

Pacific Islands Climate Change Cooperative



Facilitating adaptation in Montane plants to changing precipitation along an elevation gradient

Montane plant communities throughout the world have responded to changes in precipitation and temperature regimes by shifting upward in elevation. Where organisms cannot disperse or adapt to rapid environmental changes, there is possible decrease in both range and abundance, which diminishes ecosystem resilience. In Hawai'i, there is an indication of a long-term shift toward drier conditions for high-elevation areas, and prolonged severe drought conditions have occurred since 2008.

Supported by the [Pacific Islands Climate Change Cooperative](#), this project begins by collecting montane plant seeds from low-and high-elevation sources on the island of Hawai'i. Outplanting trials are conducted in common locations along an elevation gradient, and the growth, survival, and vigor of the plants are monitored over a two-year period. This experiment tests the hypothesis that moving the ranges of montane plants upward in elevation can facilitate adaptation to climate change. In this way, it assists in evaluating a potential restoration strategy.

This experiment is conducted within the Kanakaleonui Bird Corridor, which is a culturally important area that is in need of restoration. It also spans a 500 meter elevation gradient and is protected from nonnative ungulates that have degraded native forest ecosystems. Finally, the adjacent Mauna Kea Forest Reserve and Hakalau Forest National Wildlife Refuge contain high-and low-elevation sources for seeds of biologically and culturally important plant species, and will be used exclusively for seed sourcing.

Although outplanting will be conducted exclusively within Kanakaleonui Bird Corridor, interferences will extend to montane and subalpine forest systems throughout the Hawaiian islands including Palila Critical Habitat, Pōhakuloa Training Area, the Kahuku Unit of Hawai'i Volcanoes National Park, and leeward portions of Haleakalā, Maui. Findings will also have implications for facilitating adaptation to climate change throughout tropical montane forest ecosystems of the world.

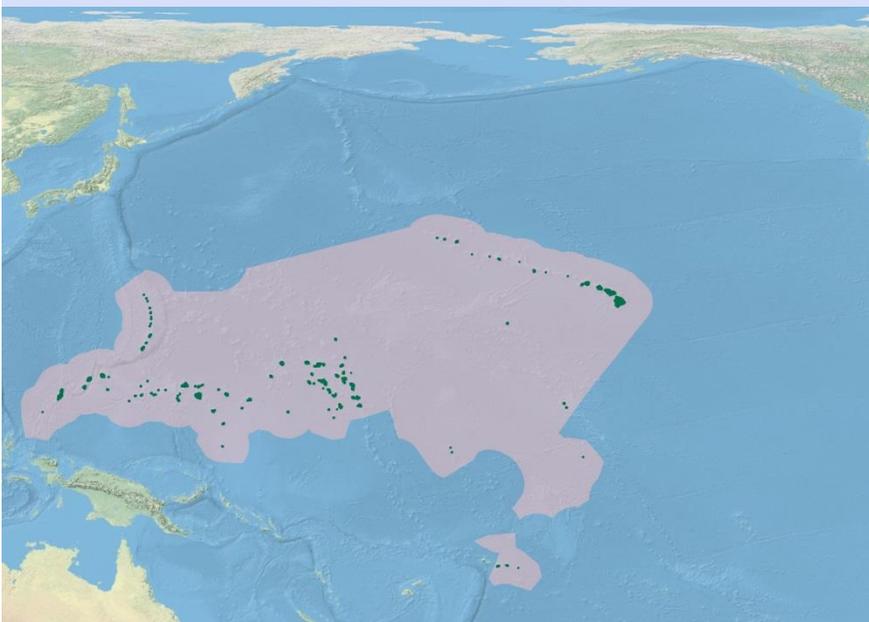


Special trees of interest include trees and understory plants which grow over a wide range of elevation, but may be locally adapted to former precipitation and temperature regimes. Tree species including 'iliahi, māmane, and naio provide important wildlife habita

and understory plants which grow over a wide range of elevation, but may be locally adapted to former precipitation and temperature regimes. Tree species including 'iliahi, māmane, and naio provide important wildlife habitat. Fruiting understory plants including 'ōhelo, pūkiawe, kūkaenēnē, and pilo provide important foods for birds and wildlife. The variables that will be measured include: seed source, species, elevation of outplanting, precipitation, temperature, humidity, and time since outplanting. Results of this research will be used to design restoration approaches for montane and subalpine forests by identifying appropriate seed sources and the elevation of favorable outplanting locations for several species of native trees and shrubs under current and future conditions. The research will also be relevant for the adaptation of montane ecosystems to rapidly changing climate regimes throughout Hawai'i, and throughout the world.

For more details about this project, visit the PICCC projects page: piccc.net/our-projects.

The map below depicts the PICCC geography, which includes Hawai'i, American Sāmoa, Guam, the Northern Mariana Islands, the Marshall Islands, the Federated States of Micronesia, Palau and 4 Marine National Monuments.



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The Pacific Islands Climate Change Cooperative (PICCC) was established in 2009 to assist those who manage native species, island ecosystems, and key cultural resources in adapting their management to climate change for the continuing benefit of the people of the Pacific Islands. The PICCC provides a range of services and tools to help managers in Hawai'i, the Mariana Islands, American Sāmoa, and other Pacific Island groups make informed decisions for conservation of natural and cultural resources including climate models at the scale of islands and archipelagos, ecological response models, and implementation and monitoring strategies for island species, resources, and communities. Our goal is to help managers reach explicit biological and cultural conservation objectives in the face of climate change and ongoing threats such as fire, land conversion, and invasive species.

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Banner photo of taro by Starr Environmental;
Flowering silversword by Laurascudder & closeup
by Kalathalan, both on Wikimedia