



A Few Puzzle Pieces at 6,000 Feet

What can a few puzzle pieces tell us about a big picture? Perhaps not a lot, but without them the picture is noticeably incomplete. Never before has society required us to gather so many pieces across hundreds of scientific disciplines with a single purpose - understanding a changing climate.

From universities across the globe to [NASA](#) and many other organizations (and yes, the [National Park Service](#) too), scientists are working together to study aspects of the world with a goal of understanding how the climate changes ecosystems and societies, and how the world can adapt.

The Hawaiian Islands are an ideal place to model plant community response to climate change because large portions of these high elevation tropical islands are protected as conservation lands. Extensive climate studies and localized climate prediction models have been and continue to be developed for the region.

Current projections for Hawaii forecast that climatic zones are changing and “novel” climates (e.g. hotter and drier) are anticipated at high altitudes. Ecological theory predicts the effects of specific factors (e.g. elevation, invasive species) on vegetation patterns and many

studies have examined these factors in Hawaii, but few have identified the relative importance of multiple factors simultaneously at both landscape and regional or island scales.



To meet the conservation challenges associated with rapidly shifting climates, one necessary step is to identify current species distributions, functional traits, and understand the underlying drivers sustaining and changing natural communities. The concept is simple - record specific data today to allow for comparisons in the future. Part of the mission of the [NPS Inventory & Monitoring Program](#) is to do just that.

The vegetated zones at Haleakalā and Hawai'i Volcanoes National Parks above about 6,000 ft. are known as subalpine shrublands. They are dominated by pūkiawe, 'ōhelo, kūkaenēnē, 'a'ali'i, and a host of other native and non-native species. The Inventory & Monitoring Program just completed its first [vegetation community monitoring survey](#) in this nosebleed section of the two parks.

The program identified 117 species (43% native) across the subalpine shrublands of Haleakalā and Hawai'i Volcanoes National Parks. Although the majority of species were non-

native grasses, total non-native cover remains low (14%) as compared to native cover (40%) in this plant community.

Even though only 30% of species were in both parks, the vegetation did not differ dramatically by island, soil type, or lava flow age. This opens the door for scientists to examine if and to what extent climatic variables, specifically rainfall and temperature, are associated with vegetation patterns on these mountains.

Preliminary results suggest that climatic variables (at least mean annual rainfall) are more important in explaining vegetation patterns across the subalpine shrubland than other factors such as geography or the soil. This is a critical discovery for modeling the potential impacts of shifting climatic conditions on Hawaiian subalpine vegetation.

Clearly, this is only the first step. As we continue, we hope to further elucidate and define vegetation-climate relationships in this unique and threatened community.

The baseline vegetation data on plant communities that we collected on these mountains is a critical puzzle piece in the grand scheme of a globally changing climate. When analyzed together with other scientific work, the broader science conducted today will become the puzzle pieces needed to aid in our understanding of a complex big picture.

—Alison Ainsworth, NPS