Fire risk report for *Cenchrus setaceus*

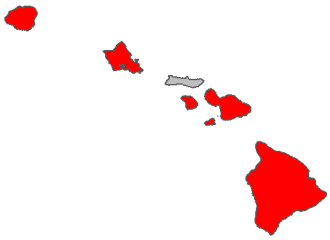
Full Species Name
Cenchrus setaceus (Forssk.) Morrone

Family: Poaceae

Common names:
fountain grass

Synonyms:
Pennisetum setaceum

Known occurrences (as of 2020)



Year first documented as naturalized in Hawai'i: 1914

This species has been ranked by the Hawai'i Weed Risk Assessment program as High Risk with a score of 26.

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 **0.99**.

This species was ranked by 49 managers on a scale of 'no risk', 'low risk', 'medium risk', or 'high risk'. The numerical score ranges from 0 to 1 with higher scores indicating more managers considered it a higher risk. A score of > .31 indicates high risk.

Summary of Fire ecology	
Native habitat fire proneness	No Data
Fire promoting plant in its native range	No
Fire promoting plant in its introduced range*	Yes
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?)	No Data	
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	no data on its native range
Fire promoting plant in its introduced range (Same as Fire Promoting Native but within the species introduced range)	Yes	"Similar processes have been observed elsewhere in Hawai'i. In dry lowland areas and other seasonal submontane sites, the alien grasses Andropogon virginicus, Hyparrhenia rufa, Pennisetum setaceum, and Cenchrus ciliaris are abundant, enhance fire, and grow rapidly in response to it. " https://doi.org/10.1146/annurev.es.23.110192.000431 Adkins, E., Cordell, S., & Drake, D. R. (2011). Role of Fire in the Germination Ecology of Fountain Grass (Pennisetum setaceum), an Invasive African Bunchgrass in Hawai'i1. Pacific Science, 65(1), 17-25. ---------- "Fountain grass produces an abundance of flammable biomass, its presence can alter the natural fire frequency in an area posing a significant fire hazard to the environment and property" http://www.landscape.sa.gov.au/files/sharedassets/eyre_peninsula/plants_and_animals/181016-fountain-grass-management-plan.pdf Eyre Peninsula NRM Board PEST SPECIES REGIONAL MANAGEMENT PLAN Cenchrus setaceus Fountain grass
Regenerates after fire (Does the plant regrow after fire by any	Yes	"In a monotypic stand of P. setaceum near the same site, total Pennisetum cover only 3 months following the same wildfire was over half (48%) of its maximum, which

means? This includes resprouters, reseeders, and recruiters which dispersed into the area within approximately one year post fire)		occurred 21 months following the burn (92%) (Castillo, unpublished data). Dense stands such as these may inhibit or preclude the establishment of plants that evolved with a much more open plant canopy. " https://hawaiiforest.org/wp-content/uploads/03-5Thesis10-1.pdf Castillo, J. M. (1997). Control of Pennisetum setaceum (Forssk.) Chiov. in native Hawaiian dry upland ecosystems (Doctoral dissertation, Colorado State University). --- "After the fire, fountain grass populations persist by resprouting from seed (Adkins et al. 2011)" https://doi.org/10.1007/s11258-020-01060-x Albuquerque, F., Macias-Rodriguez, M. A., Burquez, A., & Rowe, H. (2020). Toward an understanding of broad-scale patterns of the habitat suitability of fountain grass (Cenchrus setaceus (Forssk.) Morrone, Poaceae). Plant Ecology, 221(11), 1029-1043.
Promoted by fire (Does the plant increase in abundance after a fire?)	Yes	"Similar processes have been observed elsewhere in Hawai'i. In dry lowland areas and other seasonal submontane sites, the alien grasses Andropogon virginicus, Hyparrhenia rufa, Pennisetum setaceum, and Cenchrus ciliaris are abundant, enhance fire, and grow rapidly in response to it. " https://doi.org/10.1146/annurev.es.23.110192.000431 Adkins, E., Cordell, S., & Drake, D. R. (2011). Role of Fire in the Germination Ecology of Fountain Grass (Pennisetum setaceum), an Invasive African Bunchgrass in Hawai'i1. Pacific Science, 65(1), 17-25. --- "Fountain grass produces an abundance of flammable biomass, its presence can alter the natural fire frequency in an area posing a significant fire hazard to the environment and property" http://www.landscape.sa.gov.au/files/sharedassets/eyre_peninsula/plants_and_animals/181016-fountain-grass-management-plan.pdf Eyre Peninsula NRM Board PEST SPECIES REGIONAL MANAGEMENT PLAN Cenchrus setaceus Fountain grass
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	High	"Pennisetum setaceum, with its drought tolerance and high flammability, is perhaps the most intensively studied invasive grass in Hawaii" Daehler, C. C., & Goergen, E. M. (2005). Experimental restoration of an indigenous Hawaiian grassland after

		invasion by buffel grass (Cenchrus ciliaris). Restoration Ecology, 13(2), 380-389.
Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	Yes	"Fuels: Buffelgrass 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"

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 Kevin Faccenda in 2020.

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