

Funded by a grant from the Kaulunani Urban and Community Forestry Program of the DLNR Division of Forestry and Wildlife, and State and Private Forestry, branch of the U.S. Forest Service, Region 5



Line of Fire By Chanel Yee, Tree Canopy Viewer Fellow

New data from the Tree Canopy Viewer displays state-wide tree canopy and supplementary sociodemographic, economic, health, and environmental data layers. This tool, developed by The Hawai'i Division of Forestry and Wildlife and the U.S. Forest Service, reveals relationships between tree canopies and communities disproportionately affected by socioeconomic and environmental risksⁱ. In fall of 2022, the USDA Forest Service and Kaulunani, the State of Hawai'i's Urban and Community Forestry Program, sent out a request for fellowship applications to use this new data to explore how tree canopies can fulfil environmental goals outlined in the statewide Forest Action Plan.

Along with exploring which University of Hawai'i campus trees provide more biocultural services, where to target climate adaptive native tree species on Kauai, or how tree canopies are currently reflected in state policy, this Tree Canopy Viewer tool has been used to explore the relationship between land cover, urban expansion, and wildfire and as well as opportune areas to mitigate wildfire risk.

In August 2021, a wildfire spread along the leeward side of Hawai'i Island burning 40,000 acresⁱⁱ. This record-breaking wildfire threatened homes and brought more attention to the island's landscape ecology and urban expansion's role in aiding fire spread.

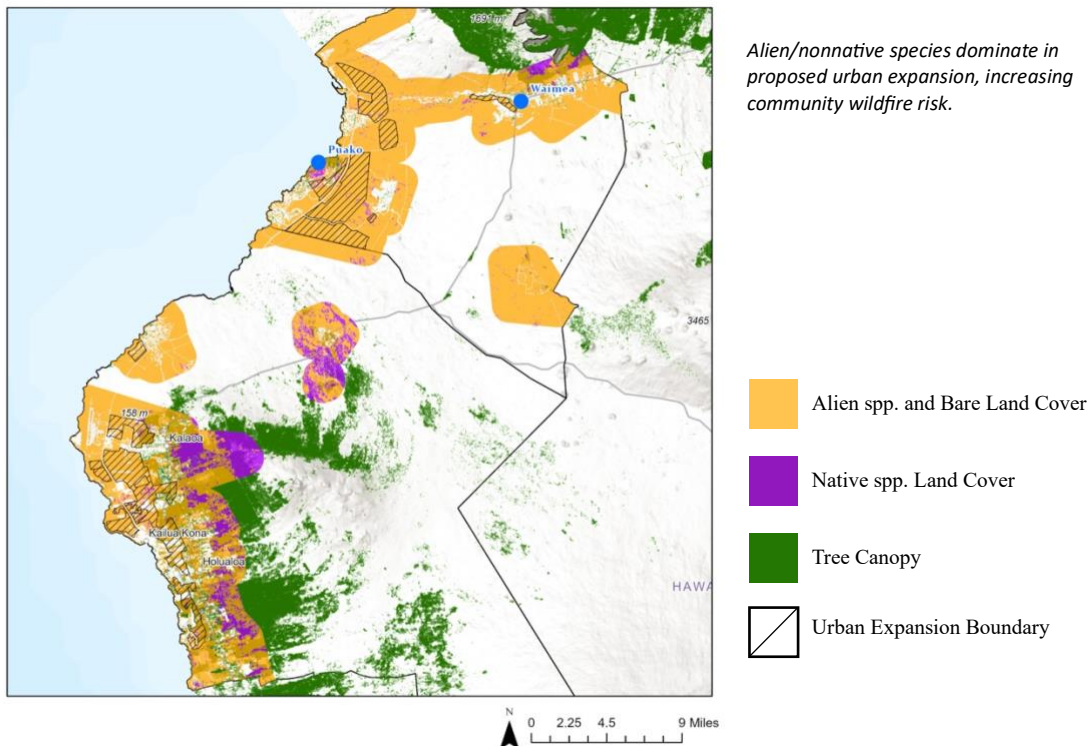


The Waimea brushfire burned over 40,000 acres of land dominated by nonnative grasses and threatening native species habitats. Hawai'i Department of Land and Natural Resources

Prior to European contact, fire was a controlled disturbance in Hawai'i utilized by early Polynesian settlers for agricultural purposes. Fire promoted pia (*Tacca leontopetaloides*) and 'ama'u (endemic *Sadleria spp.*) for food production in addition to pili grass (*Heteropogon contortus*) for thatchⁱⁱⁱ. Land privatization in the early 1800s converted this productive native dry forest landscape to pastureland^{iv}. This change in land management introduced fountain grass (*Cenchrus setaceus*) and Guinea grass (*Megathyrus maximus*) for cattle grazing, ultimately creating a landscape dominated by nonnative grasses. These fire-adapted nonnative grass species currently cover 24% of the state's land area^v and are prevalent near civilization, thus, increasing community wildfire risk.

Projected urban expansion for South Kohala on Hawai'i Island invites opportunities for wildfire events with human activity responsible for the four-fold increase in annual area burned in Hawai'i within the last century^{vi}. Anthropogenic sources ignite fire events that burn in the nonnative grass dominated landscapes composed of fire adapted species that can regenerate after fire, promoting future grass establishment^{vii}. Successful reestablishment increases the landscape's fuel load, perpetuating this fire behavior cycle.

The Tree Canopy Viewer revealed opportune areas for planting native species to mitigate this anticipated increase in wildfire risk. Native tree and shrub species such as Koa (*Acacia koa*), 'ōhi'a lehua (*Metrosideros polymorpha*), and Naio (*Myoporum sandwicense*) and pili grasslands that host *Sida fallax* and *Waltheria indica*, 'a'ali'i (*Dodonaea viscosa*), and 'ulei (*Osteomeles anthyllidifolia*) have low flammability, reduce or slow fire spread, decrease fire spotting, and shade out fire-adapted nonnative grass species^{viii} ^{ix}to alleviate the increase wildfire risk in urban areas. Analysis with this new dataset highlights that native species restoration is needed in conjunction with extensive nonnative grass species removal to decrease urban area's wildfire risk. The projected expansion provides an opportunity to incorporate native species restoration as a means of fire mitigation to decrease wildfire risk for the new communities in South Kohala.



The Tree Canopy Viewer is a publically available dataset that can be used to further identify communities disproportionately affected by risks that tree canopies have the potential to relieve for current and future generations. Funded by a grant from the Kaulunani Urban and Community Forestry Program of the DLNR Division of Forestry and Wildlife, and State and Private Forestry, branch of the U.S. Forest Service, Region 5.

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- ⁱ *Tree Canopy Viewer Hawai'i*. (2022, June 23). Division of Forestry and Wildlife: Forestry Program. <https://dlnr.hawaii.gov/forestry/lap/kaulunani/tree-canopy-viewer-hawai%ca%bbi/>
- ⁱⁱ Hawaii News Now. (2021, July 30). *Evacuation order for Waikoloa Village lifted, but residents urged to remain prepared*. <https://www.hawaiinewsnow.com/2021/07/31/firefighters-battle-raging-brush-fires-opposite-ends-hawaii-island/>
- ⁱⁱⁱ Easter, K. W., Dixon, J. A., & Hufschmidt, M. M. (1991). *Watershed Resources Management: Studies from Asia and the Pacific*. Institute of Southeast Asian Studies.
- ^v Trauernicht, C., Pickett, E., Giardina, C., Litton, C., Cordell, S., & Beavers, A. (2015). The Contemporary Scale and Context of Wildfire in Hawai'i 1. *Pacific Science*, 69, 427–444. <https://doi.org/10.2984/69.4.1>
- ^{vi} Hawbaker, T. J., Trauernicht, C., Howard, S. M., Litton, C. M., Giardina, C. P., Jacobi, J. D., Fortini, L. B., Hughes, R. F., Selmants, P. C., & Zhu, Z. (2017). Wildland fires and greenhouse gas emissions in Hawai'i. *Baseline and Projected Future Carbon Storage and Carbon Fluxes in Ecosystems of Hawai'i*. U.S. Geological Survey Professional Paper 1834. Reston, VA: U.S. Department of the Interior, U.S. Geological Survey: 57–73. Chapter 5, 1834, 57–73.
- ^{vii} Trauernicht, C., Pickett, E., Giardina, C., Litton, C., Cordell, S., & Beavers, A. (2015). The Contemporary Scale and Context of Wildfire in Hawai'i 1. *Pacific Science*, 69, 427–444. <https://doi.org/10.2984/69.4.1>
- ^{viii} Daehler, C. C., Yorkston, M., Sun, W., & Dudley, N. (1999). Genetic Variation in Morphology and Growth Characters of *Acacia koa* in the Hawaiian Islands. *International Journal of Plant Sciences*, 160(4), 767–773. <https://doi.org/10.1086/314163>
- ^{ix} Loh, R., Ainsworth, A., Tunison, T., & D'Antonio, C. (n.d.). *Testing native species response to fire – a first step towards building fire resilient native plant communities at Hawai'i Volcanoes National Park*.