

Coral Reef Watch



NOAA Coral Reef Watch uses satellite, modeled, and *in situ* data to provide current reef environmental conditions to quickly identify areas at risk for coral bleaching.

Coral reefs are one of the most diverse ecosystems in the world. Reefs support essential coastal fisheries, protect coasts from erosion, support local tourism, and are sources of pharmaceuticals.



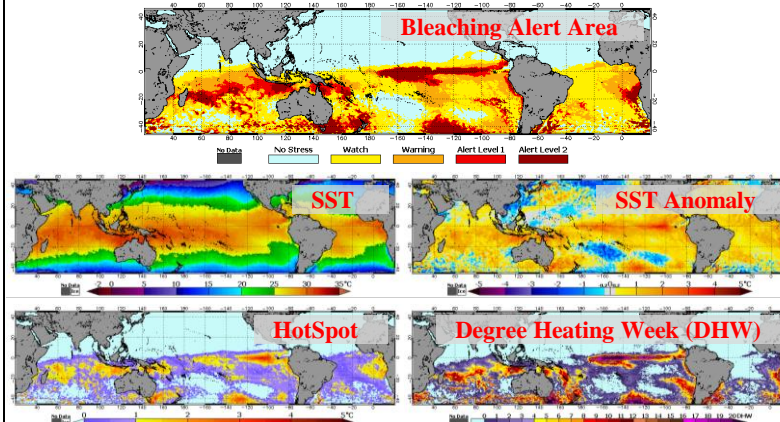
Sustained high water temperatures, in conjunction with other natural and human-based threats, could cause coral bleaching to become an annual event in most oceans. This could lead to a rapid decline in coral ecosystem health worldwide.



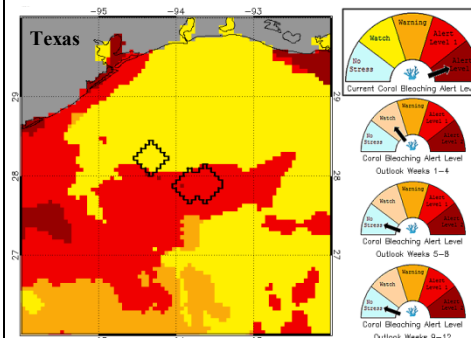
Coral Reef Watch is primarily funded by the NOAA Coral Reef Conservation Program and housed in the National Environmental Satellite, Data, and Information Service's Center for Satellite Applications and Research.



NOAA Coral Reef Watch Daily Global 5 km Bleaching Heat Stress Monitoring Products – 12 Mar 2016



High-Resolution Monitoring: Coral Reef Watch's Daily Global (above) and Regional (below) 5 km Satellite Coral Bleaching Heat Stress Monitoring Products (version 3, released May 2017) provide increased spatial and temporal resolutions and improved color scales. They use NOAA's next-generation sea surface temperature (SST) dataset, derived from a blend of geostationary and polar-orbiting satellite observations, and a significantly improved climatology. Our most user-requested upgrade, the 5 km products provide information at or near the coral reef scale and significantly reduce data gaps caused by cloud cover. These products continue to alert resource managers and other stakeholders to environmental changes and potential threats to coral reefs, helping facilitate effective management actions in preparation for and response to mass bleaching, including the 2014-17 global coral bleaching event (the longest, most widespread, and most damaging on record).



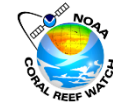
LEFT: Example 5 km Flower Garden Banks Sanctuary Regional Virtual Station on the 5 km 7-day maximum Bleaching Alert Area map for Sep. 15, 2016, when the Station registered Alert Level 2 stress (associated with widespread bleaching and significant coral mortality). Bleaching Heat Stress Gauges (right of map) indicate the Station's heat stress level on Sep. 15 (black box) and predicted levels for the next 1-4, 5-8, and 9-12 weeks.

Latest global data and images freely available at:

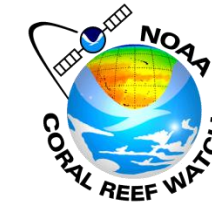
<https://coralreefwatch.noaa.gov>

For more information, contact us at:

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May 2017



NOAA Coral Reef Watch

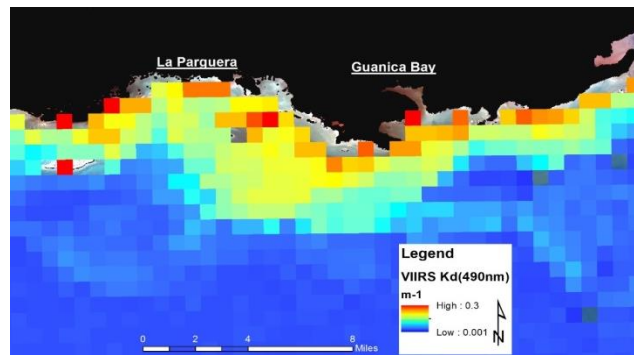


Satellite Monitoring for Coral Reefs

Coral Reefs and Climate Change

Under stress from elevated water temperatures and periods of high sunlight, corals respond by expelling symbiotic algae living within their tissues that provide most of their energy and color. While corals can recover from brief, minor stress, they can starve and die if thermal stress continues for weeks or months. Since coral bleaching has become much more severe in recent decades, Coral Reef Watch has developed and operates a world benchmark decision support system of near-real-time monitoring and prediction tools, based on satellite, modeled, and *in situ* data, to inform and alert managers and researchers to environmental stresses to coral reef ecosystems. Historical satellite data are also used to investigate and provide information on long-term changes in coral reef environmental stresses.

Ocean Color for Coral Reefs



VIIRS image of turbidity ($K_d(490)$) for Guánica and La Parguera, Puerto Rico – November 12, 2014

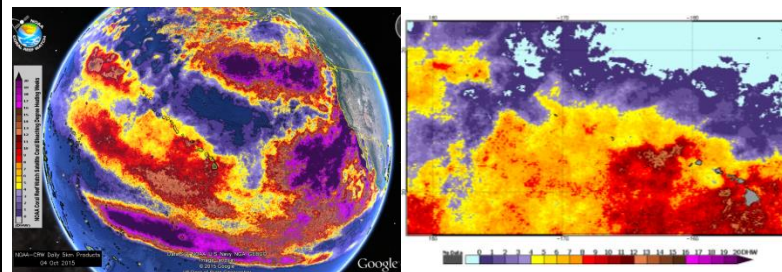
Working with U.S. Coral Reef Task Force Watershed Working Group partners, NOAA's Ocean Color Team and Coral Reef Watch are developing experimental satellite ocean color products to help managers monitor variable water turbidity (diffuse attenuation coefficient at 490 nm, $K_d[490]$) and chlorophyll-*a* affecting coral reef health, especially after large precipitation events. Background levels and anomaly time-series of K_d , chl-*a*, and SST have been developed for Guánica, Puerto Rico and West Maui, Hawaii from science-quality Visible Infrared Imager Radiometer Suite (VIIRS) 750m satellite imagery. Future improvements include validating and enhancing the spatial resolution of these observations, incorporating Total Suspended Solids (TSS), and developing public near-real-time products.

Coral Reef Conservation & Satellite Technology

NOAA Coral Reef Watch uses sea surface temperature (SST) and other data measured by polar-orbiting and geostationary environmental satellites to keep a constant, vigilant eye on changes in the environmental conditions of U.S. and global coral reef ecosystems.

Continuous monitoring of SST at global scales provides coral reef managers and other stakeholders with tools to understand, monitor, and better manage the complex interactions leading to coral bleaching, disease, and overall deterioration in coral health. When thermal stress conditions occur, Coral Reef Watch products are used to trigger bleaching and disease response plans and to support appropriate, timely management decisions.

NOAA



Google Earth, HDF, and netCDF Data

Coral Reef Watch's data products are available in the following formats: network Common Data Form (netCDF, 5 km products), Hierarchical Data Format (HDF, 50 km products), Google Earth, Google Maps, ASCII text, graphs, and images.

Future Directions

Coral Reef Watch is working on a number of experimental products to enhance its decision support system for coral reef ecosystem management. These include Light Stress Damage, Coral Disease Outbreak Risk, Thermal History, and Larval Connectivity product suites, among others.

Four-Month Bleaching Outlook

In May 2017, NOAA Coral Reef Watch released an enhanced (Version 4 or v4) Four-Month Coral Bleaching Heat Stress Outlook. The v4 Bleaching Outlook is based on the NOAA National Centers for Environmental Prediction's latest Climate Forecast System Version 2 (CFSv2). It is updated every Tuesday and features 50x50 km spatial resolution. The Outlook uses a weekly ensemble of sea surface temperature forecasts from the CFSv2, incorporating up to 112 ensemble members in the early part of the outlook period, to predict the likelihood of coral bleaching heat stress up to four months in the future. The Four-Month and weekly Outlooks have been used by coral reef managers, scientists, and monitoring networks worldwide to prepare and prioritize resources for, effectively respond to, and communicate broadly about bleaching on local coral reefs, especially during the 2014-17 global bleaching event.

Coral Reef Watch – 16 May 2017 – Four-Month Bleaching Heat Stress Outlook for May-Aug 2017

