Fire risk report for *Ailanthus altissima*

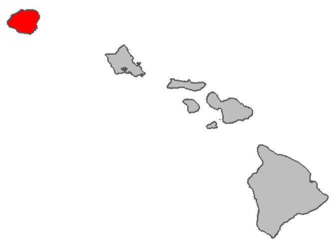
Full Species Name
Ailanthus altissima (Mill.) Swingle

Family: Simaroubaceae

Common names:
tree-of-heaven

Synonyms:

Known occurrences (as of 2020)



Year first documented as naturalized in Hawai'i: 2010

This species has been ranked by the Hawai'i Weed Risk Assessment program as High Risk with a score of 21.

View photos on Starr Environmental

View on Wikipedia

View occurrences on iNaturalist

View at Plants of Hawaii

View photos on Flickr

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Lowest risk ⇔ Highest risk

This species is likely a **low** fire risk in Hawai'i with a fire risk score of **0.16**.

This species was ranked by our machine learning algorithm using the data presented on the next page. A predicted score of > .34 suggests the plant is a high fire risk.

Summary of Fire ecology	
Native habitat fire proneness	Non 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*	No Data
Relative is flammable*	No

*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?)	Non Fire-prone	"The native range of recent Ailanthus altissima covers large parts of China, where the species grows as a natural component of broadleaf forests....Ailanthus has developed a secondary range on all other continents except Antarctica with a broad latitudinal range from the temperate to meridional zones. It is most frequent in the meridional and submeridional zones (Fig. 5). Both, the native and secondary ranges match well climatic conditions characterized by a long and warm growing season, regular winter frost and annual precipitation of mostly > 500 mm." https://doi.org/:10.1016/j.ppees.2007.03.002 Kowarik, Ingo, and Ina Säumel. "Biological Flora of Central Europe: Ailanthus Altissima (Mill.) Swingle." Perspectives in Plant Ecology, Evolution and Systematics 8 (2007): 207–37.
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	"The fire ecology of tree-of-heaven in its native China was not available in English-language literature as of this writing (2010)." https://www.fs.fed.us/database/feis/plants/tree/ailalt/all.html#FireEffectsAndManagement
Fire promoting plant in its introduced range (Same as Fire Promoting Native but within the species introduced range)	No	
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	"Natural disturbances, such as frost or fire, and human-mediated impacts by cutting, chopping or girdling of stems induce a prolific vegetative regeneration by sprouts that may emerge from the root, the root crown or the stem" https://doi.org/:10.1016/j.ppees.2007.03.002 Kowarik, Ingo, and Ina Säumel. "Biological Flora of Central Europe: Ailanthus Altissima (Mill.) Swingle." Perspectives in Plant Ecology, Evolution and Systematics 8 (2007): 207–37. ---------------------------- "Tree-of-heaven sprouts after top-kill by fire [103,274,299]. It sprouts from the roots, root crown, and/or bole after

		other aboveground damage (see Vegetative regeneration); so any of these sprouting strategies may occur after top-kill by fire, with root sprouting most likely. Anecdotal accounts suggest that tree-of-heaven is "able to sprout vigorously when...burnt" [185] and persists in some areas "despite...burning" [309]." https://www.fs.fed.us/database/feis/plants/tree/ailalt/all.html#FireEffectsAndManagement
Promoted by fire (Does the plant increase in abundance after a fire?)	Yes	"Studies on the George Washington National Forest, West Virginia [196,247], and Tar Hollow State Forest, Ohio [11,39,150] show that prescribed burning or thinning and burning may increase tree-of-heaven abundance over prefire or pretreatment levels... One year after late March prescribed fires on the George Washington National Forest, tree-of-heaven increased on 2 of 3 study sites compared to prefire abundance; these increases were not considered significant except on the upper portion of 1 site, where tree-of-heaven increased exponentially. All postfire tree-of-heaven regeneration was from seedling establishment." https://www.fs.fed.us/database/feis/plants/tree/ailalt/all.html#FireEffectsAndManagement
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	No Data	"Non-flammable rank: Populus canadensis Moench., Armeniaca sibirica Lam., Vitex negundo var. heterophylla Rehd., Ailanthus altissima Wingle..." https://doi.org/10.1007/s11461-009-0059-6 Wang, Xiaoli, Shukui Niu, and Zhenguo Kan. “Properties and Flammability of Major Tree Species in the Beijing Area.” Frontiers of Forestry in China 4, no. 3 (2009): 304–8. ---------------------------- "Flammability: 2... 2= moderately flammable" https://doi.org/10.1016/j.landurbplan.2016.11.003 Molina, Juan, Teodoro Martin, Francisco Rodriguez Y Silva, and Miguel Herrera. “The Ignition Index Based on Flammability of Vegetation Improves Planning in the Wildland-Urban Interface: A Case Study in Southern Spain.” Landscape and Urban Planning 158 (February 2017): 129–38. ---------------------------- "Few quantitative measurements of tree-of-heaven litter, aboveground biomass, or leaf area indices were available as of 2010, so the ability of tree-of-heaven to alter fuel loads of native ecosystems is unclear. Fuel studies are needed on tree-of-heaven."

		https://www.fs.fed.us/database/feis/plants/tree/ailalt/all.html#FireEffectsAndManagement
Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	No	

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 Hawaiʻi 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 Hawaiʻi is available from the Hawaiʻi 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 Ronja Steinbach and Kevin Faccenda in 2020.

This research was funded by the Department of the Interior Pacific Islands Climate Adaptation Science Center. The project described in this publication was supported by Grant or Cooperative Agreement No.G20AC00073 to Curt Daehler from the United States Geological Survey. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Geological Survey. Mention of trade names or commercial products does not constitute their endorsement by the Pacific Islands Climate Adaptation Science Center or the National Climate Adaptation Science Center or the US Geological Survey.