Fire risk report for *Schinus terebinthifolius*

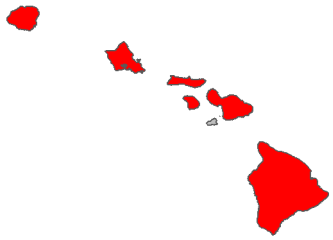
Full Species Name
Schinus terebinthifolius Raddi

Family: Anacardiaceae

Common names:
Christmas berry
wilelaiki

Synonyms:
Schinus terebinthifolia

Known occurrences (as of 2020)



Year first documented as naturalized in Hawai'i: 1926

This species has been ranked by the Hawai'i Weed Risk Assessment program as High Risk with a score of 19.

View photos on Starr Environmental

View on Wikipedia

View occurrences on iNaturalist

View at Plants of Hawaii

View photos on Flickr

0	.5	1
Lowest risk	⇔	Highest risk

This species is likely a **high** fire risk in Hawai'i with a fire risk score of **0.45**.

This species was ranked by 49 managers on a scale of 'no risk', 'low risk', 'medium risk', or 'high risk'. The numerical score ranges from 0 to 1 with higher scores indicating more managers considered it a higher risk. A score of > .31 indicates high risk.

Summary of Fire ecology	
Native habitat fire proneness	Fire-prone
Fire promoting plant in its native range	No
Fire promoting plant in its introduced range*	No
Regenerates after fire	Yes
Promoted by fire	Yes
Reported flammable*	Low
Relative is flammable*	Yes

*These values were used by the model to predict fire risk

Detailed summary of Fire Ecology

Native habitat fire proneness (In any part of the plant's native range is its habitat described as fire prone due to natural or human caused fires?)	Fire-prone	"Schinus terebinthifolius, known as Brazilian peppertree, is a native species, occurring throughout Brazil's Atlantic Forest region, as well as areas belonging to the "Cerrado" (Brazilian tropical savanna) latu sensu and 'Pampa'" #Cerrado is famously fire prone http://dx.doi.org/10.1590/18069657rbcs20150444 Freitas Frasson, Joice de, Joao Rosado, Samuel Elias, and Birgit Harter-Marques. "Litter Decomposition of Two Pioneer Tree Species and Associated Soil Fauna in Areas Reclaimed after Surface Coal Mining in Southern Brazil." Revista Brasileira de Ciência Do Colo 40 (November 3, 2016).
Fire promoting plant in its native range (Does the species act as a major fuel source, increase fire severity, frequency, or modify fuel bed characteristics within its native range?)	No	
Fire promoting plant in its introduced range (Same as Fire Promoting Native but within the species introduced range)	No	"Wade and others [197] note that intense wildfires do not commonly penetrate dense stands of Brazilian pepper. Because of this, Brazilian pepper hedgerows are often used as firebreaks [197]. Attempts to burn Brazilian pepper using delayed aerial incendiary devices resulted in a patchy burn. There was little fire spread in a Brazilian pepper stand even under dry conditions and with the addition of gasoline [98]. It is likely that the lack of herbaceous cover (see above) in stands dominated by Brazilian pepper contributes to their lack of flammability [44,197]." https://www.fs.fed.us/database/feis/plants/shrub/schter/all.html#FireEffectsAndManagement ---------- "In contrast, woody invaders of pine barren ecosystems (Schinus terebinthifolius and Robinia pseudoacacia) reduce fire frequency or intensity (Richburg et al. 2004; Stevens and Beckage 2009)." https://www.researchgate.net/profile/Lisa_Mandle/publication/225149286_Woody_exotic_plant_invasions_and_fire_

		Reciprocal_impacts_and_consequences_for_native_ecosystems/links/5671b8cf08aecc73dc095148/Woody-exotic-plant-invasions-and-fire-Reciprocal-impacts-and-consequences-for-native-ecosystems.pdf Mandle, L., Bufford, J. L., Schmidt, I. B., & Daehler, C. C. (2011). Woody exotic plant invasions and fire: reciprocal impacts and consequences for native ecosystems. Biological Invasions, 13(8), 1815-1827.
Regenerates after fire (Does the plant regrow after fire by any means? This includes resprouters, reseeders, and recruiters which dispersed into the area within approximately one year post fire)	Yes	"Brazilian pepper typically survives or is top-killed by fire [45,118], although small trees are often killed by fire. Based on observations in southern Florida, fire-induced mortality of Brazilian pepper less than 20 inches (50 cm) tall is nearly 100% [56,118]. In pine rockland savanna of southeastern Florida, mortality rates of unburned Brazilian pepper were 0% to 4%, while mortality rates of Brazilian pepper burned in late July were 30% to 45%. Mortality rates of individuals with a basal diameter <0.4 inch (1 cm) were 63% to 100%, while mortality rates of individuals with a basal diameter >1 inch (3 cm) ranged from 0% to 8% [178]." https://www.fs.fed.us/database/feis/plants/shrub/schter/all.html#FireEffectsAndManagement
Promoted by fire (Does the plant increase in abundance after a fire?)	Yes	"Brazilian pepper is well known for its ability to establish in disturbed areas (see Site Characteristics), and is often reported on burned sites, although the origin of these plants is not always discussed. For example, Brazilian pepper was found in a severely burned hardwood stand in Big Cypress National Preserve during a survey of nonnative plants during the early 1970s (Alexander and Crook 1975 cited in [78]). Wade and others [197] report Brazilian pepper on recently burned sites in southern Florida, and small Brazilian pepper plants have been reported on pineland sites burned approximately every 5 years in the Everglades [118]. In tree island vegetation of the Everglades, Brazilian pepper was most common on sites where recent, severe fire was common (50% of sites) " https://www.fs.fed.us/database/feis/plants/shrub/schter/all.html#FireEffectsAndManagement ---------- "Given the lack of Brazilian pepper germination in a laboratory experiment in which seeds were heated to 158 °F (70 °C) for an hour [142] and Brazilian pepper's short-lived seed bank, the source of postfire recruitment is more likely from sprouts, seeds from on-site trees that survived

		the fire, and/or seeds from trees in neighboring areas rather than from seeds in the soil seed bank." https://www.fs.fed.us/database/feis/plants/shrub/schter/all.html#FireEffectsAndManagement --- "Sprouts of fire-damaged Brazilian pepper can grow rapidly. Some sprouts grew to over 3 feet (1 m) tall within 6 months of a fall prescribed fire in a pineland community. Average shoot growth was over 5 inches (14 cm) per month [118]. Growth rates of burned Brazilian pepper in a pine rockland community in Everglades National park averaged 0.69 cm/year, which was faster than the average growth rate of 0.33 cm/year observed in unburned Brazilian pepper [179]." https://www.fs.fed.us/database/feis/plants/shrub/schter/all.html#FireEffectsAndManagement --- "In highly disturbed communities it is unlikely that fire has substantial negative effects on Brazilian pepper. In a previously farmed area within Everglades National Park, Brazilian pepper stem densities increased [46] and recruitment into larger size classes continued [45] despite successful burning 2 to 4 times in a 5-year period. Brazilian pepper density declined on 1 site, but this was most likely due to a long hydroperiod. Brazilian pepper density increased linearly on sites that were burned 4 times during the 5-year period, and exponentially on sites burned less frequently and/or less completely. Higher fuel production by associated plant species may account for some sites burning more frequently and/or completely [46]. The slowed colonization by Brazilian pepper on these fuel-rich sites may not be due to burning, but rather to increased competition with associated, fuel-producing species or to site conditions that allowed for persistence of these species." https://www.fs.fed.us/database/feis/plants/shrub/schter/all.html#FireEffectsAndManagement
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	Low	"Wade and others [197] note that intense wildfires do not commonly penetrate dense stands of Brazilian pepper. Because of this, Brazilian pepper hedgerows are often used as firebreaks [197]. Attempts to burn Brazilian pepper using delayed aerial incendiary devices resulted in a patchy burn. There was little fire spread in a Brazilian pepper stand even under dry conditions and with the addition of gasoline [98]. It is likely that the lack of herbaceous cover (see above) in

		stands dominated by Brazilian pepper contributes to their lack of flammability [44,197]." https://www.fs.fed.us/database/feis/plants/shrub/schter/all.html#FireEffectsAndManagement
Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	Yes	"Senegalia gilliesii was identified as the most flammable species when using functional trait analysis, whereas shoot-level assessments found Larrea divaricata and Schinus johnstonii to be the most flammable. There were no disturbance effects on the FI but there was seasonal variation" # weak evidence Santacruz-García, A. C., Bravo, S., del Corro, F., & Ojeda, F. (2019). A comparative assessment of plant flammability through a functional approach: The case of woody species from Argentine Chaco region. Austral Ecology, 44(8), 1416-1429.

Text in quotes are direct quotes from the source
Text in square brackets was added by the assessor to clarify something or to summarize from a figure.
Text preceded by a "#" is comment from the assessor

The data presented were assembled from literature and database searches for each species using as much data as could be collected regarding the plant's fire ecology under natural conditions. Searches aimed to be exhaustive and consist of as much data as could be located in 2020. Our machine learning algorithm was trained on 49 species of plants which had their fire risk ranked by 49 managers in Hawai'i in November 2020. The model used a conditional random forest regression algorithm to predict scores for each species using the manager score as the response variable and the fire ecology traits of each plant as the predictor variables to generate a fire risk score. This trained model was then used to predict the fire risk for all species which were not ranked by managers. The model was calibrated such that it is 90% accurate at predicting high fire risk plants and 79% accurate at predicting low fire risk plants. This research and the resulting fire risk model has been published in the journal Biological Invasions by Kevin Faccenda and Curt Daehler (both at the University of Hawai'i at Mānoa).

Note that the analysis doesn't account for a plant species' spatial distribution, population density, or distinct climate and ecosystem conditions (which can also influence fire risk). The fire risk of these species are mostly under "worst case" environmental conditions where the climate is dry enough to maintain fire, but wet enough to allow for plant growth and fuel accumulation. The fire risk ranking should not be taken as a stand-alone risk metric in prioritizing weed control

efforts. Rather, this information may also be useful for determining if a newly discovered species poses a potential fire threat in wildland areas.

More general information on the weed risks and ecology of non-native plants in Hawai‘i is available from the Hawai‘i Invasive Species Committee’s Weed Risk Assessment database.

View more fact sheets at https://www.pacificfireexchange.org/weed-fire-risk-assessments

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Fact sheet prepared by Kevin Faccenda (faccenda@hawaii.edu) in November 2021. Data were prepared by Kevin Faccenda in 2020.

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