

Assessing the Impacts of Land-Based Pollutants on Coral Health in Puakō

2014 Project Summary



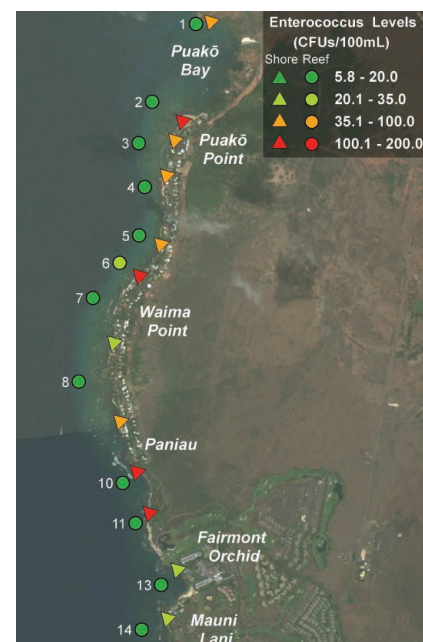
Integrating Science to Strengthen Community-Based Management

The Puakō-Mauna Lani reef system is one of the most extensive fringing reefs on Hawai'i Island, and vital to the health of the local community. Unfortunately, its fish populations are declining, and **more than half of the corals have died over the last 40 years**. To understand and mitigate the impacts of land-based pollution on coral reef health, Conservancy scientists are working with the University of Hawai'i at Hilo and other researchers to: 1) identify where high groundwater flows occur on the Puakō reef system; 2) determine what is in the water by monitoring levels of bacteria and nutrients; and 3) assess whether degraded water quality can compromise coral health – and if so, which sites are most vulnerable. These collaborations allow us to pool resources and expertise to increase the scale of our sampling and get a more complete picture of what is happening across the reef system.

Understanding Impacts of Land-Based Pollutants

In 2014, The Nature Conservancy designed and initiated water quality surveys, began mapping groundwater springs, and conducted coral health assessments at 12 sites across the Puakō-Mauna Lani reef system. Initial findings indicate:

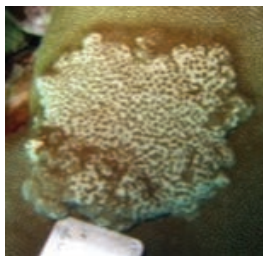
- There was a link between groundwater discharge and degraded coral health.
- Coral growth anomalies were the most prevalent coral disease, resulting in tumor-like growths on coral skeletons.
- Growth anomaly levels were highest on reefs with nutrient levels elevated from groundwater input.
- The reef was overgrown by red filamentous algae, which can cause coral mortality. The algae was widespread at Puakō compared with other areas along the coast.
- High bacteria counts associated with sewage (Enterococcus) were documented at shoreline sites and not at sites in deeper waters.



Average Enterococcus levels across 12 sites in Puakō between March and September 2014.

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Coral growth anomalies

are cause for concern because they impede a coral's ability to grow and reproduce, and may mean a slow death for the animal. The lighter colored areas on the lobe corals (left) are growth anomalies found in Puakō.

While specific causes of the coral disease observed at Puakō are currently unknown, research on other coral reefs corroborates what we found here: that growth anomalies are more common in areas with higher human activity and land-based sources of pollution. Coral cover is one of the most common indicators of reef health, and though these findings do not prove that the declines in coral cover documented at Puakō are solely the result of changes in groundwater, they strongly suggest that actions to improve water quality would benefit coral health.

Identifying the Sources of Land-Based Pollutants

The technique to measure bacteria from sewage (*Enterococcus*) used in this research conforms to regulatory standards, but does not distinguish human sources of *Enterococcus* from animal sources. In 2015, we are collaborating with three microbial ecologists, Dr. Melissa Garren (Massachusetts Institute of Technology), Dr. Craig Nelson (University of Hawai'i, Manoa), and Dr. Tracy Wiegner (University of Hawaii at Hilo) to augment our water quality monitoring using microbial source tracking, a technique that has been widely used in freshwater systems to identify sources of land-based pollution (i.e. human versus animal). This project will improve detection of human sewage "hot spots," helping the Puakō community prioritize areas for management activity. It will also provide a more precise indicator to help gauge the efficacy of these mitigation efforts on Puakō's reefs.

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Mahalo to the Puakō Community Association, the Division of Aquatic Resources, the South Kohala Coastal Partnership, the National Oceanic and Atmospheric Administration, the University of Hawai'i at Hilo and all of the project funders, partners, and volunteers working hard to promote reef health in Puakō.

