



Summary of Findings

2015-2016 Coral Bleaching Recovery Surveys: South Kohala, North Kona

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Coral Reefs and Bleaching

Corals form the three-dimensional structure of reefs, providing the foundation for coral reef ecosystems. Coral reefs provide more than \$360 million annually in valuable services to the people of Hawai'i, including protection from storm surge, food for local families, recreational opportunities, and an important tie to our cultural heritage. Coral bleaching critically threatens these important ecosystems and the services they provide to people. Coral bleaching is a stress response caused by the breakdown of the symbiotic relationship between the coral and the algae (zooxanthellae) that live inside its tissues. When the coral expels these algae, the coral skeleton becomes visible, giving it a pale or "bleached" appearance. Mass bleaching events are caused by higher-than-normal ocean temperatures associated with a warming planet and are expected to increase in severity, extent, and frequency. Bleached corals may eventually die if temperatures remain high and the symbiosis is not reestablished. But corals can also recover from bleaching, with zooxanthellae repopulating the coral tissue to normal densities in the months or year following the end of the thermal stress.

Severe bleaching at Keanapukalua in October 2015.



Coral Bleaching in Hawai'i

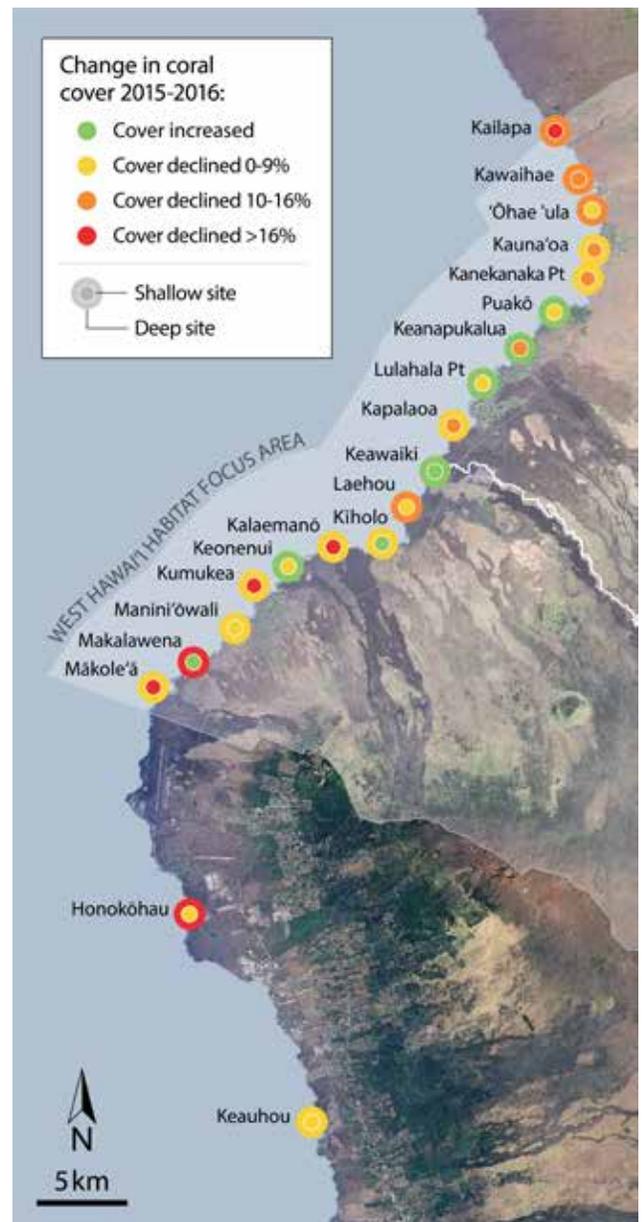
By early October 2015, the west side of Hawai'i Island had experienced severe thermal stress for 18 consecutive weeks; more stress for longer than anywhere else in the Hawaiian archipelago. Scientists from The Nature Conservancy, The National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Ecosystem Program (CREP), and Hawai'i's Division of Aquatic Resources (DAR) conducted field surveys at shallow (5-8 m) and deep (12-15 m) areas of 20 reef sites to assess coral bleaching impacts. The team surveyed more than 14,000 coral colonies across the South Kohala and North Kona regions of West Hawai'i in 2015, assessing the prevalence (proportion of coral colonies that bleached) and severity of bleaching of each colony. The same sites were surveyed in October 2016 to examine changes in coral reef community condition and composition between 2015 and 2016.

Highlights: Extent and Severity of Bleaching in 2015

- 38-92% of all coral colonies on North Kona and South Kohala reefs were partially or fully bleached.
- An average of $68 \pm 15\%$ of shallow water (18-21') and $60 \pm 18\%$ of deeper water (38-42') corals were partially or fully bleached.
- Average bleaching severity across all colonies was ~75%, and similar in shallow and deeper reef zones.
- Survey sites in South Kohala (north end of the survey area) experienced worse bleaching than those in North Kona (south end of the survey area).

Changes to Coral Reef Community Condition: 2015 to 2016

- Coral loss between 2015 and 2016 was greatest where severe bleaching prevalence in 2015 was highest. Overall, survey data suggest that roughly half of the coral that was severely bleached in 2015 died due to bleaching in the months after the 2015 thermal stress event.
- Declines in coral cover (percent of the reef area made up by corals) and coral density (number of coral colonies per unit area) were greater in the northern survey sites and lower in the southern sites.
- In the shallow reef areas, coral cover decreased from 28% in 2015 to 20% in 2016. Average coral cover decline was 8% and the largest decline observed was 21%.
- In the deep reef areas, coral cover decreased from 23% in 2015 to 16% in 2016. Average coral cover decline was 6% and the largest decline observed was 37%.
- Though coral cover decreased on average in both depths, average coral density hardly changed. The most likely explanation for coral density not declining with coral cover is that bleaching mostly caused partial rather than whole colony mortality.
- Macroalgae, which can often increase following coral mortality and then inhibit coral recovery, did not increase as coral cover decreased. Macroalgae cover was <1% in 2015 and was also <1% again in 2016.
- Many coral recruits were observed during 2015 and 2016 surveys—meaning reefs are starting to recover.



Coral cover changes between October 2015 and October 2016 caused by severe coral bleaching in West Hawai'i in 2015.

How We Can Help Improve Reef Resilience

For the first time in history, the Hawaiian Islands experienced back-to-back bleaching events in 2014 and 2015. These events and the likelihood that they will continue into the future require us to improve our understanding of bleaching impacts. We also need to continue to apply reef resilience principles to ensure we are doing everything we can to reduce mortality and support recovery on Hawai'i's reefs. We will continue to monitor coral reefs in West Hawai'i, and are working to identify and prioritize conservation actions that will promote recovery. Such actions involve minimizing local stressors (e.g., land-based pollution, runoff, and overfishing of herbivores) that are within our control and compromise coral health and the reef's ability to resist and recover from future bleaching events.

For Additional Information

Contact Dr. Eric Conklin at econklin@tnc.org or Dr. Dwayne Minton at dminton@tnc.org for additional information on these results and plans for future surveys. Visit reefresilience.org for additional information on coral bleaching and reef resilience principles.

Mahalo Nui Loa

To Moana Ohana LLC for helping to make this work possible.