

Pacific Islands Climate Change Cooperative



How climate change is affecting the iconic Hawaiian silversword and its high elevation ecosystems

The decline of one of Hawai'i's most iconic plants as a result of climate change is sending a powerful message about the urgency of this global issue. With support from the [Pacific Islands Climate Change Cooperative](#) and the Pacific Islands Climate Science Center, scientists with the University of Hawai'i and the US Geological Survey have confirmed that the population of federally threatened silverswords (*Argyroxiphium sandwicense macrocephalum*) in Haleakalā National Park has declined by more than half since the early 1990's. Precipitation has declined in this alpine environment, and air temperatures have increased over the same time period. These shifts appear to be directly related to the downward trend in silversword numbers.

The Haleakalā silversword is an ideal species with which to assess impacts from climate change. It forms the foundation of a diverse alpine community in largely barren cinder habitats and plays a critical ecological role in the alpine desert zones ranging from 2,160 to 3,055 meters at the summit of Haleakalā volcano. Its population response to climate change will shed light on potential changes among related species and their communities. Moreover, its striking appearance makes it highly recognizable and unmatched in educational potential for the one to two million visitors to Haleakalā National Park each year.

Silversword's future may depend on successful restoration

Researchers are collecting population and weather data with which to model future

silversword population changes in response to the environment. For mountain-dwelling species that might adapt to the warming climate by moving upslope, habitat area will decrease rapidly with increasing elevation, and species that already occupy summits may literally have nowhere to go as their habitats disappear. Scientists conducting this research fear that unless climate trends on the mountain reverse course, the Haleakalā silversword will be consigned to extinction in the not too distant future without active restoration.

Scientists know that decreasing rainfall is strongly tied to decreasing silversword population trends, and that overall mortality is higher at lower elevations. They also know that seedling survival has been very low across the entire range. However, the mechanisms of plant death and seedling drought tolerance are unknown. Therefore, they are conducting drought and temperature tolerance



experiments to address these issues and develop optimum protocols for silversword propagation and restoration planting. There is the potential that natural variation in drought tolerance could be strategically used when designing management and restoration.

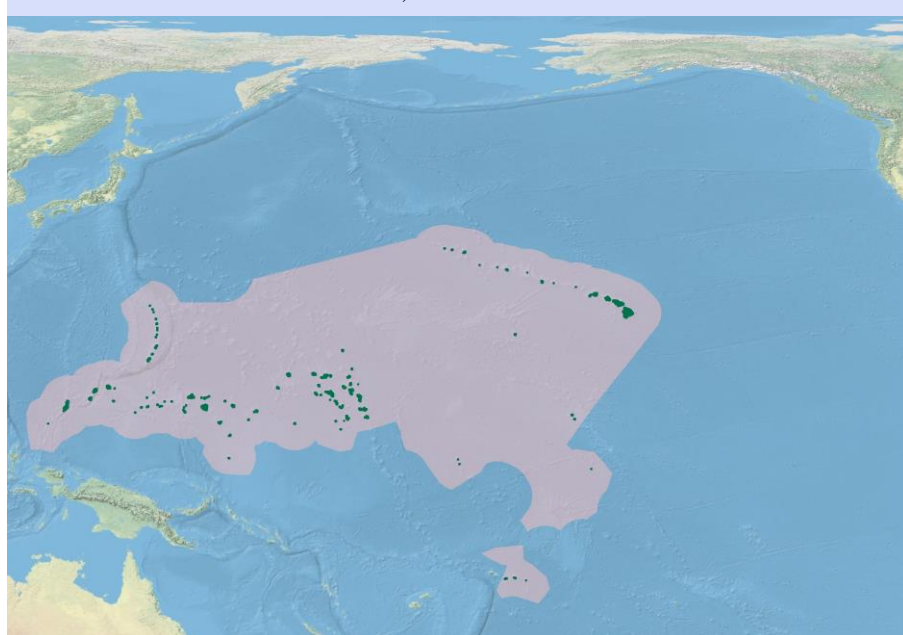
This project will produce several products of direct use to park managers and interpreters:

- annual silversword monitoring data and associated GIS layers;
- climate data from the six Haleakalā climate stations (compiled annually);
- silversword propagation recommendations;
- a population model for understanding the future responses of Haleakalā silversword to changing conditions;
- several peer-reviewed publications and regular updates of relevant findings to Haleakalā National Park interpretive staff, for use in presentations to park visitors.

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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Partners

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*co-funder

[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 &
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