Fire risk report for *Terminalia bellirica*

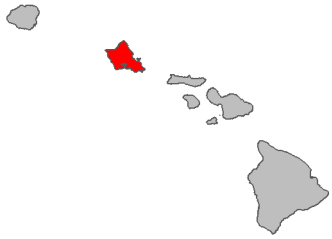
Full Species Name
Terminalia bellirica (Gaertn.) Roxb.

Family: Combretaceae

Common names:
bahera

Synonyms:

Known occurrences (as of 2020)



Year first documented as naturalized in Hawai'i: 2005

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

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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	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 Data
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?)	Fire-prone	"Scattered forests, sunny mountain slopes, one of the upper layer trees of stream valleys and lower seasonal rain forests; 500-1400 m." http://efloras.org/florataxon.aspx?flora_id=610&taxon_id=200014745 --- "The four most abundant species (Kydia calycina, Lagerstroemia microcarpa, Terminalia crenulata and Helicteres isora) constituted nearly 56% of total stems... Fire is an almost annual occurrence in these forest and causes high mortality of spalings" https://www.jstor.org/stable/24094449?seq=1#metadata_info_tab_contents Sukumar, R., Dattaraja, H. S., Suresh, H. S., Radhakrishnan, J., Vasudeva, R., Nirmala, S., & Joshi, N. V. (1992). Long-term monitoring of vegetation in a tropical deciduous forest in Mudumalai, southern India. Current science, 608-616. --- "The present study area is also prone to fire, where a total of 13 forest fires were recorded for the last 11 years... [listed T. bellirica as occuring here]" http://www.mathewkjacob.com/img/publication/Fire%20Risk%20Zone%20Mapping%20in%20Chinnar.pdf Ajin, R. S., Loghin, A. M., Vinod, P. G., & Jacob, M. K. (2016). Forest fire risk zone mapping in Chinnar Wildlife Sanctuary, Kerala, India: A study using geospatial tools. Journal of Global Resources, 3, 16-26. --- "Lastly, the moist tropical forest... [lists T. bellirica]... [later describes how this area burns, but less frequently and with less intensity than the other drier habitats]" Kodandapani, N., Cochrane, M. A., & Sukumar, R. (2009). Forest fire regimes and their ecological effects in seasonally dry tropical ecosystems in the Western Ghats, India. In Tropical Fire Ecology (pp. 335-354). Springer, Berlin, Heidelberg.
Fire promoting plant in its native range (Does the species act as a	No	

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	not widely introduced
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	"The four most abundant species (Kydia calycina, Lagerstroemia microcarpa, Terminalia crenulata and Helicteres isora) constituted nearly 56% of total stems... Fire is an almost annual occurrence in these forest and causes high mortality of spalings" #must regenerate if it is dominant in a fire prone ecosystem https://www.jstor.org/stable/24094449?seq=1#metadata_info_tab_contents Sukumar, R., Dattaraja, H. S., Suresh, H. S., Radhakrishnan, J., Vasudeva, R., Nirmala, S., & Joshi, N. V. (1992). Long-term monitoring of vegetation in a tropical deciduous forest in Mudumalai, southern India. Current science, 608-616.
Promoted by fire (Does the plant increase in abundance after a fire?)	No Data	
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	No Data	Data related to flammability available: Heat of Combustion (kJ/g dry weight) of the bark = 14.43, wood=17.43, mean=15.93 Ash (%) bark=8.00, wood=2.94, mean=5.74 (Shanavas, A, and Mohan Kumar. “Fuelwood Characteristics of Tree Species in Homegardens of Kerala, India.” Agroforestry Systems 58 (2003): 11–24.)
Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	No	T. melanocarpa and T. ivorensis among others are not considered fire hazards in natural ecosystems according to their HWRA.

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 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

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