

# National Coral Reef Monitoring Program
# Climatic Monitoring

**Coral reefs are among the most valuable ecosystems on Earth, providing us with food, protection from storms, and recreational opportunities. These assets are also tied to economic benefits including tourism, fishing, ornamental resources and biomedical products. When coral reefs are threatened by climate change, unsustainable consumption, and land-based pollution, nearby human communities are also threatened.**

The National Coral Reef Monitoring Program (NCRMP) is part of NOAA's Coral Reef Conservation Program, and focuses on monitoring four components of coral reef ecosystem condition: biological (benthic composition and reef fish), climate, and socioeconomic. By consistently collecting monitoring data on these four components throughout the 10 U.S. coral reef areas, NCRMP can provide a holistic understanding of the status of U.S. coral reefs. To learn more about NCRMP, visit https://www.coris.noaa.gov/monitoring/.

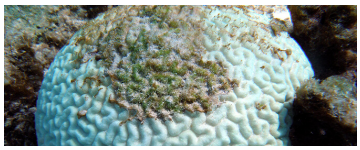
## Climatic Monitoring

Many climate samples are collected in the field, but a major component is from satellites. Satellite observationare the primary way to continuously monitor sea surface temperature and estimate thermal stress for coral reefs. NCRMP climate field monitoring includes both random and fixed-site monitoring conducted every three years.

To download NCRMP Climate data, please visit https://www.coris.noaa.gov/monitoring/climate.html.

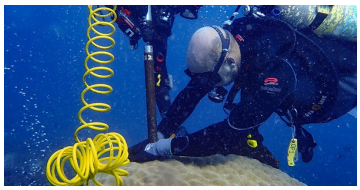
## How Satellite Data is Used

NOAA and partner satellites provide daily global sea surface temperature values at a 5 kilometer scale. Usingthese data, NOAA scientists can identify HotSpots, or areas where the temperature is higher than the average temperature during the warmest month.



## NCRMP Climatic Indicators

- Sea surface temperature and heat stress
- Water temperature on a coral reef
- pH of the water on a coral reef
- Speed of coral skeleton growth
- Speed of coral reef erosion



## How Climate Field Data are Collected

- Temperature, salinity, and carbonate chemistry at stratified random sites
- Sub surface temperature at fixed sites
- Daily variability in carbonate chemistry using water samplers deployed on a reef
- Ecosystem response to ocean acidification using calcification accretion units, bioerosion monitoring units, and coral coring
- Carbon dioxide, pH, air temperature, salinity, dissolved oxygen, and humidity at moored buoys

## How Satellite Data are Used

- HotSpots of 1°C or more indicate heat stress that can lead to coral bleaching.
- Accumulated hotspots greater than or equal to 1°C during a 12-week period are called Degree Heating Weeks (DHW).
- Significant bleaching usually occurs when DHW values reach 4°C weeks (Alert Level 1).
- At 8°C weeks bleaching and mortality are likely (Alert Level 2).

## Satellite Data Results

NOAA scientists use both hotspot and DHW data to predict when bleaching may occur.

To learn more about Coral Reef Watch modeled outlooks, visit https://coralreefwatch.noaa.gov/satellite.

## Climatic Field Monitoring Geographies and Years

| Atlantic Ocean | Pacific Ocean | Deployment Cycle |
|---|---|---|
| Puerto Rico, St. Thomas, St. John | Guam, CNMI | 2020 |
| Flower Garden Banks, St. Croix, Miami, Broward, Florida Keys | Hawai'i, NW Hawaiian Islands | 2019 |
| Dry Tortugas | American Samoa, Pacific Remote Islands | 2018 |
| Puerto Rico, St. Thomas, St. John | Guam, CNMI | 2017 |
| St. Croix, Miami, Broward, Florida Keys | Hawai'i, NW Hawaiian Islands | 2016 |
| Puerto Rico, Flower Garden Banks, Dry Tortugas | American Samoa, Pacific Remote Islands | 2015 |
| St. Thomas, St. Croix, St. John, Biscayne National Park | Guam, CNMI | 2014 |
| Miami, Broward, Florida Keys | Hawai'i, NW Hawaiian Islands | 2013 |

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