142-155.

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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** point(s) to the total PRE score.
- The *screener* has a **Medium** confidence in this answer based on the available literature.

Answer / Justification:

Flora of North America identifies the flowering period of P. tomentosa as lasting just three months, April-June, from which, in the absence of more specific information, it is inferred that seed production also lasts that long.

Reference(s):

- Freeman, C. (2020). Paulownia tomentosa (Thunberg) Steudel.. 2022,

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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** point(s) to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

None of the available literature suggests that animals are an important vector for P. tomentosa seed dispersal.

Reference(s):

- [Anonymous] .

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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** point(s) to the total PRE score.
- The *screener* has a **High** confidence in this answer based on the available literature.

Answer / Justification:

P. tomentosa has light (6200 seed/g) winged seeds adapted for wind dispersal (Bonner 2008). Seeds disperse up to 3.7 km from the parent plant (Kuppinger et al. 2006).

Reference(s):

- Bonner, F. (2008). Paulownia tomentosa (Thunb.) Siev. & Zucc. ex Steud.; royal paulownia. Woody Plant Seed Manual. 772-773.
- Kuppinger, D., White P., & Jenkins M. (2006). Predicting the invasion and survival of the exotic species Paulownia tomentosa following burning in pine and oak-pine forests.

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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** point(s) to the total PRE score.
- The *screener* has a **Low** confidence in this answer based on the available literature.

Answer / Justification:

None of the available literature suggests that these vectors are important for P. tomentosa seed dispersal.

Reference(s):

- [Anonymous] .

Total PRE Score

PRE Score: 15 -- Moderate Potential Risk
Confidence: 75 / 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 : Low Potential Risk
13 - 15 : Moderate Potential Risk
> 15 : High Potential Risk

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: 2022 Western IPM Grant 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:

• Alex Simmons	September 2, 2022
• Jutta Burger	September 2, 2022
• Wendy Descamp	August 31, 2022

This evaluation has a total of 3 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 info@plantright.org if additional action is required to resolve open issues.

Issue ID # 8108

Date Created: September 2, 2022 - 5:21pm
Date Updated: September 13, 2022 - 1:06pm

Submitted by: Alex Simmons

Status: Fixed
Type: Comment
Severity: Minor
Scope: Evaluation as a whole

Issue Description

Strong references are used and marked "high" (such as in Q5)-- can probably raise confidence to Very High where peer reviewed journals are used. -Alex Simmons

Issue Resolution (Screener's Response to Issue)

I changed the confidence level for Q. 11 to Very High -- it might have just been my oversight to rank that CL lower. I also changed the CL for # 5 as suggested, although I'm less sure why this CL should not be just High. I've been using the guidelines for CL in the Screener's Guide, which states for Very High: "Highly credible evidence; reviewed scientific publications," thinking this definition meant that highly credible evidence was *limited* to peer-reviewed publications. Perhaps I should be considering other highly regarded sources in this definition as well, even if not strictly peer-reviewed?

Issue ID # 8100

Date Created: September 2, 2022 - 1:38pm
Date Updated: September 13, 2022 - 3:06pm

Submitted by: Jutta Burger

Status: Fixed
Type: Suggestion
Severity: Minor
Scope: Evaluation as a whole

Issue Description

Your evaluations look really good. Consider also consulting the various robust websites that have also consolidated information about invasive plant listing status across regions. The list of those websites is in the Help menu. Great ones to always check are Global Invasive Species Database, EddMaps, plants.usda.gov, CABI. - Jutta

Issue Resolution (Screener's Response to Issue)

Revisited links references in PLANTS Database and Invasives.org to refine narrative about where P. tomentosa is invasive. Will take note of other suggested references in future.

Issue ID # 8099

Date Created: September 2, 2022 - 1:33pm
Date Updated: September 13, 2022 - 12:16pm

Submitted by: Jutta Burger

Status: Fixed
Type: Suggestion
Severity: Major
Scope: Q17. Does this plant continuously produce seed for >3 months each year or does seed production occur more than once a year?

Issue Description

Since there is no evidence that Paulownia flowers / produces seeds for >3 months, consider answering "no" to this question. - Jutta Burger

Issue Resolution (Screener's Response to Issue)

Changed answer to 'No' per suggestion, and changed narrative to say the species flowers '*just* three

months.'

Issue ID # 8098

Date Created: September 2, 2022 - 1:26pm
Date Updated: September 13, 2022 - 2:59pm

Submitted by: Jutta Burger

Status: Fixed
Type: Suggestion
Severity: Minor
Scope: Q04. Is the species (or cultivar or variety) noted as being invasive in the US or world in a similar climate?

Issue Description

Because Paulownia tomentosa does not appear to be formally listed across much of the US. I would make that clear in the justification and not count those references as evidence. Seems that the jury is still out for this species in many areas. According to https://plants.usda.gov/home/plantProfile?symbol=PATO2, It is listed in CT as "potentially invasive" and as such is prohibited. It also appears to be listed as invasive in Queensland http://www.iucngisd.org/gisd/speciesname/Paulownia+tomentosa# and and by the SE Exotic Pest Plant Council. Make sure these areas match WA climate. - Jutta Burger

Issue Resolution (Screener's Response to Issue)

Changed the narrative for Q. 4 to "The PlantRight climate match tool indicates that P. tomentosa's distribution in the Appalachian Mountains from New England to Alabama, and most of the species distribution in Europe is a match with the climate of Washington. P. tomentosa is invasive in several Appalachian states. In Tennessee, where P. tomentosa competes with native plants on rocky cliffs and in scoured riparian zones, the species is listed as an ‘Established Threat’ in natural areas. In Connecticut the species is “prohibited from importation, movement, sale, purchase, transplanting, cultivation and distribution,” and added references to Tennessee-IPC and Connecticut-IPC

Issue ID # 8074

Date Created: August 31, 2022 - 2:53pm
Date Updated: September 13, 2022 - 12:21pm

Submitted by: Wendy Descamp

Status: Fixed
Type: Suggestion
Severity: Minor
Scope: Q09. Is the plant a health risk to humans or animals/fish? Has the species been noted as impacting grazing systems?

Issue Description

Hi Jim, Should the Rationale sentence be edited to just be: None of the considerable amount of literature available on P. tomentosa suggests that that it presents any health risk to humans or animals. So, remove the 'thickets' as that is used in the next (#10) answer?

Issue Resolution (Screener's Response to Issue)

The inclusion of 'thickets' in this rationale statement was a copy-and-paste error, since the answers to 9 and 10 had similar language, up to a point. Changed the narrative to read "None of the considerable amount of literature available on P. tomentosa suggests that it presents any health risk to humans or animals."

Issue ID # 8073

Date Created: August 31, 2022 - 2:52pm
Date Updated: September 13, 2022 - 2:59pm

Submitted by: Wendy Descamp

Status: Fixed
Type: Suggestion
Severity: Minor
Scope: Q04. Is the species (or cultivar or variety) noted as being invasive in the US or world in a similar climate?

Issue Description

Hi Jim, As with past PRE review, suggest maybe take off WSNWCB reference as the monitor list is to gather information about a species and it hasn't necessarily been noted as invasive in WA (aiming to gather more information about the plant), though it has been found in WA, so could be a reference for question 2. I do not believe it is considered invasive (yet) in WA.
Is there a reference that can be listed as an Oregon reference for invasiveness?

Issue Resolution (Screener's Response to Issue)

Changed the narrative for Q. 4 to "The PlantRight climate match tool indicates that P. tomentosa's distribution in the Appalachian Mountains from New England to Alabama, and most of the species distribution in Europe is a match with the climate of Washington. P. tomentosa is invasive in several Appalachian states. In Tennessee, where P. tomentosa competes with native plants on rocky cliffs and in scoured riparian zones, the species is listed as an ‘Established Threat’ in natural areas. In Connecticut the species is “prohibited from importation, movement, sale, purchase, transplanting, cultivation and distribution,” and added references to Tennessee-IPC and Connecticut-IPC

About PRE and this Plant Evaluation Report

The Plant Risk Evaluator (PRE) is an online database and platform designed to assess the risk of a plant becoming invasive in a given region.This tool offers many benefits, and we encourage you to visit the PRE website (https://pretool.org) for more information.

If you would like to learn more about PRE, please email us at info@plantright.org, requesting a PRE Account.

PRE beta funding was provided by Sustainable Conservation (https://www.suscon.org/) and a USDA Farm Bill grant. Additional funding has been provided by the Western Integrated Pest Management Center.