

Summary of Findings

Assessing the Resilience of Leeward Maui Reefs to Help Design a Resilient Managed Area Network

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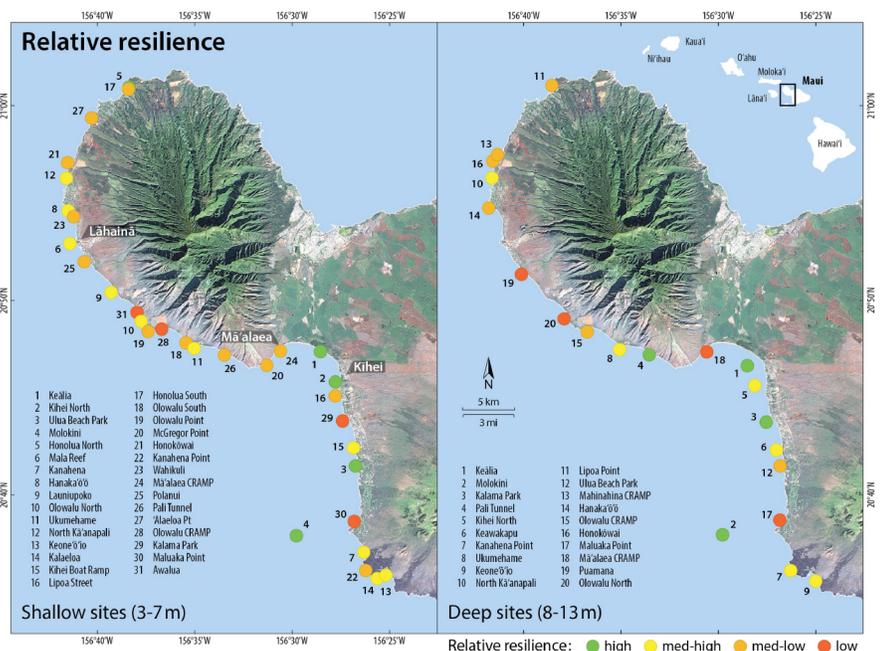
Hawai'i's culture, economy and island lifestyle are inextricably tied to our marine environment. But the coral reefs we rely on for food, recreation, tourism and coastal protection are threatened by unsustainable fishing, runoff from land, and warming and rising seas. Coral cover on Maui has decreased over the last century, as coral disease and runoff have become more prevalent, and fisheries these reefs support have declined by up to 75%. In 2015, higher-than-normal ocean temperatures associated with a warming planet led to the first statewide bleaching event in Hawai'i, resulting in up to 90% coral mortality on some reefs. While it is too early to know the long-term effects of this event, Hawai'i is taking action to address this new threat and reverse the declining condition of coral reefs and fisheries.

With support from the State Division of Aquatic Resources, the University of Hawai'i and National Oceanic Atmospheric Administration, The Nature Conservancy conducted surveys to identify the sites likely to be the most—and least—resilient to climate change impacts. The surveys measured coral cover and diversity, herbivore biomass (combined weight of all fish), rugosity (structural complexity of reef), and reef builder ratio (a measure of reef growth and repair capacity), and identified the different local pressures affecting those reefs that, if reduced, could enhance reef resilience, defined as a reef's ability to resist or recover from climate change impacts.

Survey findings offer a snapshot (*at right*) of more than 22,000 coral colonies at 51 sites along Maui's South and West shores that will help inform community-based conservation efforts on Maui and the State's Marine 30x30 Initiative, a commitment to effectively manage 30% of nearshore waters by 2030.

Key Findings: High and Low Resilience Sites

- Five of Leeward Maui's most resilient reefs are found in State managed areas (Molokini and Honolua Marine Life Conservation Districts, Kahekili Herbivore Fisheries Management Area, 'Āhihi Kīna'u Natural Area Reserve) and offshore the U.S. Fish & Wildlife Refuge at Keālia—a natural wetland that protects coastal resilience.
- Low resilience reefs tended to have higher levels of land-based sediments and nutrients across shallow reef sites, including at Kīhei, at Lāhainā, and at Olowalu, a vitally important source of coral larvae across West Maui.



Key Findings: Resilience Indicators

- High resilience sites in both deep and shallow waters had higher coral cover and a higher reef-builder ratio.
- Low resilience sites in shallow waters had poor scores across all indicators, including higher levels of coral disease and lower herbivore biomass and coral recruitment.
- Low resilience sites in deep waters had lower reef-builder ratio, lower coral cover, lower coral diversity and lower herbivore biomass.



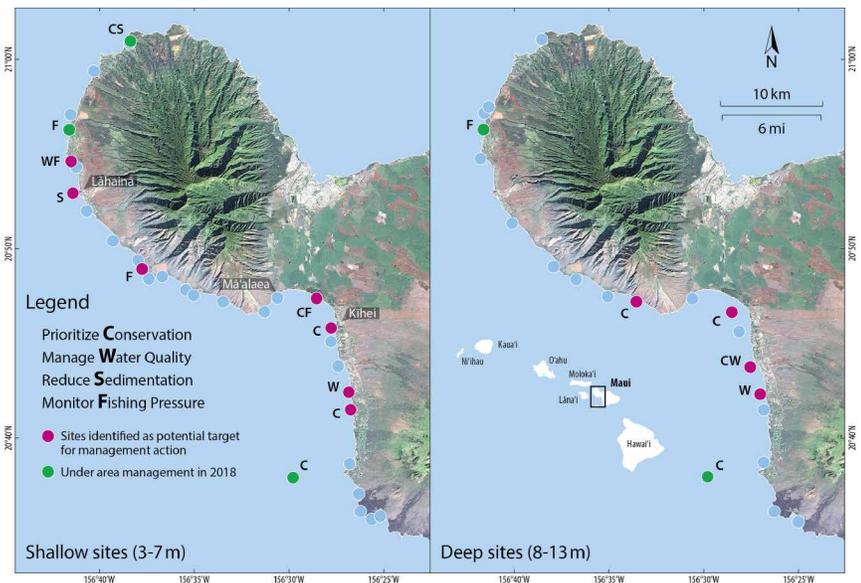
High coral cover, reef builder ratio, coral diversity, and herbivore biomass contribute to a reef's resilience.

Management Recommendations

In Hawai'i, our ability to alter the global forces driving climate change is limited, but evidence suggests that **reducing local pressures can promote reef resilience and enhance recovery** along Maui's Leeward coast.

For the greatest long-term benefit, our overarching recommendation is to primarily target management at sites with high and medium resilience sites - the sites most likely to fare well under our changing climate. We identified four types of potential conservation actions for these sites (as indicated on maps at right):

- **Prioritize conservation at sites that are not currently within managed areas.** Shallow sites that met these criteria are Keālia, Kihei North, Ulua Beach Park, Molokini, Honolua North. Deep sites that met these criteria are Keālia, Molokini, Kalama Park, and Pali Tunnel.
- **Manage water quality at sites that have greater nutrient inputs than the leeward Maui average.** Shallow sites that met these criteria are Hanaka'ō'ō and Kihei Boat Ramp. Deep sites that met these criteria are Kalama Park and Keawakapu.
- **Reduce sedimentation at sites that have greater sedimentation levels than the leeward Maui average.** Shallow sites that met these criteria are Honolua North and Mala Reef. There are no deep sites that met these criteria.
- **Monitor fishing pressure at sites that have greater total fishing catch than the leeward Maui average.** Shallow sites that met these criteria are Keālia, Hanaka'ō'ō, Olowalu North, and North Kā'anapali. The deep site that met these criteria is North Kā'anapali.



Moving Forward

The results of this survey have been shared with the Division of Aquatic Resources and will be available to Maui stakeholders to help identify areas and actions for place-based management under the 30x30 initiative. This information can help communities and State agencies determine how to bolster reef resilience along Maui's Leeward coast to build and maintain healthy and abundant reefs and fisheries that will allow Maui communities to enjoy nearshore waters, support local livelihoods, and feed their families.

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.