Fire risk report for *Banksia marginata*

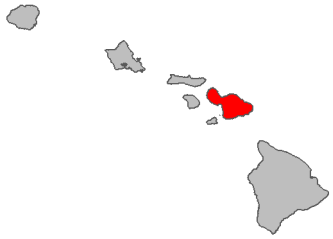
Full Species Name
Banksia marginata Cav.

Family: Proteaceae

Common names:
silver banksia

Synonyms:

Known occurrences (as of 2020)



Year first documented as naturalized in Hawai'i: 2011

This species has not yet been ranked by the Hawai'i Weed Risk Assessment program as of 2020.

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 **0.52**.

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	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	No
Reported flammable*	High
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	"its native range is SE. Australia." http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:703136-1 --- "Most Proteaceae are sclerophyllous shrubs that occur in fire-prone vegetation on nutrient-poor soils in southern Australia and South Africa. . . . Banksia marginata is widely distributed along the coast and ranges of south-eastern Australia. We examined B. marginata within Gibraltar Range National Park (29°36'S, 152°16'E, 1000 m a.s.l.) in north-eastern New South Wales, where it is at the northern limit of its range (Harden 1991). In this area, populations occur in fire-prone sedge-heath swamps on acidic, granitic soils." https://doi.org/10.1046/j.1365-2745.1998.00279.x Vaughton, Glenda, and Mike Ramsey. “Sources and Consequences of Seed Mass Variation in Banksia Marginata (Proteaceae).” Journal of Ecology 86, no. 4 (December 25, 2001): 563–73. --- "It occupies a wide edaphic range, having a preference for sandy soils, although it has been found on clay loam, peaty loam, rocky soil, and soils developed on quartz sandstone, limestone and granite (George 1981). It can occur in shrubland, woodland forest, swamps and coastal dunes, living within a rainfall range of 400-1000 mm per annum (George 1984). " Blake, Julieanne, and Robert Hill. “An Examination of the Drought and Frost Tolerance of Banksia Marginata (Proteaceae) as an Explanation of Its Current Widespread Occurrence in Tasmania.” Australian Journal of Botany 44 (1996): 265–81.) --- "We examined the sources and consequences of seed mass variation in Banksia marginata occurring in fire-prone heath" Vaughton, G., & Ramsey, M. (1998). Sources and consequences of seed mass variation in Banksia marginata (Proteaceae). Journal of Ecology, 86(4), 563-573.
Fire promoting plant in its native range (Does	No	

the species act as a major fuel source, increase fire severity, frequency, or modify fuel bed characteristics within its native range?)		
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	"As most species (including Banksia) in the fire-prone environments of Australia regenerate prolifically in the first year of two following fire" https://www.researchgate.net/profile/Timothy_Wills/publication/248899417_Using_Banksia_Proteaceae_node_counts_to_estimate_time_since_fire/links/541771000cf2f48c74a4092a/Using-Banksia-Proteaceae-node-counts-to-estimate-time-since-fire.pdf Wills, T. J. (2003). Using Banksia (Proteaceae) node counts to estimate time since fire. Australian Journal of Botany, 51(3), 239-242. --- "The resprouter species, B. serrata L.f., B. marginata Cav., and H. gibbosa (Smith) Cav. also occur in the heath and resprout as well as release seed after fire (Bradstock 1990)." https://doi.org/10.1071/bt96116 Hammill, K. A., Bradstock, R. A., & Allaway, W. G. (1998). Post-fire Seed Dispersal and Species Re-establishment in Proteaceous Heath. Australian Journal of Botany, 46(4), 407.
Promoted by fire (Does the plant increase in abundance after a fire?)	No	"Plants per m^2" for B. marginata was between ".14 and .39" ... Banksia marginata, D. viscosa and L. parviflorus all occurred at significantly lower densities in the burnt site than in the unburnt. Banksia marginata regenerates predominantly by re-sprouting from buds on lateral roots, only rarely regenerating from seed (Groves et al. 1986). The lower density after fire may be a result of plant mortality and a failure of seedlings to replenish during the two years since the burn" Digby, Ryan, Paul Finos, Scott Giacopini, Manfred Jusaitis, Joan Gibbs, and Sophie Petit. “DENSITY OF FOUR MID-

		STOREY PLANT SPECIES IN BURNT AND UNBURNT HABITAT IN BAGDAD NATIVE FOREST RESERVE, SOUTH AUSTRALIA." The South Australian Naturalist 88, no. 1 (June 2014): 12–15 --- "Banksia marginata had increased as predicted due to the long-term absence of fire (Lunt 1998a,b)" https://doi.org/10.1111/j.1442-9993.2007.01667.x Gent, M. L., & Morgan, J. W. (2007). Changes in the stand structure (1975–2000) of coastal Banksia forest in the long absence of fire. Austral Ecology, 32(3), 239-244. --- #limited data regarding how this species responds post fire, little of it is quantative despite the abundance of research regarding the plant
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	High	"This contrasts with the results of Dickinson & Kirkpatrick (1985) who found that some fresh foliage of Tasmanian, dry forest species (e.g. Eucalyptus viminalis, Banksia marginata) burnt freely" Bowman, D, and B Wilson. "Fuel Characteristics of Coastal Monsoon Forests, Northern Territory, Australia." Journal of Biogeography 15, no. 5/6 (November 1988): 807–17. --- "Banksia marginata responded explosively with rapid flame propagation and spark emission often extinguishing the gas flame... the most flammable and self-propagating species were Eucalyptus viminalis adult leaves, Banksia marginata, E. pulchella and Acacia stricta, all characteristic of dry forest... However, Banksia marginata, Acacia stricta, Eucalyptus pulchella and Poa emerged as the four most flammable species." Dickinson, K, and J Kirkpatrick. "The Flammability and Energy Content of Some Important Plant Species and Fuel Components in the Forests of Southeastern Tasmania." Journal of Biogeography 12, no. 2 (March 1985): 121–34. https://doi.org/10.1111/j.1442-9993.2007.01667.x Gent, M. L., & Morgan, J. W. (2007). Changes in the stand structure (1975–2000) of coastal Banksia forest in the long absence of fire. Austral Ecology, 32(3), 239-244. --- "Banksia marginata wet scrub = H [Highly flammable]" https://www.sttas.com.au/sites/default/files/media/documents/science/tasforests/Tasforests-Vol-16__3_web.pdf

		Pyrke, A. F., & Marsden-Smedley, J. B. (2005). Fire-attributes categories, fire sensitivity, and flammability of Tasmanian vegetation communities. Tasforests, 16, 35-46.
Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	Yes	"There is some support from phylogenetic studies that some of these features [e.g. branch retention in Pinus (He et al. 2012; Schwilk 2003)] and foliage retention in Banksia (He et al. 2011) have evolved to shape fire regimes." #In addition to needing serotinity/needing fire to reproduce Clarke, Peter, Lynda Prior, Ben French, Ben Vincent, Kirsten Knox, and David Bowman. "Using a Rainforest-Flame Forest Mosaic to Test the Hypothesis That Leaf and Litter Fuel Flammability Is under Natural Selection." Oecologia 176 (2014): 1123–33. --- "Banksia serrata woodland = H [high flammability]" https://www.sttas.com.au/sites/default/files/media/documents/science/tasforests/Tasforests-Vol-16__3_web.pdf Pyrke, A. F., & Marsden-Smedley, J. B. (2005). Fire-attributes categories, fire sensitivity, and flammability of Tasmanian vegetation communities. Tasforests, 16, 35-46.

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

---

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.