Fire risk report for *Festuca bromoides*

Full Species Name
Festuca bromoides L.

Family: Poaceae

Common names:
brome fescue

Synonyms:
Vulpia bromoides

Known occurrences (as of 2020)

Year first documented as naturalized in Hawai'i: 1983

This species has been ranked by the Hawai'i Weed Risk Assessment program as High Risk with a score of 18.

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	No Data
Fire promoting plant in its native range	No
Fire promoting plant in its introduced range*	No
Regenerates after fire	Yes
Promoted by fire	Yes
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?)	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	[limited data from native range]
Fire promoting plant in its introduced range (Same as Fire Promoting Native but within the species introduced range)	No	
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 different of each species to heat and smoke indicates, perhaps, that V. myuros may be better adapted to fire than V. bromoides. However, field studies of the effect of fire on grasslands that contain infestations of these species demonstrate an increase in cover of this grass weed following the fire event (Lunt 1990, Figueroa et al. 2009, Figueroa & Cavieres 2012). It is thought that the response of V. bromoides is not due to the vulnerability of its seeds to heat. Instead, any seeds present in the soil seed bank, which are not exposed to direct heat, are be available to germinate in the gaps left by the removal of other species as a result of the fire (Tozer et al. 2008)" Weller, S., Florentine, S., Chauhan, B. S., Mahmood, A., & Florentine, A. (2019). Effects of various ecological factors on the germination of two crop and pasture weed species, Vulpia bromoides and Vulpia myuros. New Zealand Plant Protection, 72, 135-146.

Promoted by fire (Does the plant increase in abundance after a fire?)	Yes	"Although we do not know the degree to which fire promoted invasions in California grasslands, there are a number of nonnatives that consistently have high cover values in burned grassland areas (Klinger and Messer 2001; Parsons and Stohlgren 1989) (table 9-1). These include Eurasian annual grasses such as barbed goatgrass (Aegilops triuncialis), slender oat (Avena barbata), wild oat (A. fatua), ripgut brome (Bromus diandrus), soft brome (B. hordeaceus), red brome (B. rubens), seaside barley (Hordeum marinum), mouse barley (H. murinum), Italian ryegrass (Lolium perenne ssp. multiflorum), medusahead (Taeniatherum caput- medusae), brome fescue (Vulpia bromoides), and foxtail fescue (V. myuros)." Zouhar, K., Smith, J.K., Sutherland, S. & Brooks, M.L.2008. Wildland fire in ecosystems: fire and nonnative invasive plants. Gen. Tech. Rep. RMRS-GTR-42-vol. 6. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT ---------- "The fire promoted abundant regeneration of exotics from seed, particularly *Vulpia bromoides, *Romulea rosea, *Briza minor and *A ira cupaniana... The annual *Vulpia bromoides increased 100-fold after the fire, with up to 1150 individuals in one burnt 0.25 m2... " https://www.researchgate.net/profile/Ian_Lunt/publication/251312215_Impact_of_an_autumn_fire_on_a_long-grazed_Themeda_triandra_Kangaroo_Grass_grassland_implications_for_management_of_invaded_remnant_vegetations/links/53e320590cf2b9d0d832ccf1/Impact-of-an-autumn-fire-on-a-long-grazed-Themeda-triandra-Kangaroo-Grass-grassland-implications-for-management-of-invaded-remnant-vegetations.pdf Lunt, I. D. (1990). Impact of an autumn fire on a long-grazed Themeda triandra (Kangaroo Grass) grassland: implications for management of invaded, remnant vegetations. Victorian Naturalist, 107(2), 45-51. ---------- " In particular, the germination of Vulpia myuros (AG) showed a slight improvement with smoke-water treatment at 1:500 (v/v). This confirms the related findings of Gómez-González and Cavieres (2009), where V. myuros showed greater numbers of germinants from the soil seed bank following a low-intensity fire compared to a control. " Abedi, M., Zaki, E., Erfanzadeh, R., & Naqinezhad, A. (2018). Germination patterns of the scrublands in response to

		smoke: The role of functional groups and the effect of smoke treatment method. South African Journal of Botany, 115, 231-236.
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	No Data	"The overwhelming majority of the nonnative grass abundance in this study was contributed by four species, including European hairgrass (Aira caryophylla), nitgrass (Gastridium ventricosum), brome fescue (Vulpia bromoides) and rat-tail fescue (Vulpia myuros) (Appendix A). These species comprised 93% and 98% of the nonnative grass abundance in the mastication and prescribed fire treatments, respectively." #likely adding fuels, but this is California chaparral habitat which is intrinsically flammable https://www.fs.fed.us/psw/publications/ff/psw_2009_potts001.pdf Potts, J. B., & Stephens, S. L. (2009). Invasive and native plant responses to shrubland fuel reduction: comparing prescribed fire, mastication, and treatment season. Biological Conservation, 142(8), 1657-1664.
Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	Yes	"Rattail sixweeks grass sometimes forms dense stands that become flashy fine fuels when stands dry and then burn in the summer or fall fire season [1,125]." https://www.fs.fed.us/database/feis/plants/graminoid/vulmyu/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 Kevin Faccenda in 2020.

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