Fire risk report for *Liriodendron tulipifera*

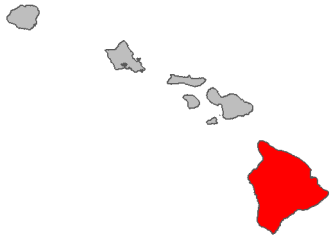
Full Species Name
Liriodendron tulipifera L.

Family: Magnoliaceae

Common names:
tulip tree
yellow poplar
tulip poplar

Synonyms:

Known occurrences (as of 2020)



Year first documented as naturalized in Hawai'i: 2010

This species has been ranked by the Hawai'i Weed Risk Assessment program as Evaluate with a score of 2.

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 **0.25**.

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	Yes
Promoted by fire	Yes
Reported flammable*	Low
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?)	Fire-prone	"Occurs in appalachian dry oak-pine fire regime with a fire return intervale of 2 to 5 years" No way to permalink this, search liriodendron and then click fire regime https://www.feis-crs.org/feis/
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	"Hickory and tulip poplar should not contribute to mesophication to the extent in which American beech and maple species do, but may not actively create flammable conditions because of less pyrophytic leaf litter in comparison to oak leaf litter" https://www.srs.fs.usda.gov/pubs/ja/2020/ja_2020_willis_001.pdf Babl, E., Alexander, H. D., Siegert, C. M., & Willis, J. L. (2020). Could canopy, bark, and leaf litter traits of encroaching non-oak species influence future flammability of upland oak forests?. Forest Ecology and Management, 458, 117731.
Fire promoting plant in its introduced range (Same as Fire Promoting Native but within the species introduced range)	No	#not invasive anywhere else
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	"Tuliptree seedlings and saplings have thin bark which makes them very susceptible to fire damage. Fire generally kills young trees less than 1 inch (2.5 cm) in diameter. Once bark is thick enough to insulate the cambium (0.5 inch [1.3 cm]), tuliptree becomes extremely resistant to fire damage [1,2]. Little mortality occurs once trees are greater than 3 or 4 inches d.b.h. [31]. Tuliptree seeds are generally resistant to heat damage [31]." https://www.fs.fed.us/database/feis/plants/tree/lirtul/all.html#FIRE%20ECOLOGY
Promoted by fire (Does the plant increase in abundance after a fire?)	Yes	"Seedling establishment: Prescribed fire enhances the regeneration of tuliptree by releasing seed stored on the forest floor [31]. Following fall prescribed fire in the Upper Piedmont of South Carolina, the number and height growth of tuliptree seedlings were significantly higher on burned

		than on unburned plots. After one growing season, the burned plots had about 12,000 seedlings per acre; the unburned, 2,000. After three growing seasons, seedlings on the burned plots averaged 3.5 feet (1.06 m) in height; seedlings on the unburned plots averaged 3.0 feet (0.91 m) [26]." https://www.fs.fed.us/database/feis/plants/tree/lirtul/all.html#FIRE%20ECOLOGY
Reported flammable (Is the species described as being flammable, being a major wildfire fuel, or high fire risk?)	Low	"Litter from the nine ravine tree species differed in several aspects of flammability (Table 1). Mean maximum flame height differed among the nine species burned. Liriodendron tulipifera and F. grandifolia burned with the tallest flames with means of 84.6 cm and 81 cm, respectively." #litter burns tall, but that's only one dimension of flammability. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0103933 Mola, J. M., Varner, J. M., Jules, E. S., & Spector, T. (2014). Altered community flammability in Florida's Apalachicola ravines and implications for the persistence of the endangered conifer Torreya taxifolia. PLoS One, 9(8), e103933. --- "non-oaks, including tulip-poplar (Liriodendron tulipifera L.), sweetgum (Liquidambar styraciflua L.), and others (Han-berry et al., 2020; Abrams, 1992; Hutchinson et al., 2008). This transi-tion in species composition from pyrophytic oaks to non-oak species is likely a component of a process termed mesophication, whereby non- oaks species promote cooler, moister, less flammable conditions that are conducive to their own growth and persistence at the expense of more fire-tolerant species (Nowacki and Abrams, 2008)." McDaniel, J. K., Alexander, H. D., Siegert, C. M., & Lashley, M. A. (2021). Shifting tree species composition of upland oak forests alters leaf litter structure, moisture, and flammability. Forest Ecology and Management, 482, 118860. https://doi.org/10.1016/j.foreco.2020.118860 --- "listed as a firewise tree" https://extension.tennessee.edu/publications/Documents/SP685.pdf

Relative is flammable (Does a plant in the same genus meet the Reported Flammable criteria?)	No	#only one other member in genus, L. chinense, and there is no literature regarding its fire ecology

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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