Fire risk report for *Imperata cylindrica*

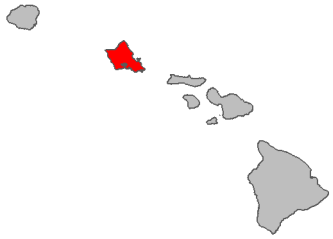
Full Species Name
Imperata cylindrica (L.) P.Beauv.

Family: Poaceae

Common names:
cogongrass

Synonyms:

Known occurrences (as of 2020)



Year first documented as naturalized in Hawai'i: 2007

This species has been ranked by the Hawai'i Weed Risk Assessment program as High Risk with a score of 22.

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 **0.72**.

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*	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?)	Fire-prone	"It is native to tropical and subtropical areas of the eastern hemisphere . . Its habitats are quite diverse, including the coarse sands found in desert dunes or along shorelines, as well as the fine sands or sandy loam soils of swamps and river margins. Cogongrass is adapted to full sun, but can thrive under the moderate shade of savannahs" Bryson, C.T., and R. Carter. “Cogongrass, Imperata Cylindrica, in the United States.” Weed technology<U+202F>: a journal of the Weed Science Society of America 4 (1993): 1005–1009. Web. --- "In Indonesia [141] and Australia [160] cogongrass can tolerate annual fires, and frequent fire maintains cogongrasslands, which are successionally replaced by shrubs and/or secondary tropical forest in the absence of fire [100,141,144,161]. " https://www.fs.fed.us/database/feis/plants/graminoid/imspp/all.html
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	"Consequences of cogongrass, in both the native and invaded ranges, include reductions in biodiversity, monotypic stands, and timber loss; furthermore, cogongrass is pyrogenic, meaning this grass species is highly-flammable, contributing to alterations in fire regimes to more frequent and/or intense fire events [23,24,26,33]." Lucardi, R. D., Wallace, L. E., & Ervin, G. N. (2020). Patterns of Genetic Diversity in Highly Invasive Species: Cogongrass (Imperata cylindrica) Expansion in the Invaded Range of the Southern United States (US). Plants, 9(4), 423. --- "In Indonesia [141] and Australia [160] cogongrass can tolerate annual fires, and frequent fire maintains cogongrasslands, which are successionally replaced by shrubs and/or secondary tropical forest in the absence of fire [100,141,144,161]. " https://www.fs.fed.us/database/feis/plants/graminoid/imspp/all.html
Fire promoting plant in its introduced range (Same as Fire Promoting Native but	Yes	"perpetuates fire in the sandhill ecosystem" www.jstor.org/stable/43911899

within the species introduced range)		Lippincott, C. (2000). Effects of Imperata cylindrica (L.) Beauv. (Cogongrass) Invasion on Fire Regime in Florida Sandhill (USA). Natural Areas Journal, 20(2), 140-149.
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	"Cogongrass sprouts from rhizomes after top-kill by fire [64,97,127,144]. It also establishes from seed, usually blown in from off-site [97]. Regrowth from rhizomes is rapid [8,124], and frequent fire favors cogongrass over associated species worldwide [15,97,100,160,161]. Fire is so important to cogongrass's ecology that relative response to fire is one of the characteristics used to distinguish between its varieties [64]." https://www.fs.fed.us/database/feis/plants/graminoid/imspp/all.html
Promoted by fire (Does the plant increase in abundance after a fire?)	Yes	"Fire has also been found to increase the abundance and dominance of cogongrass within native communities." https://doi.org/10.1016/j.gecco.2014.10.014 Estrada, James, and Luke Flory. “Cogongrass (Imperata Cylindrica) Invasions in the US: Mechanisms, Impacts, and Threats to Biodiversity.” Global Ecology and Conservation 3 (2015): 1–10.
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	High	"With more rapid accumulation of fuels that are more evenly distributed than in univaded sandhill, fire in sandhill invaded by cogongrass has the potential to ignite and spread more frequently in the absence of fire management" www.jstor.org/stable/43911899 Lippincott, C. (2000). Effects of Imperata cylindrica (L.) Beauv. (Cogongrass) Invasion on Fire Regime in Florida Sandhill (USA). Natural Areas Journal, 20(2), 140-149. --- "Consequences of cogongrass, in both the native and invaded ranges, include reductions in biodiversity, monotypic stands, and timber loss; furthermore, cogongrass is pyrogenic, meaning this grass species is highly-flammable, contributing to alterations in fire regimes to more frequent and/or intense fire events [23,24,26,33]." Lucardi, R. D., Wallace, L. E., & Ervin, G. N. (2020). Patterns of Genetic Diversity in Highly Invasive Species: Cogongrass (Imperata cylindrica) Expansion in the Invaded Range of the Southern United States (US). Plants, 9(4), 423. --- "Fine fuels are the most important factor in ignition and spread of fire in Florida longleaf pine ecosystems [159], and cogongrass contributes a large fine fuel load. Observational

		[111] and anecdotal [110] accounts from Indonesia indicate that live cogongrass plants ignite and burn easily while still relatively green, and researchers in Indonesia note that cogongrass becomes very dry and flammable during the dry season [100]. Cogongrass's fuel properties and abundant litter may alter fire behavior on invaded sites in Florida [86,87]. Cogongrass is high in silica content, so the litter decays relatively slowly. In an Australian study, cogongrass had the slowest decay rate of 3 grass species studied. Its half-life rate of decay exceeded the study period of 24 weeks [59]." https://www.fs.fed.us/database/feis/plants/graminoid/imspp/all.html
Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	Yes	"Both Brazilian satintail [I. brasiliensis] and cogongrass [I. cylindrica] are adapted to very frequent fires [55,63,93,97,128,160]. Brazilian satintail sprouts from rhizomes after top-kill [128]. Postfire seedling establishment is also likely. Mass flowering has been noted in Brazilian satintail following fires in Brazil [55,93]." https://www.fs.fed.us/database/feis/plants/graminoid/imspp/all.html

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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