Fire risk report for *Tillandsia usneoides*

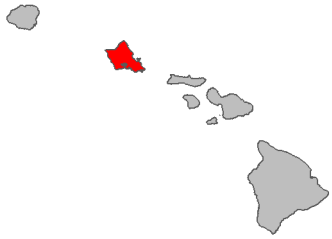
Full Species Name
Tillandsia usneoides (L.) L.

Family: Bromeliaceae

Common names:
Spanish moss
Dole's beard
‘umi‘umi-o-Dole

Synonyms:

Known occurrences (as of 2020)



Year first documented as naturalized in Hawai’i: 2006

This species has been ranked by the Hawai'i Weed Risk Assessment program as High Risk with a score of 12.

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	Yes
Fire promoting plant in its introduced range*	No
Regenerates after fire	Yes
Promoted by fire	Yes
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	"reported to have arisen in the Peruvian Andes . . . Spanish moss 'prefers' a well-lighted but moist habitat and that the plants are confined to the 'water-side' of trees on stream banks in some areas....Mez (1904) believed that the plant is limited to drier habitats due to a need for regular periods of desiccation." Garth, R. “THE ECOLOGY OF SPANISH MOSS (TILLANDSIA USNEOIDES): ITS GROWTH AND DISTRIBUTION.” Ecology 45, no. 3 (1964): 470–81. ---------- "This is a frost tender plant that is native from the southeastern U. S. to Chile and Argentina, often found in wet habitats (swamps, rainforests, mangroves, and along streams, rivers, ponds, lakes)." http://www.missouribotanicalgarden.org/PlantFinder/PlantFinderDetails.aspx?kempercode=f427 ---------- "Natural fire frequency is estimated to be frequent, with a 1 - 3 year return interval (FNAI, 2010)... [T. usneoides listed as occuring in this habitat]" https://core.ac.uk/reader/71999144 Maholland, Peter D., "Effects of Prescribed Fire on Upland Plant Biodiversity and Abundance in Northeast Florida" (2015).UNFGraduate Theses and Dissertations. 562.
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?)	Yes	"This resulted in a broad and rapidly moving headfire with 2 to 4 m high flames that generated at least two fire whirlwinds before reaching the timber. The fire crowned in the shrub growth and climbed up hanging Spanish moss (Tillandsia usneoides L.) to several tree canopies" https://www.jstor.org/stable/pdf/2424038.pdf Vogl, R. J. (1973). Effects of fire on the plants and animals of a Florida wetland. American Midland Naturalist, 334-347. ---------- "Highly flammable Spanish moss (Tillandsia usneoides) accumulates on older sand pine and can be ignited by lightning or can elevate a ground fire to the crown [9]." https://www.fs.fed.us/database/feis/plants/tree/pincla/all.html#9
Fire promoting plant in its introduced range	No	#not introduced anywhere else besides for Australia

(Same as Fire Promoting Native but within the species introduced range)		
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	"[abundance increased after fire in sandhills and scrubby flatwoods, but decreased in mesic flatwoods. table 11]" #necessarily regenerated if abundance increased after fire https://core.ac.uk/reader/71999144 Maholland, Peter D., "Effects of Prescribed Fire on Upland Plant Biodiversity and Abundance in Northeast Florida" (2015).UNFGraduate Theses and Dissertations. 562.
Promoted by fire (Does the plant increase in abundance after a fire?)	Yes	"[most commmon area found was in areas with low burn frequency rather than high or unbruned sites. table 2]" #promoted by infrequent fire but too frequent fires kill it? https://www.jstor.org/stable/pdf/2996725.pdf Mehlman, D. W. (1992). Effects of fire on plant community composition of North Florida second growth pineland. Bulletin of the Torrey Botanical Club, 376-383. --- "[abundance increased after fire in sandhills and scrubby flatwoods, but decreased in mesic flatwoods. table 11]" https://core.ac.uk/reader/71999144 Maholland, Peter D., "Effects of Prescribed Fire on Upland Plant Biodiversity and Abundance in Northeast Florida" (2015).UNFGraduate Theses and Dissertations. 562.
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	High	"These field fires often spread to the adjacent woods, damaging the trees and burning the festoons of Spanish moss which hang in the lower branches" https://doi.org/10.2307/1936100 Garth, R. E. (1964). The ecology of Spanish moss (Tillandsia usneoides): its growth and distribution. Ecology, 45(3), 470-481. --- "Highly flammable Spanish moss (Tillandsia usneoides) accumulates on older sand pine and can be ignited by lightning or can elevate a ground fire to the crown [9]." https://www.fs.fed.us/database/feis/plants/tree/pincla/all.html#9 ---

		"These fires are suually very explosive due to the abundance of highly flammable material such as Spanish moss (Tillandsia usneoides) and a "varnish" that coats the pine needles" https://www.google.com/books/edition/Palm_Coast_Flagler_County_ITT_Permit/Gfs0AQAAMAAJ?hl=en&gbpv=1&dq=%22Tillandsia+usneoides%22+AND+flammable&pg=PA62&printsec=frontcover Palm Coast, Flagler County, ITT Permit: Environmental Impact Statement. (1976). United States: (n.p.).
Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	Yes	"We took two separate crown base height (CBH) measurements for each overstorey tree because most supported the epiphytic bromeliad, Tillandsia spp., which sometimes reached the ground, and nearly all of the bases of N. parviflora were covered in dead fronds that could serve to carry fire." https://doi.org/10.4103/0972-4923.179884 Sheridan, Rachel, Peter Fulé, Martha Lee, and Erik Nielsen. "Identifying Social-Ecological Linkages to Develop a Community Fire Plan in Mexico." Conservation & Society 13, no. 4 (2015): 395–406.

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.

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