Use of NOAA Coral Reef Watch Ecoforecasts by Resource Managers During the 2014-2017 Global Coral Bleaching Event

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Abstract

Coral reefs are one of the most diverse ecosystems on Earth and provide significant ecological, economic, and societal benefits valued at approximately $9.8 trillion U.S. dollars per year. Since 1997, NOAA's Coral Reef Watch (CRW) has used near real-time satellite monitoring to provide ecological nowcasting of the ocean heat stress that can cause mass coral bleaching. While this benefitted coral reef managers, scientists, and other stakeholders, our users desired longer-range forecasts. In 2012, CRW launched its probabilistic, global Four-Month Coral Bleaching Outlook system based on NOAA's operational Climate Forecast System (now CFSv2). The Outlook proved accurate in local bleaching events over the following two years. Subsequently, June 2014-May 2017 brought the longest, most widespread, and probably most damaging coral bleaching event on record. As this global event greatly threatened all tropical coral reefs, the Outlook system proved critical in helping users worldwide prepare for and respond to bleaching – including actions to reduce damage from these intense marine heatwaves. This presentation will introduce CRW's ecoforecasting tools and focus on four "use cases" of CRW's Outlook system during the 2014-17 global coral bleaching event. In 2015, concern over bleaching forecasted by CRW's Outlooks prompted two actions by the State of Hawaii. First, the "Eyes of the Reef" volunteer network organized numerous training sessions and its first state-wide Bleach Watch "Bleachapalooza" event to monitor bleaching across the state. Second, State scientists collected specimens of rare corals to preserve them in onshore nurseries. One of these species is now locally extinct on Hawaii's reefs, and these rescued specimens are being prepared for re-introduction. Next, as CRW predicted bleaching would persist for several months in the Northern Line Islands, NOAA mounted a special cruise to monitor these remote coral reefs. The record heat stress killed over 98% of the corals at Jarvis Island. Finally, in 2016, prior to peak bleaching, Thailand used CRW's prediction of severe heat stress to close ten heavily used coral reefs to tourism as a way to reduce further stress to the reefs. These actions show the value of ecoforecasts to prepare resource managers for further climate change impacts.

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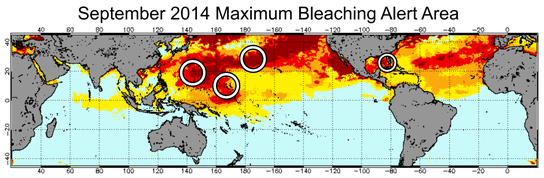
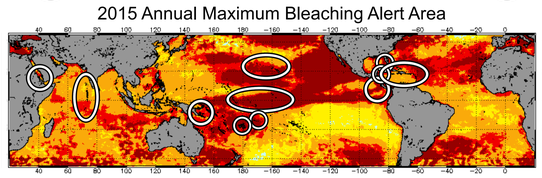
Since 1997, NOAA's Coral Reef Watch (CRW) has used near real-time satellite monitoring to provide ecological nowcasting of the ocean heat stress that can cause mass coral bleaching. While this benefitted coral reef managers, scientists, and other stakeholders, our users desired longer-range forecasts. In 2012, CRW launched its probabilistic, global Four-Month Coral Bleaching Outlook system based on NOAA's operational Climate Forecast System (now CFSv2). The Outlook proved accurate in local bleaching events over the following two years. Subsequently, June 2014-May 2017 brought the longest, most widespread, and probably most damaging coral bleaching event on record. The Outlook system proved critical in helping users worldwide prepare for and respond to bleaching – including actions to reduce damage from these intense marine heatwaves.

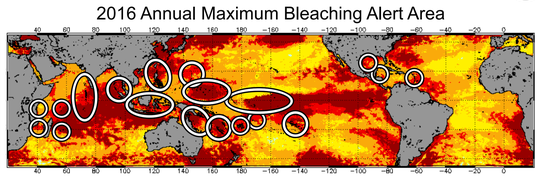
Responses to CRW's Outlooks prompted:

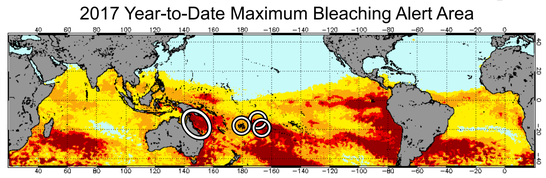
1) Hawaii "Eyes of the Reef" volunteer network organized first state-wide Bleach Watch "Bleachapalooza" to monitor bleaching across the state.
2) Hawaii scientists collected specimens of rare corals to preserve them in onshore nurseries. One of these species is now locally extinct on Hawaii's reefs, and these rescued specimens are being prepared for re-introduction.
3) NOAA mounted a special cruise to monitor these remote coral reefs. The record heat stress killed over 98% of the corals at Jarvis Island.
4) In 2016, prior to peak bleaching, Thailand used CRW's prediction of severe heat stress to close ten heavily used coral reefs to tourism as a way to reduce further stress to the reefs.

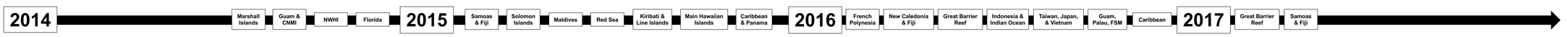
2014-2017 Global Bleaching Event: The Longest Global Bleaching Event on Record (3 years)

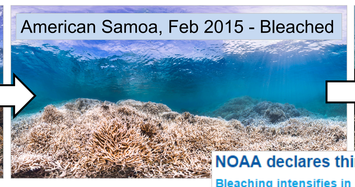


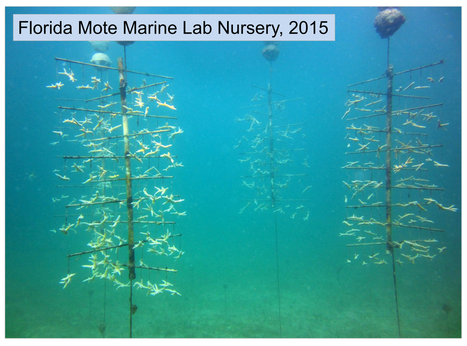


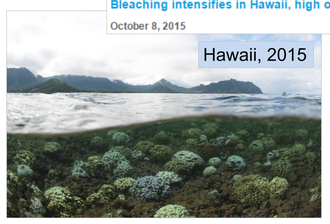


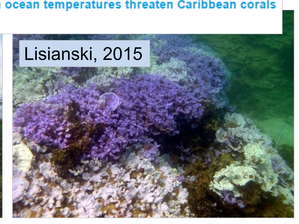


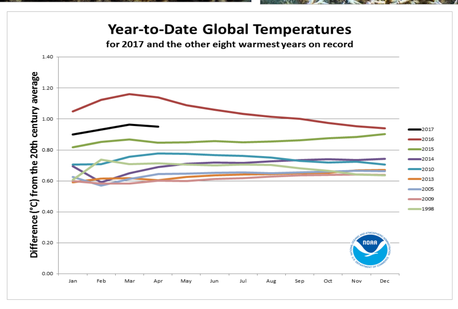




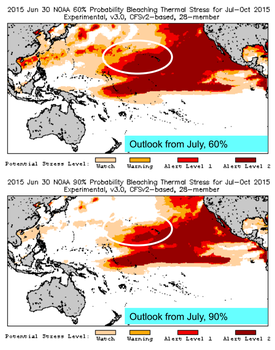


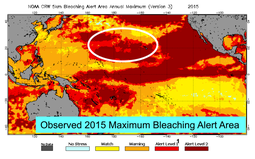






2015 4-Month Bleaching Outlook: Hawai'i





1. Maui Women Launch Statewide Bleachapalooza to Combat Coral Bleaching

October 1, 2015, 2:08 PM HST · Updated October 5, 4:51 PM
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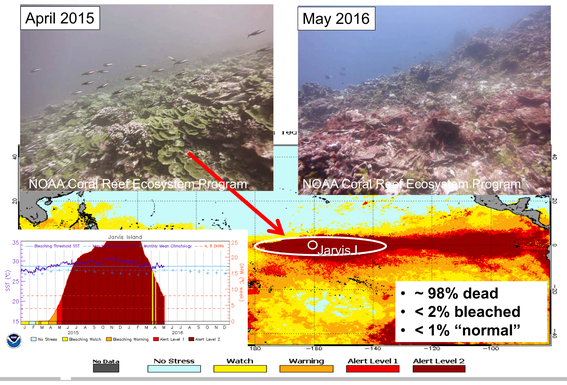
Bleached Coral in Kāhe'ohe Bay Hawai'i. Photo credit: XL Catlin Seaview Survey

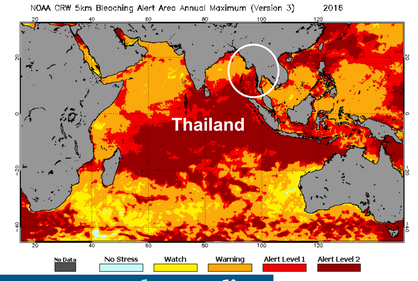
The state department of Land and Natural Resources launches a "Bleachapalooza" event this weekend to bring attention to the damaging effects of coral bleaching in the islands.

2. Reduce Local Stressors 2015 Hawai'i Division of Aquatic Resources Develops Rare Coral "Ark"

3. Record 12 Months of Continuous Heat Stress



4. Thailand Closes Dive Sites in Response to Bleaching Outlook – prior to event peak



NOAA CORAL REEF CONSERVATION PROGRAM

UNIVERSITY OF MARYLAND

http://coralreefwatch.noaa.gov

The only satellite-based system available for U.S. and global coral reef management

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