

Pacific Islands Network

Climate Change Resource Brief: Terrestrial

Pacific West Region
Inventory & Monitoring
National Park Service
U.S. Department of the Interior



Landbird Monitoring

Birds are the principal, and often only, native terrestrial vertebrates on Pacific Islands. Due to isolation, many have evolved into new species. Native avian populations have been severely impacted by habitat loss, alien species, and diseases such as avian malaria; threats that are expected to increase. The landmark Hawaii Forest Bird Survey established the basis for long-term population monitoring in Hawaii, including surveys in HAVO and HALE; with other historical surveys providing baselines for NPSA. To allow comparisons to historical data, we will use point-transect sampling to conduct surveys at population scales, efforts that will contribute to ongoing programs such as the National Point Count Database and the Hawaii Forest Bird Interagency Database Project.

Plant Invasive Species Monitoring

Nonnative plant species pose a serious threat to the vegetation habitats important for all terrestrial species. There are over 100 disruptive invasive plants with the capacity to cause serious changes to ecosystem structure and function in each Pacific Islands Network (PACN) area (Hawaii, Micronesia, and American Samoa). Native species and ecosystems stressed by climatic change will be less resistant to these invasions. Efforts will focus both on early detection of invasive species and monitoring of established populations. Early-detection monitoring will focus on cooperative efforts with other agencies to establish a database with reporting and notification capabilities, and to provide educational materials on troublesome plants just arriving in our area. Established invasive species will be monitored in all PACN parks with significant vegetation resources. Monitoring will occur in focal communities of invasive species along belt transects consisting of a mixture of legacy and newly generated random transects, as well as in major dispersal corridors where human vectors like vehicles and boots are the primary means for spreading invasive plant species.

Focal Plant Species and Communities Monitoring

Plant communities represent essential habitat for other Vital Signs (such as birds), reflect the dynamic relationship between native and invasive species, and serve to evaluate the effectiveness of previous management practices at the community level. Five plant communities in seven PACN parks will be monitored for measures related to species composition and vegetation structure. Specifically, data will be collected on plant community parameters including diversity, cover, density, and frequency of native and nonnative plant species. These focal plant communities were selected based on relative intactness, high species diversity, prevalence across parks, uniqueness to their respective areas, and usefulness as indicators of environmental change. Invasive species and climatic change represent the greatest threats to these ecosystems. Focal plant communities will be measured using both permanent and temporary plots with a split panel design that will provide greater ecological and statistical inference than either method alone. Pacific Island ecosystems are especially rich in rare plant species indicators will need to be carefully chosen to represent this suite of high diversity.

Contact Information

Penny Latham, PWR Regional I&M Program Manager, PWRO-Seattle, 909 First Ave., 5th floor, Seattle, WA 98104; Penny_Latham@nps.gov; phone, 206-220-4267.

Greg Kudray, Pacific Islands I&M Program Manager, HAVO, Hawaii National Park, HI 96718; greg_kudray@nps.gov; phone 808-985-6183.



Found only in Hawaii, Akepa (*Loxops coccineus*) are being monitored, along with other native birds.



Climate change may allow greater spread of invasive species, such as these strawberry guava trees (*Psidium littorale*).



Coastal strand vegetation is vulnerable to sea level rises caused by climate change, and will be monitored for changes in species composition, plant density, and other characteristics.

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Water Quality Monitoring

Water quality is being monitored by I&M in all Pacific Islands Network (PACN) parks except VALR. Changes in water quality can significantly alter the environment. All monitoring is correlated with biotic monitoring efforts and provides insight into environmental correlates. Continuous monitoring of physical characteristics occurs in both surface water and groundwater monitoring. Stream discharge is measured annually.

Groundwater Monitoring

Groundwater is being monitored in KAHO and AMME where existing monitoring wells are located. Groundwater withdrawal decreases the water table, decreasing stream volume and habitat, and changing the coastal environment through saltwater intrusions into the underground freshwater aquifer. Sampling consists of quarterly point samples of physical and chemical water characteristics.

Freshwater Animal Community Monitoring

Tropical freshwater animal communities are one of the most threatened groups of fauna because of invasive species, water withdrawal for growing population and irrigation requirements, and projected decreases in rainfall associated with climatic changes. Streams in WAPA, KALA, HALE, and NPSA, and anchialine pools in KAHO, PUHO, and HAVO are being monitored to measure physical habitat characteristics such as depth, discharge, temperature, oxygen content, and salinity. Population size, abundance, and habitat association are being measured annually at 30 sites enabling detection of status and trends of species diversity, distribution, mean size, and abundance, along with habitat association characteristics.

Coral Reef Monitoring Strategy

Coral reefs and associated biological diversity have been in a steady decline across the globe for decades. Ocean acidification and temperature rise lead to coral stress, disease, and death, removing key habitat components necessary for reef fishes to survive. This decline is expected to accelerate with increases in sea surface temperatures and ocean acidification associated with global climate change, decreasing fish populations, a primary source of sustenance to populations living in proximity to reefs. Marine Fish monitoring is co-located with Coral Reef Monitoring and a Fish Harvest monitoring protocol is also under development. The I&M program works closely with coral-reef ecologists in the Pacific Islands to develop and implement monitoring.

Coral Reef Monitoring

Coral reef habitats within the marine parks of the PACN have been mapped and a sampling strata of 10–20 m identified as the target monitoring area. Sampling occurs at 30 sites annually. Data from the monitoring will detect annual status and trends of coral, invertebrate, and algal cover; disease incidence; and structural changes to the physical environment (rugosity).

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Waterfall on Laufuti stream in the Tau unit of the National Park of American Samoa (NPSA).



Native Hawaiian shrimp opae kala'ole (*Atyoida bisulcata*) in Palikea Stream, Haleakala National Park (HALE).



Coral reef at 60 feet in the Tutuila unit of the National Park of American Samoa (NPSA).