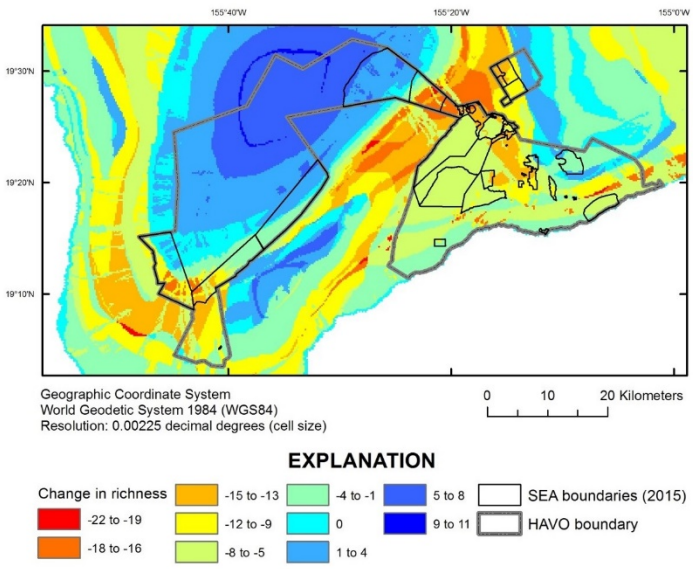
Assessing the potential effects of climate change on vegetation in Hawai‘i Volcanoes National Park

James Jacobi and Rick Camp, USGS Pacific Island Ecosystems Research Center

Lama (Diospyros sandwicensis), a small tree endemic to Hawai‘i. Photo courtesy of Forest and Kim Starr/ CC BY 3.0.

Climate change is expected to alter the seasonal and annual patterns of rainfall and temperature in the Hawaiian Islands. Land managers and other responsible agencies will need to know how plant species' habitats will change over the next hundred years in order to manage these resources effectively. This is a major concern for resource managers at Hawai‘i Volcanoes National Park who have specified certain areas of the park as Special Ecological Areas (SEAs). These areas have unusually high species diversity or rare species, and are the focus of special conservation effort including fencing and invasive plant removal. However, current areas may no longer provide suitable habitat for important plant species and communities in the future as climate changes. Expanding invasive species' distributions also may pose a threat to areas where native plants currently predominate. We combined recent climate modeling efforts for the state of Hawai‘i with existing models of plant species distribution to forecast suitable habitat range for 39 plant species through the end of this century. At the present time, good congruence exists between native species richness and SEA locations. The congruence, however, was projected to breakdown over time, and by the end of the century many of the existing SEAs will contain suitable habitat for only a limited number of species.

Our forecasted shifts in suitable habitat for native plant species will assist park managers in assessing the current SEA configurations and prioritizing future management strategies including altering boundaries, creating new SEAs, and working in conjunction with adjoining landowners and partner agencies. Our projections can also be used to identify locations where major changes in habitat conditions are predicted. Obtaining additional environmental data in these areas, for example deploying weather stations, will help managers understand the trajectory and extent of climate change, while vegetation monitoring will provide information on how plants are responding to these measured changes in climate conditions.



Projected change in native species richness from 2000 to 2090. Image courtesy of authors.

Quick Summary:

- Future changes in rainfall and temperature will affect the habitat distribution of plant species in Hawai'i Volcanos National Park and Hawai'i generally.
- Our forecasts suggest that many Special Ecological Areas will experience declines in native species richness due to changes in climate, although it may be possible to change the boundaries of the SEAs as species and communities move in response to changing conditions.
- Predicting habitat shifts due to climate change will allow for the development of adaptive management plans to better protect important plant species and communities, both within Hawai'i Volcanos National Park and in the surrounding areas.

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This project is a collaboration with the USGS Pacific Island Ecosystems Research Center and the NPS Hawaii Volcanoes National Park. Contact Jim Jacobi (jjacobi@usgs.gov) for more information on this project. To learn more about climate science at PI-CSC, contact David Helweg at dhelweg@usgs.gov or visit: https://nccwsc.usgs.gov/pacificislandscsc.

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