



Weed Fire Risk Assessment for Hawai'i

Pacific islands are increasingly threatened by wildfire and its effects which negatively impact our economies, physical and social environments. Hawaiian ecosystems in particular are not readily adapted to fire and are easily replaced by non-native plants, especially weedy grasses which now cover 25% of Hawai'i. The [Weed Fire Risk Database](#) assesses 360+ weed species for their fire-promoting traits and can assist landowners and managers in prioritizing invasive species control efforts. This database may also be useful for determining if a newly discovered species poses a potential fire threat in urban, wildland and agricultural areas.

Weed Fire Risk Database

An ounce of prevention...



The "grass-fire cycle" is a positive-feedback loop in which fire-prone weeds overtake more natural areas and spread wildfire risk across an ever-increasing footprint.



People also contribute to the problem by inadvertently planting or allowing problem weeds to take over. Early detection and eradication of incipient weeds is a critical component of preventing many negative impacts including an increased fire risk. Once established, certain weeds and the fire threat they pose become too costly and difficult to eradicate across many thousands of acres.



- To date, information on incipient weeds in Hawai'i includes the Hawai'i Invasive Species Committee's [Weed Risk Assessment](#) database which provides a screening system for potentially invasive, non-native plants.



- University of Hawai'i's Kevin Faccenda and Curt Daehler expanded this inquiry by asking land managers to assign a relative fire risk for weeds which are already naturalized (widespread) in Hawai'i.



- This land manager expertise was then used to train a machine learning model to rank hundreds of other species based on plant traits and other information from the scientific literature.

Results

- ✓ The computer model generated a **fire risk score between 0 (no risk) and 1 (highest risk)** for 360+ weed species. An index value of **0.3 is a threshold above which fire risk is considered high** and not an absolute ranking of species relative to one another.
- ✓ **The model considered important traits** including growth form (such as grasses or grass-like structures which are known to easily burn). It also considered whether a species is fire-promoting elsewhere.
- ✓ Another important finding is **the degree to which each plant species regenerates after fire.**
- ✓ **The analysis doesn't account for a weed species' spatial distribution, population density, or distinct climate and ecosystem conditions.** These factors may influence the abundance and physical growth of species which also influence fire risk.
- ✓ The fire risk index value should not be **taken as a stand-alone risk metric** in prioritizing weed control efforts.
- ✓ Supplementing this ranking with **field observations is important** when determining the relative fire risk of each species specific to a given locale.

Implications for Management

Fire-promoting Weeds²

To search the database of 360+ species by common or scientific name, visit:

<https://www.pacificfireexchange.org/weed-fire-risk-assessments>

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Canada thistle (*Cirsium arvense*)



Recently naturalized; rhizomatous; wind dispersed; forms thickets; burns rapidly.

Devil weed (*Chromolaena odorata*)



Recently naturalized and forms thickets; wind dispersed; reported to burn while green; contains oils and burns rapidly.

Formosan koa (*Acacia confusa*)



Grows in dry habitats; flammable.

Gorse (*Ulex europaeus*)



Highly flammable; forms monocultures; contains oils; burns rapidly.

Ironwood (*Casuarina equisetifolia*)



One time fire promoter (does not regenerate after fire); forms flammable litter.

Lantana (*Lantana camara*)



Forms “fire-lantana cycle”; flammable; re-sprouts after fire; contains oils; burns rapidly.

Molasses grass (*Melinis minutiflora*)



Highly flammable; regenerates after fire; rhizomatous; contains oils; burns rapidly.

Paperbark tea tree (*Melaleuca quinquenervia*)



Flammable bark elevates surface fires into canopy fires; can regenerate after complete canopy burn.

Vernonanthura polyanthes



Recently detected on Maui; woody shrub; increases fire frequency; regenerates after fire contains oils; burns rapidly.

More Fire-Promoting Weeds

Other wide-spread weeds posing potential fire threats include: various **eucalyptus** and **pine** species; **fountain grass** (*Cenchrus setaceus*); **Guinea grass** (*Megathyrsus maximus*); **buffelgrass** (*Cenchrus ciliaris*); **beardgrass** (*Schizachyrium condensatum*); **broomsedge** (*Andropogon virginicus*); **cattail** (*Typha latifolia*); **Pampas grass** (*Cortaderia spp.*); **elephant grass** (*Cenchrus purpureus*); and **giant reed** (*Arundo donax*).

References: 1. Weeds noted here are naturalized plant species in Hawai'i. 2. Plants scoring at or above 0.3 in the index are high fire risk. For more information, refer to: Faccenda, K., Daehler, C.C. [A screening system to predict wildfire risk of invasive plants](#). Biol Invasions (2021). Photo Credits: Kevin Faccenda, Forest & Kim Starr, Wikipedia Commons.