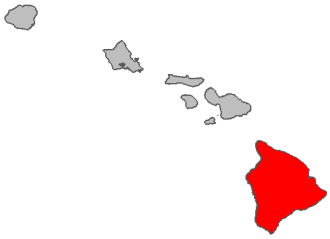
Fire risk report for *Cenchrus elegans*

Full Species Name *Cenchrus elegans*
Family: Poaceae
Common names: burgundy giant foxtail bamboo
Synonyms: *Pennisetum macrostachys* *Pennisetum macrostachyum*
Known occurrences (as of 2020) 
Year first documented as naturalized in Hawai'i: 2011
This species has been ranked by the Hawai'i Weed Risk Assessment program as High Risk with a score of 7.
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 **0.31**.

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	No Data
Promoted by fire	No Data
Reported flammable*	No Data
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	"[Native in tropics: Malesia and Papuasia]" http://plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:77142633-1 --- "Habitat — Sunny, infertile soil, slopes, along hollow roads, Imperata fields, gravel beds, savannahs, 0–2130 m altitude." #Imperata is highly flammable and typically occurs in areas which burn frequently https://doi.org/10.3767/000651914X684376 Veldkamp, J. “A Revision of Cenchrus Incl. Pennisetum (Gramineae) in Malesia with Some General Nomenclatural Notes.” Blumea 59 (2014): 59–75. --- "The main pioneer grasses, colonising abandoned garden land, are the two Imperata species, I. conferta and I. cylindrica; usually there are other, more robust species: Coelorhachis rottboellioides, Ophiuros tongcalingii, Pennisetum macrostachyum [=C. elegans] and Polytoca macrophylla. The sprawling species, Microstegium spectabile and Eulalia leptostachys, may also be present. In wetter areas, the introduced, creeping, Paspalum con juga tum may cover the ground at first, but it is finally overgrown by taller species. In some localities, Saccharum spontaneum may be prominent. In the early stages of grassland establishment, a variety of woody plants survive for a while, but these are reduced as the years pass, with regular burning." https://doi.org/10.1007/978-94-009-8632-9_19 Henty, E. E. (1982). Grasslands and grassland succession in New Guinea. In Biogeography and ecology of New Guinea (pp. 459-473). Springer, Dordrecht.
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	No	

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, data not expected
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)	No Data	
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	#likely, but no data
Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	Yes	"Fuels: Buffelgrass [Cenchrus ciliaris] fine fuel loads are generally much higher than fine fuel loads from native plants in desert environments. Thus, fires in buffelgrass stands may have longer flame lengths, greater rates of spread, and higher temperatures than fires in native desert vegetation, and cause high mortality in native flora and fauna [43]. Buffelgrass stands burn "very hot" [24] and can burn when green [42,129]. In the Sonoran Desert, buffelgrass-fueled fires can reach temperatures so hot that the soil is scorched and the bedrock cracked [42]. Headfires in buffelgrass stands can reach temperatures of 1,090 to 1,300 °F (585-700 °C) [27,103]. Esque and others [42] state that buffelgrass grows into an "almost-woody subshrub", accumulating flammable material over several years, "in effect unlinking fire frequency from annual climatic variability and increasing the fire intensity"."

		https://www.fs.fed.us/database/feis/plants/graminoid/pencil/all.html#FIRE%20ECOLOGY --- "Buffel grass invasion was significantly correlated with increased fuel loads. Increased fuel loads were significantly correlated with increased burn severity, although the direct relationship between the proportion of buffel grass and increased burn severity was marginally non-significant." Miller, G., Friedel, M., Adam, P., & Chewings, V. (2010). Ecological impacts of buffel grass (Cenchrus ciliaris L.) invasion in central Australia–does field evidence support a fire-invasion feedback?. The Rangeland Journal, 32(4), 353-365.

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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