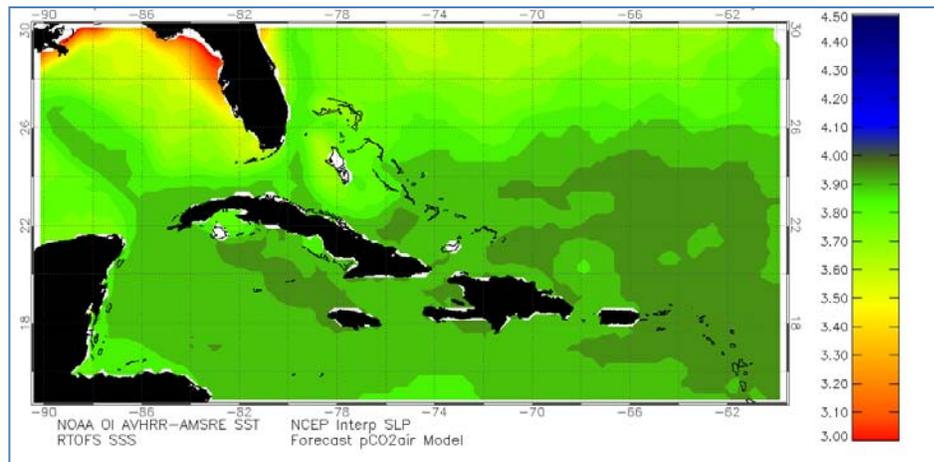


# Florida Keys National Marine Sanctuary

## Climate Change

### Management Issue

Global climate is changing due to human activities. We anticipate increased occurrences of worldwide mass coral bleaching events if human carbon footprints remain at current levels. How these climate change impacts will cascade through the ecosystem and affect resources of the Florida Keys National Marine Sanctuary (FKNMS or Sanctuary) remains questionable because other components of the marine ecosystem (e.g., fishes, invertebrates, seagrass, algae, etc.) are less predictable.



NOAA Coral Reef Watch Aragonite saturation state composite for January 2009.  
Map credit: NOAA

### Description

Evidence shows that average global temperatures have been increasing over the last thirty years. Additionally, concentrations of carbon dioxide have been increasing in both the atmosphere and the oceans during the same time period. How these climate change impacts will cascade through the marine ecosystem remains questionable because some coral reefs and associated organisms (e.g., fishes, invertebrates, seagrass, algae, etc.) may have resilient characteristics. Understanding the nature of this resiliency will require expertise from multiple ecological disciplines.

### Questions and Information Needs

- 1) What characteristics of a specific geographic area confer resistance or resilience to bleaching?
- 2) What characteristics of each coral species confer resistance or resilience to bleaching?
- 3) How far in advance can bleaching events be predicted using currently available tools?
- 4) What is the predictability of bleaching events in terms of duration and geographic scope?
- 5) How do bleaching conditions affect other components of the ecosystem (e.g., fish, reef invertebrates, sponge pumping rates, etc.)?
- 6) How do increased concentrations of carbon dioxide affect reef accretion, coral larvae formation, metamorphosis, growth and survival?
- 7) How do increased concentrations of carbon dioxide affect otolith development in fish? Does this in turn affect their foraging or defensive behaviors?
- 8) How do increased concentrations of carbon dioxide affect sponge spicule development? Invertebrate exoskeletal development?

Updated: 5/1/2010

For More Information -- <http://www.sanctuaries.noaa.gov/science/assessment>

## Scientific Approach and Actions

- Examine existing habitat monitoring data to look for characteristics that have historically conferred resistance and cross reference those with bleaching data
- Assess and prioritize research and monitoring activities by developing and implementing a prioritized research and monitoring plan for the monument
- Develop a local coral bleaching response plan
- Assemble relevant research, monitoring, and bathymetric data into appropriate databases for management consideration and guidance.
- Monitor the socioeconomic correlation to climate change and its impact of the marine ecosystem.

## Potential Key Partners and Information Sources

NOAA/NESDIS; FWC/Florida Wildlife Research Institute; NOAA/AOML; Florida Institute of Oceanography; Academic partners such as UM/RSMAS, UNCW, FIU, FIT, etc.; NGOs such as MML, WWF, and TNC

## Management Support Products

- Coral bleaching response plan
- Report characterizing the accuracy of bleaching event predictions
- Report describing characteristics that may relate to resistance or susceptibility to bleaching
- Distilled summaries of scientific reports regarding the extent, severity, or predictability of bleaching events
- Presentations on the effects of climate change on the marine ecosystem of south Florida at conferences, symposia, meetings and workshops
- Maps of particularly sensitive areas

## Planned Use of Products and Actions

- Draft a Bleaching Response Plan using the information collected during research and monitoring activities
- Contribute to the data record on long term monitoring of coral bleaching in the Sanctuary
- Use results to develop or enhance education and outreach products
- Use relevant data to recommend management strategies that would promote ecosystem resiliency (e.g., temporary closure of sensitive areas or other temporal zoning strategy)

## Program References

### FKNMS Management Plan

- Science Management and Administration Action Plan (Chapter 3.1.1)
- Research and Monitoring Action Plan (Chapter 3.1.2)

### ONMS Performance Measures

- Number of sites in which living marine resources, based on long-term monitoring data, are being maintained or improved

*Updated: 5/1/2010*

*For More Information -- <http://www.sanctuaries.noaa.gov/science/assessment>*