Fire risk report for *Pluchea carolinensis*

Full Species Name
Pluchea carolinensis (Jacq.) G.Don

Family: Asteraceae

Common names:
sourbush
marsh fleabane

Synonyms:
Pluchea symphytifolia

Known occurrences (as of 2020)

Year first documented as naturalized in Hawai'i: 1931

This species has been ranked by the Hawai'i Weed Risk Assessment program as High Risk with a score of 16.

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 **low** fire risk in Hawai'i with a fire risk score of **0.16**.

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	Non Fire-prone
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*	No

*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?)	Non Fire-prone	"Distribution and Notes. Native of warm regions of the New World, mainly from coastal regions of the Florida Keys, the West Indies, Central America south to Ecuador and Venezuela, and also in West Africa [Gills, 1977, as Pluchea symphytifolia (Miller) Gills]. In Taiwan, P. carolinensis is naturalized in disturbed ruderal places of the countryside, often seen on barren mudstone slopes or associated with scrubby vegetation along roads. It occurs at ca. 50200 m alt. Since the first discovery of this adventive species in Taiwan in 1987, its range has extended considrably on the island (Figure 2)." https://www.researchgate.net/profile/Chih-Hui_Chen/publication/254258769_Pluchea_Cass_Asteraceae_in_Taiwan/links/0046351fca7c08ec6c000000.pdf Peng, C. I., Chen, C. H., Leu, W. P., & Yen, H. F. (1998). Pluchea Cass.(Asteraceae: Inuleae) in Taiwan. Botanical Bulletin of Academia Sinica, 39(4), 287-297. #Seems to be a habitat generalist
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	"Native of warm regions of the New World, mainly from coastal regions of the Florida Keys, the West Indies, Central America south to Ecuador and Venezuela, and also in West Africa" #Likely genearlist Peng, Ching-I, Chih-Huei Chen, Wen-Pen Leu, and Hsin-Fu Yen. “Pluchea Cass. (Asteraceae: Inuleae) in Taiwan.” Botanical Bulletin of Academia Sinica 39 (1998): 287–197.)
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	Yes	"In Hawaii, cure-for-all quickly invades burned areas, but being early successional, is soon replaced by other species (Smith and Tunison 1992). Plants sprout after fires if they are not too intense (University of Hawaii Botany 2002)." https://data.fs.usda.gov/research/pubs/iitf/iitf_gtr026.pdf Francis, John K. "Wildland shrubs of the United States and its territories: Thamnic descriptions, Volume 1." Gen. Tech.

within approximately one year post fire)		Rep. IITF-GTR-26. San Juan, PR: US Department of Agriculture, Forest Service, International Institute of Tropical Forestry; Fort Collins, CO: US Department of Agriculture, Forest Service, Rocky Mountain Research Station. 830 p. 26 (2004). ---------- "Woody alien plants usually invade burned areas only to a limited degree and are typically early successional species. Alien shrubs such as partridge pea (Chamaecrista nictitans), indigo (Indigofera suffmticosa), sourbush (Pluchea symphytifolia)" http://manoa.hawaii.edu/hpicesu/book/1992_chap/17.pdf FIRE AND ALIEN PLANTS IN HAWAII: RESEARCH AND MANAGEMENT IMPLICATIONS FOR NATIVE ECOSYSTEMS Clifford W. Smith and J. Timothy Tunison ---------- "The presence of small seeded, non-mycrorrhizal plants such as ... Pluchea symphyifolia at the burn site and not ad the unburned site may be due to environmenal conditions altered by the burne that allow their establishment, or they may be opportunistic colonizing species that dispersed into the area via wind blown seeds" http://128.171.57.22/bitstream/10125/992/uhm_phd_4328_r.pdf#page=107 Wilkinson, M. M. (2003). Changes in growth and survival by three co-occurring grass species in response to mycorrhizae, fire, and drought (Doctoral dissertation, University of Hawaii at Manoa). ---------- " Individuals of alien shrub species Pluchea symphytifolia, Lantana camara, Indigofera suffruticosa, and Psidium guajava were found [after fire], however densities were so low that formal analysis was not conducted (< 3 ind/plot" http://128.171.57.22/bitstream/10125/26986/160.pdf McDaniel, S., Loh, R., Dale, S., Smith, K., & Vaidya, M. (2008). Rehabilitation of 'ohi'a-swordfern (metrosideros polymorpha-nephrolepis multiflora) woodlands following the kupukupu fire, Hawaii Volcanoes National Park.
Promoted by fire (Does the plant increase in abundance after a fire?)	Yes	"Woody alien plants usually invade burned areas only to a limited degree and are typically early successional species. Alien shrubs such as partridge pea (Chamaecrista nictitans), indigo (Indigofera suffruticosa), sourbush (Pluchea symphytifolia), and yellow Himalayan raspberry (Rubus

		ellipticus) invade burned sites immediately after fire but appear to be early successional species." Smith, Clifford, and Timothy Tunision. “FIRE AND ALIEN PLANTS IN Hawai`i: RESEARCH AND MANAGEMENT IMPLICATIONS FOR NATIVE ECOSYSTEMS.” Alien Plant Invasions in Native Ecosystems of Hawaii: Management and Research. Cooperative National Park Resources Studies Unit, Honolulu, 1992, 394–408. ---------- "Seedling emergence from the soil seed bank samples taken 11 months after the fire (September 2004) revealed seven nonnative and zero native species in the soil seed bank, all of which emerged from just 18 of the 56 plots (32.1%) sampled in the burn site (Fig. 6). The plant species recorded were the shrubs Buddleja asiatica, Clidemia hirta, and Phytolacca octandra and the weedy, herbaceous asters Erigeron bonariensis, Emilia sp., Youngia japonica, and Crassocephalum crepidioides. In contrast, soil samples taken from the burn site 16 months after the fire (February 2005) indicated viable seed banks in 54 of the 56 plots (99.6%; Fig. 6). The same plant species above (except Y. japonica) were present in addition to 1 native (Solanum americanum) and one nonnative (Rubus rosifolia) shrub, 2 more weedy asters (Sonchus oleraceus, Pluchea carolinensis)," Trauernicht, C., Ticktin, T., Fraiola, H., Hastings, Z., & Tsuneyoshi, A. (2018). Active restoration enhances recovery of a Hawaiian mesic forest after fire. Forest Ecology and Management, 411, 1-11.
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	No Data	"Fuel moisture ranged from 8% for 1-hr dead woody fuels to 297% for live P. symphytifolia. In general, the highest fuel moistures were in live woody species (P. symphytifolia, I. suffruticosa, L. camara and D. viscosa)." #this however does not account for dry conditions, but the plant is certainly not flammable when suitable water is available Pierce, A. D., McDaniel, S., Wasser, M., Ainsworth, A., Litton, C. M., Giardina, C. P., & Cordell, S. (2014). Using a prescribed fire to test custom and standard fuel models for fire behaviour prediction in a non-native, grass-invaded tropical dry shrubland. Applied vegetation science, 17(4), 700-710.
Relative is flammable (Does a plant in the	No	

same genus meet the Reported Flammable criteria?)		

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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