U.S. Coral Reef Task Force

Coral Reef Task Force Response to the 2005 Caribbean Coral Bleaching Event

Dr. C. Mark Eakin
National Oceanic and Atmospheric Administration
Dr. Caroline Rogers
U.S. Geological Survey
Mr. William J. Miller
National Park Service
Dr. Phil Kramer
The Nature Conservancy

Photo by Ernesto Weil, Puerto Rico

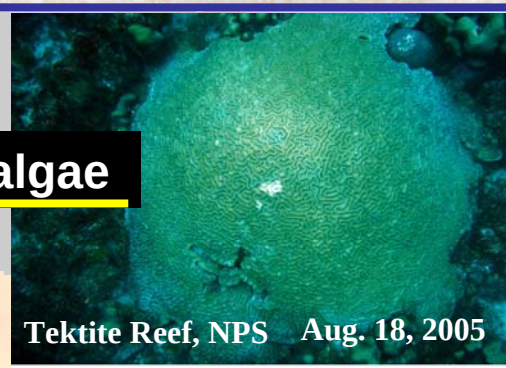
Why Do We Care?

CRTF
U.S. Coral Reef Task Force

What is Coral Bleaching?

U.S. Coral Reef Task Force

- Corals exposed to high temperatures and/or high light become stressed and bleach
- If stress is mild or brief, corals recover, otherwise they die



http://www.coralreef.gov

NOAA Coral Stress Data

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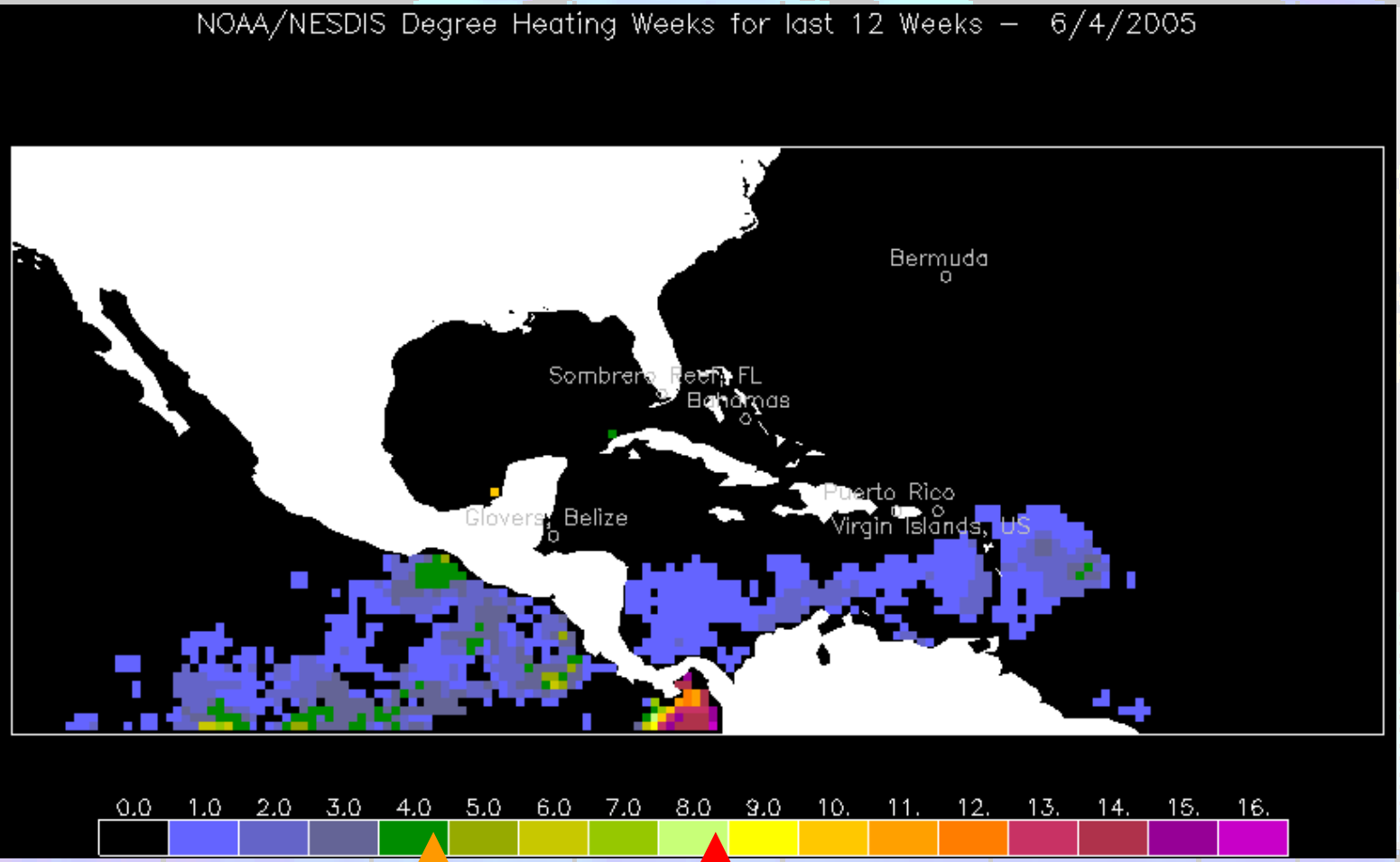

Degree Heating Weeks Thermal Stress Product

1 DHW = 1°C above maximum monthly mean for 1 week

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

http://coralreefwatch.noaa.gov/caribbean2005

US Coral Reef Task Force Resolution (11/7/05)

U.S. Coral Reef Task Force

At this time, scientists and managers throughout the wider Caribbean region have observed massive, regional-scale bleaching of coral reefs. This is related to extreme ocean temperatures around eastern Caribbean coral reefs, shown by satellite data to be at record levels of thermal stress (10-15 degree heating weeks over much of the region). As seen in previous massive bleaching events, such as the Indo-Pacific bleaching of 1997-98, such high temperature stress is known to promote the bleaching, and often death, of reef corals.

Members of the US Coral Reef Task Force meeting in Palau on 5-7 November 2005 expressed great concern over the magnitude of the bleaching event now taking place in the Caribbean. We call for immediate action to

1. Establish an ad hoc interagency group to coordinate national and CRTF partner efforts on this event (DOI, NOAA volunteer to lead group);
2. Assist with mobilization of monitoring efforts to assess the scale and impact of the bleaching event including:
    a. Document the extent of bleaching, mortality, and recovery, ecological and socioeconomic impacts as part of national and CRTF member monitoring efforts
    b. Target coral reefs for protection, especially those in resilient areas (those that demonstrate high survival and/or recovery), including through adding to existing networks of marine protected areas, and ensuring enforcement in these areas;
2. Play a leadership role in developing a comprehensive response in the wider Caribbean region;
3. Improve US capabilities to forecast thermal stress and its ecosystem impacts in order to enhance management and conservation of coral reef ecosystems;
4. Take steps to better understand and address the underlying causes of massive bleaching events; and
5. By December1, 2005, each member identify to the Steering Committee technical, financial, or additional resources they can provide to assist in the phase I documentation and assessment of this event.
6. Ad hoc group to report back to the CRTF at 2006 CRTF meetings on actions, lessons learned.

US Coral Reef Task Force Resolution (11/7/05)

1. Establish an ad hoc interagency group to coordinate a comprehensive response in the wider Caribbean
2. Assist with monitoring
   a. extent of bleaching, mortality, and recovery
   b. Target resilient coral reefs for protection,
3. Improve US capabilities to forecast thermal stress and its impacts
4. Better understand and address the underlying causes

Benefits of the Federal Response

U.S. Coral Reef Task Force

NOAA:

- Best documented bleaching event
- Understand relationship between ocean warming and ecosystem impacts to improve operational satellite products

DOI:

- Detailed understanding of ecological processes of bleaching and subsequent disease
- New insights into importance of genetics in adaptation to bleaching stress

NASA:

- Improve application and validation of satellite sensor systems
- Improve understanding of physical-biological relationships

Interagency:

- Improve ability to forecast future bleaching events and their consequences to the benefit of management

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NOAA Response

CRTF U.S. Coral Reef Task Force

- Special NOAA Bleaching Observations
  - NOAA Sanctuaries, Florida, USVI, Puerto Rico
  - Funding USVI, Puerto Rico Observations
  - Funding of International Observations by NGOs
    - ReefCheck
    - Atlantic-Gulf Rapid Reef Assessment
- Caribbean Coordination and Training Workshop
- Collate Regional Bleaching Data and Analysis of Potential Climate Cause

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

NOAA coral reef conservation program

http://www.coralreef.noaa.gov

NOAA Training and Bleaching Workshop

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- **Satellite tools training workshop:**
  - Promote awareness
  - Build capacity
  - Incorporate satellite tools into management protocols
- **Bleaching response workshop:**
  - Report on monitoring efforts
  - Initiate plans for local bleaching response strategies

St. Croix, USVI, January 23-25 2006
Funded by NOAA
Hosted by The Nature Conservancy

NOAA coral reef CONSERVATION PROGRAM

http://www.coralreef.noaa.gov

Regional Impact and Cause of the 2005 Caribbean Coral Bleaching Event

Dr. C. Mark Eakin

National Oceanic and Atmospheric Administration

Jessica Morgan

National Oceanic and Atmospheric Administration

The Caribbean Bleaching Collaboration

Alcolado, Pedro; Alvarez-Filip, Lorenzo; Amat, Alexandra; Ancieta, Daniel; Baldwin, K.; Banks, Kenneth; Bartels, Erich; Bastidas, Carolina; Booker, Catherine; Bouchon, Claude; Bouchon-Navaro, Yolande; Bourque, Amanda; Brandt, Marilyn; Brathwaite, A.; Bruckner, Andy; Bryan, David R.; Buch, Kevin; Bunkley-Williams, Lucy; Carilli, Jessica; Carr, Liam; Causey, Billy; Chiappone, Mark; Collier, Chantal; Crabbe, MJC; Day, Owen; de la Guardia, Elena; Diaz-Pulido, Guillermo; DiResta, Dan; Emtiaz, Tony; Fahy, Dan; Finney, C.; Florez-Leiva, Lennin; Forrester, Graham; Garzón-Ferreira, Jaime; Gil-Agudelo, Diego L.; Gilliam, David; Gintert, Brooke; Gledhill, Dwight; Gonzalez-Ontivero, Oyaima; Goodridge, R.; Gore, Shannon; Gracie, Kelly; Guevara, Carlos A.; Guzman, Hector; Hendee, Jim; Herlan, James; Hernandez-Delgado, Edwin A.; Heron, Scott; Hill, Ron; Hinds, Fabian; Husain, Ellen; Jarecki, Lianna; Jeffrey, Chris; Johnson, Meaghan; Juman, Rahanna; Kenny, Ivana; Keyes, Melissa; Kojis, Barbara; Lirman, Diego; Liu, Gang; Mallela, Jennie; Manfrino, Carrie; Maréchal, Jean-Philippe; Marquez, Sheila; Miller, Jeff; Millet-Encalada, Marines; Monty, Jamie; Mueller, Erich; Muller, Erinn; Murdoch, Thad; Murray, Jason; Nava-Martinez, Gabriela; Navas-Camacho, Raúl; Nieves, Pedro; O'Farrell, Shay; Orozco, Carlos; Oxenford, Hazel A.; Portillo, Pedro; Quinn, Norman; Quirolo, DeeVon; Rangel-Campo, Alejandro; Reyes-Bonilla, Hector; Reyes-Nivia, Catalina; Ritchie, Kim; Roach, R.; Rodriguez, Sebastian; Rodriguez-Martinez, Rosa; Rodríguez-Ramírez, Alberto; Rogers, Caroline S; Rollino, John; Romano, Sandra; Rutten, Leanne; Samhouri, Jameal F.; Santodomingo, Nadiezhda; Schmahl, George; Skirving, William; Smith, Tyler B.; Soto, Alejandra; Spitzak, Tony; Steele, Mark A.; Steiner, Sascha; Stephens, Nicole; Strong, Alan; Taylor, Marcia; Thanner, Sarah; Tichenor, Ed; Venera-Pontón, Dagoberto E.; Waara, Rob; Walsh, Sheila; Ware, John; Weaver, Doug; Weil, Ernesto; Williams, Dana; Williams, E.H.; Woody, Kimberly

Photo by Ernesto Weil, Puerto Rico

2005 Caribbean Bleaching Survey

U.S. Coral Reef Task Force

What was requested:

- Site-wide average bleaching
- Timing of bleaching
- Temperature data
- Disease data
- Early mortality data

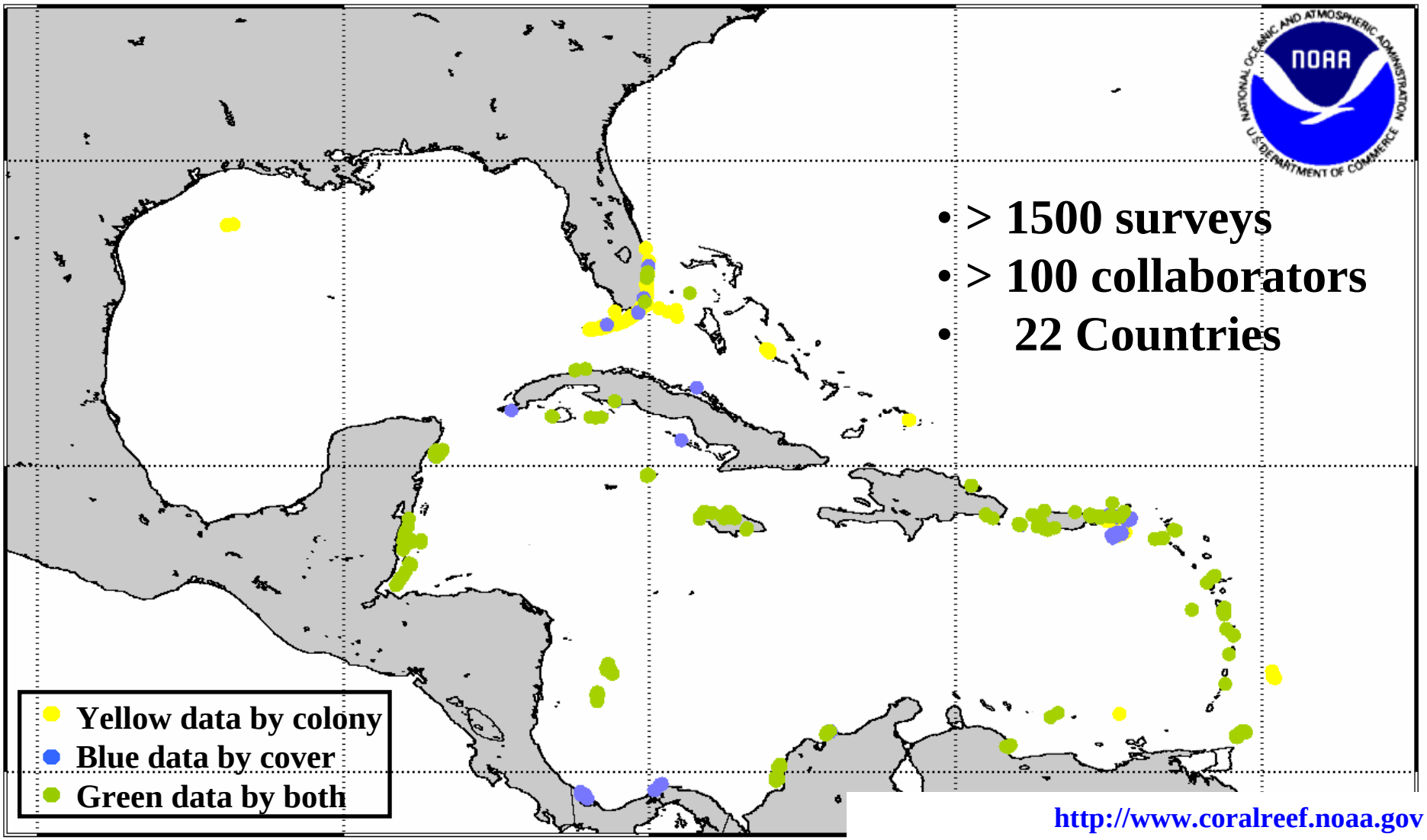
What was not requested:

- Species-level bleaching responses
- Specific disease impacts

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

http://coralreefwatch.noaa.gov/caribbean2005

Contributed Bleaching Reports



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Bleaching & Thermal Stress

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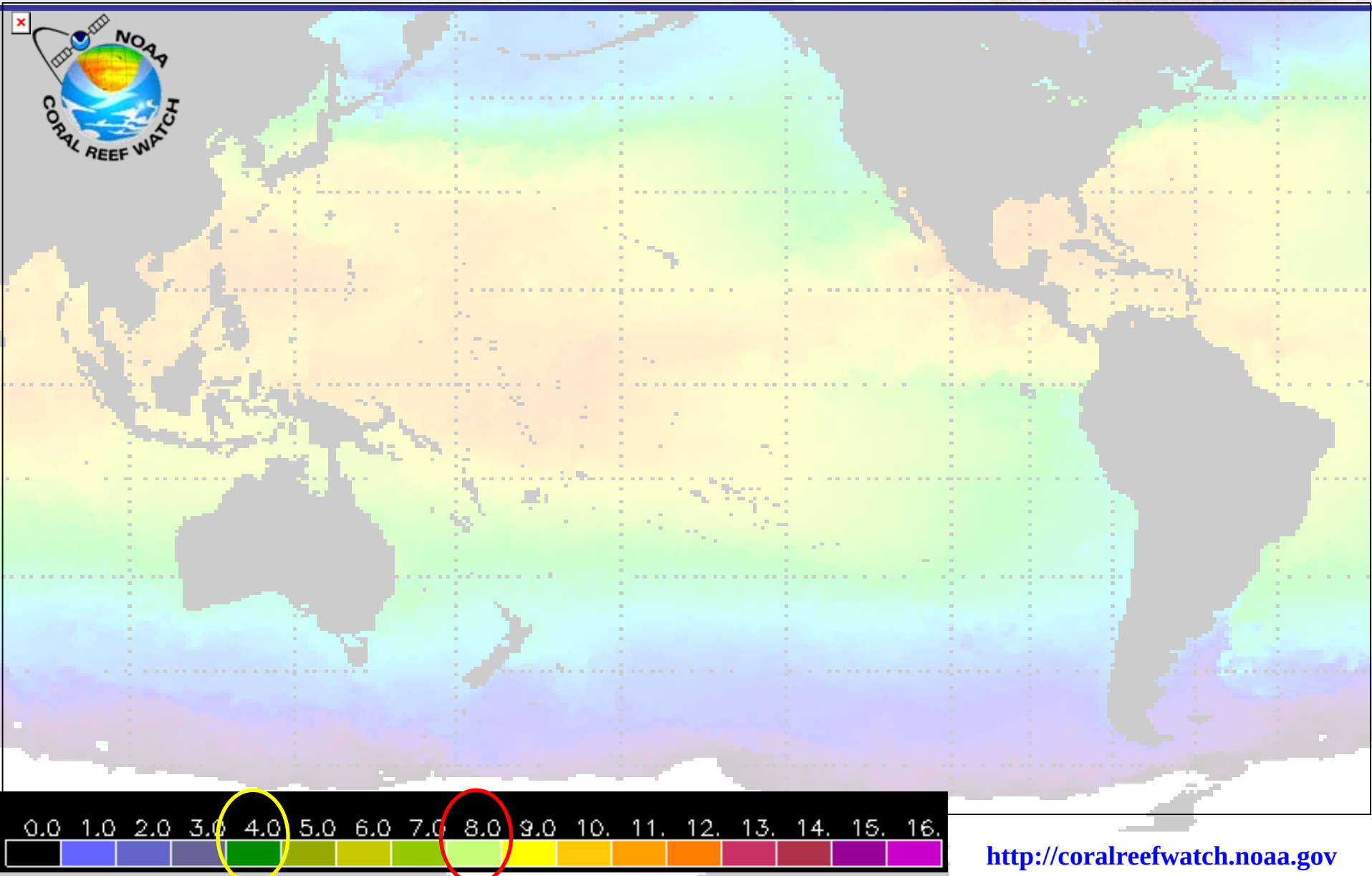

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Percent of Coral Cover Bleached

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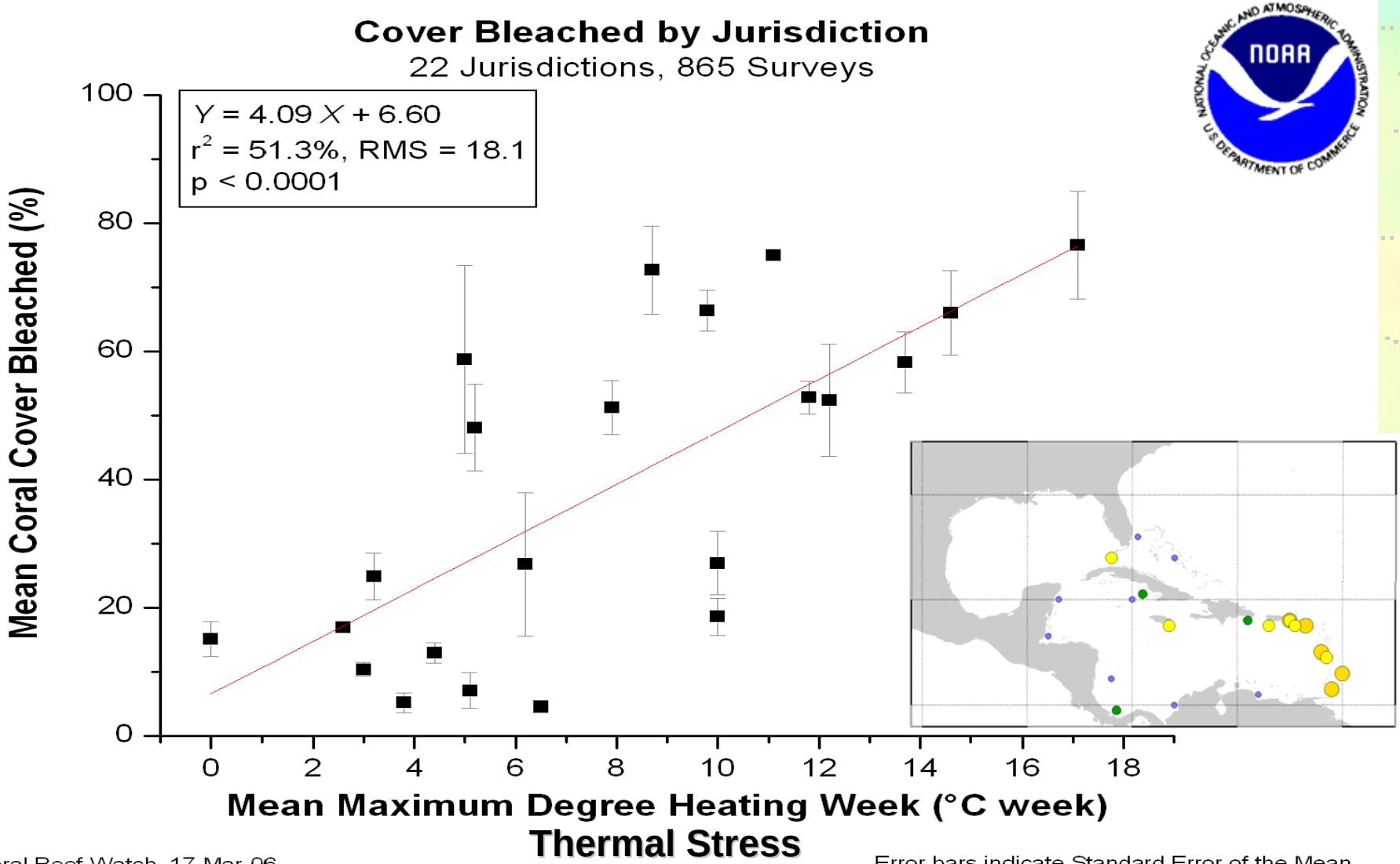

NOAA Coral Reef Watch, 17-Mar-06

Error bars indicate Standard Error of the Mean.

Bleaching Can Lead to Disease

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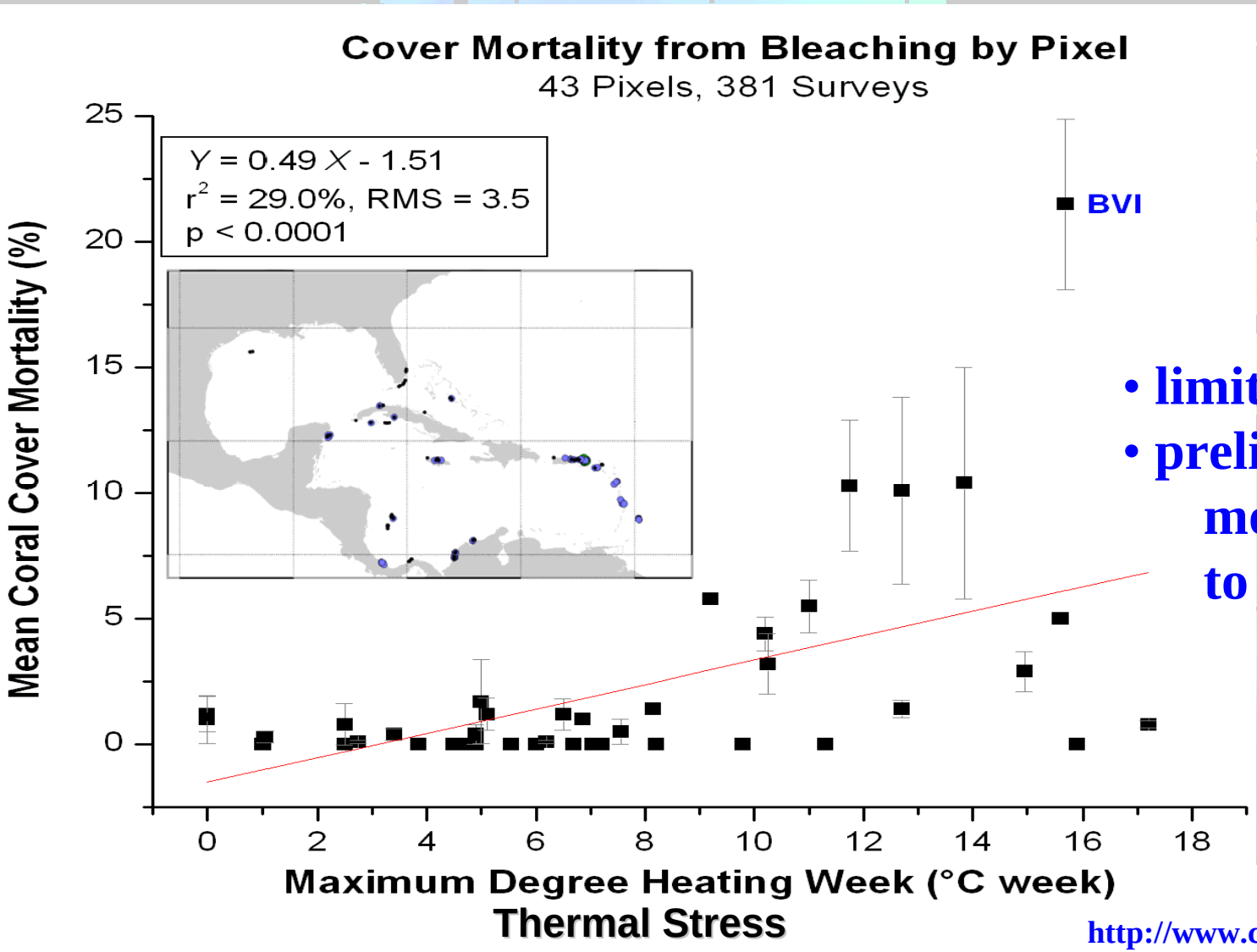
- **Many bleached colonies have become diseased**

- **Some diseases are rapid and devastating**

Inshore patch reefs
Middle Florida Keys

Marilyn E. Brandt
University of Miami

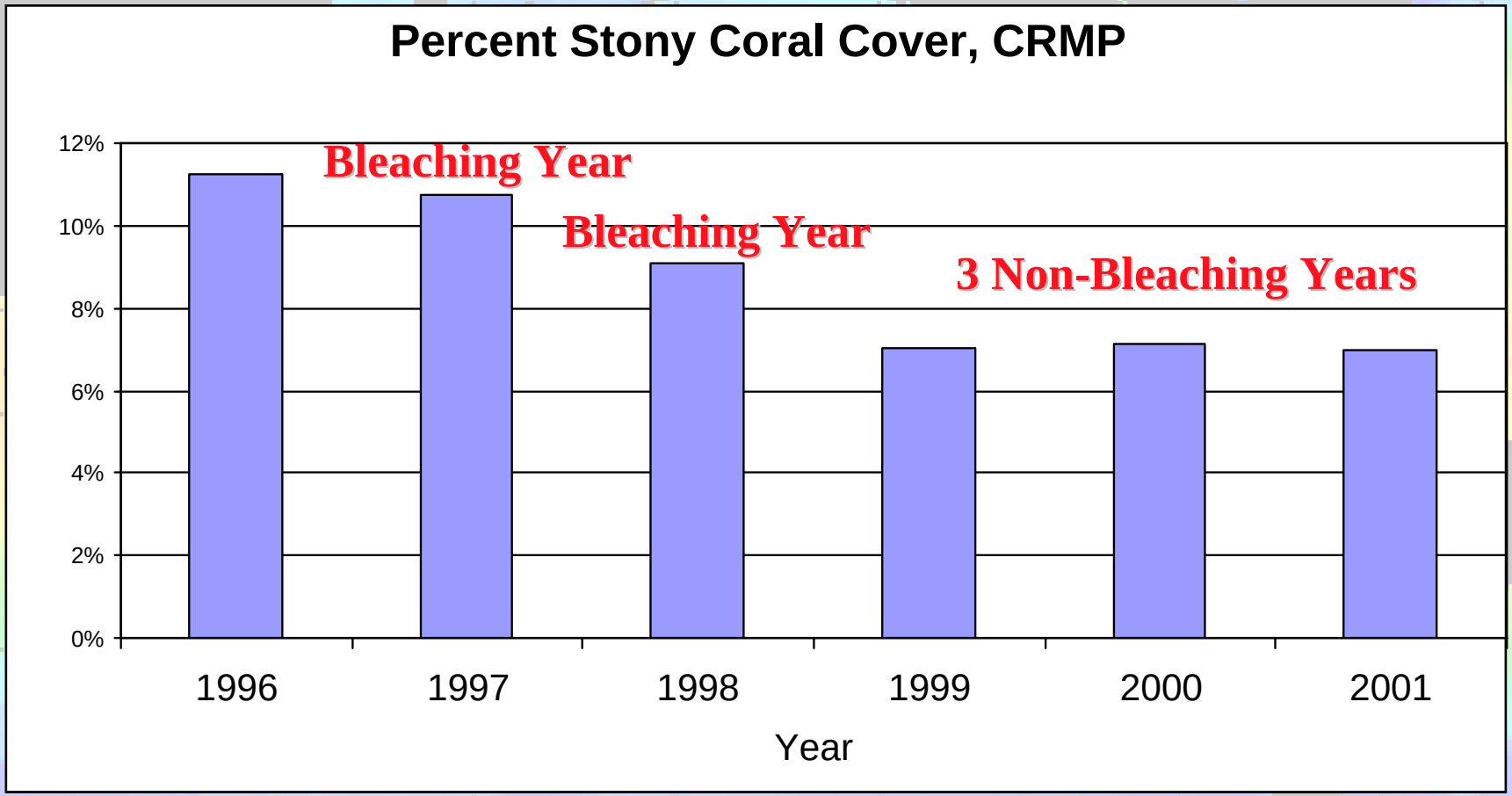
Percent of Coral Cover Dead



- limited data
- preliminary - most surveys yet to take place

http://www.coralreefwatch.noaa.gov

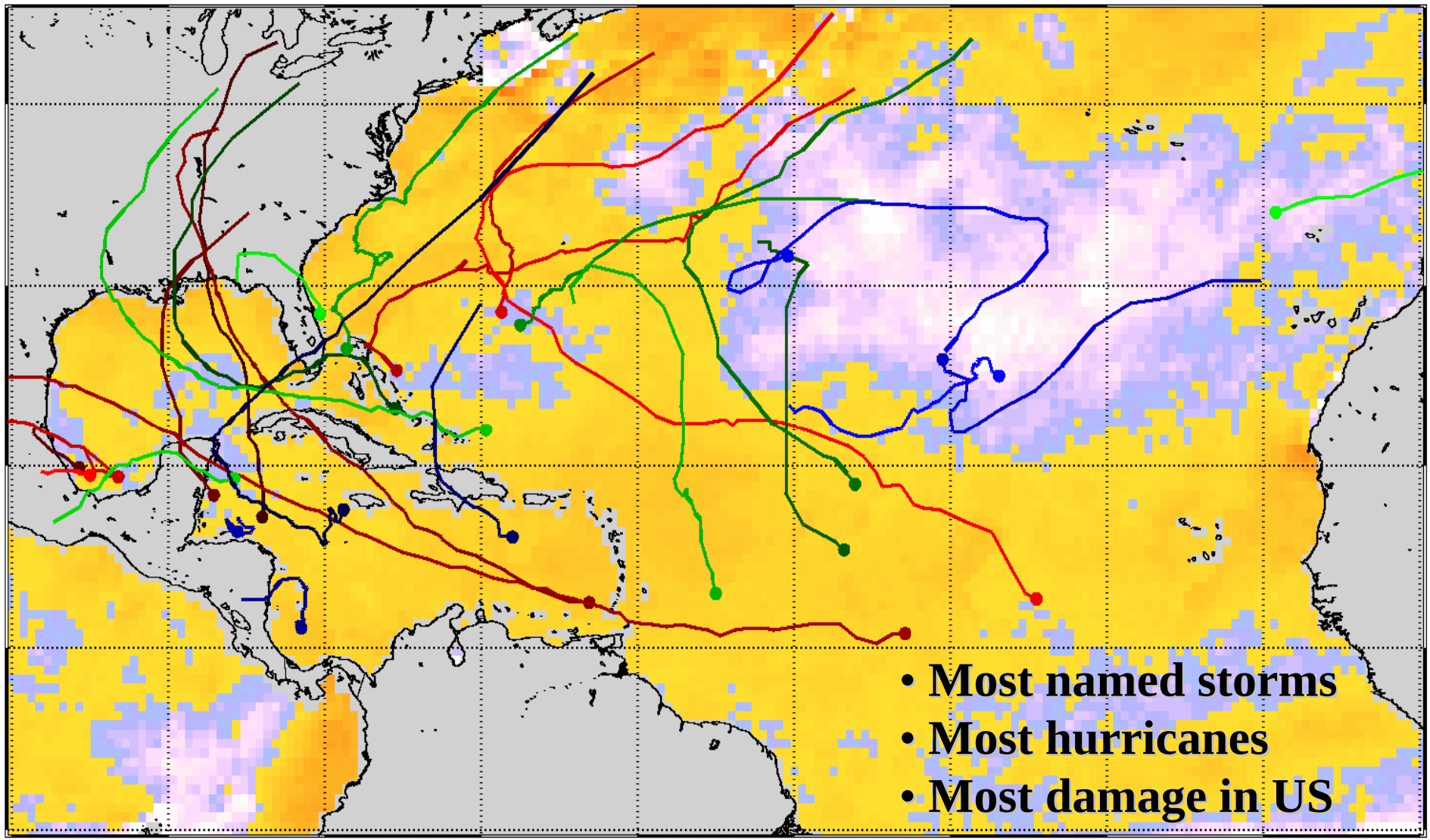
Bleaching and Florida Keys Coral Cover



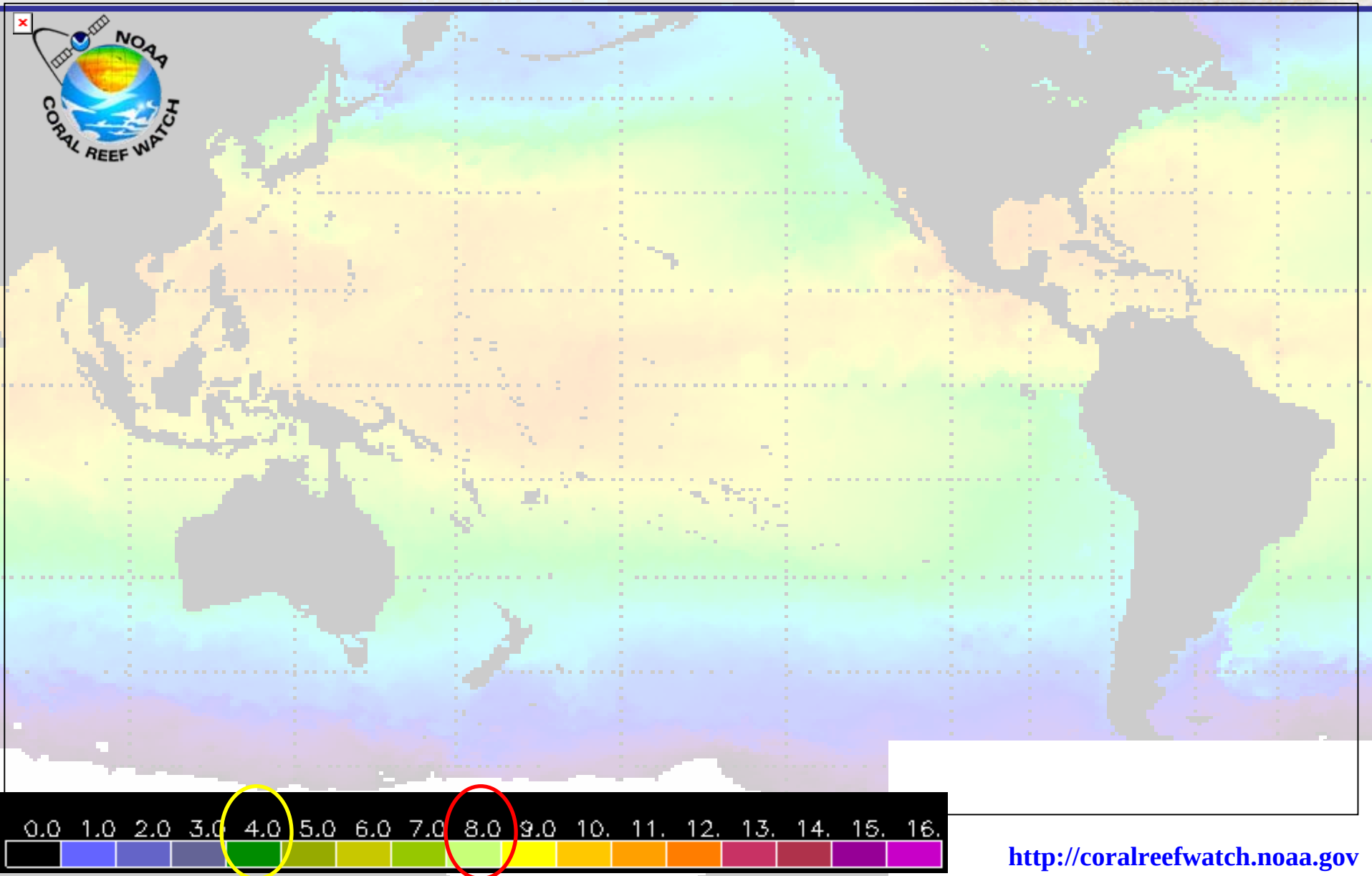
Coral cover declined between 1996 and 1999 and leveled off from 1999 - 2005.

http://coralreefwatch.noaa.gov/caribbean2005

2005 Hurricane Season



2005 Maximum Thermal Stress



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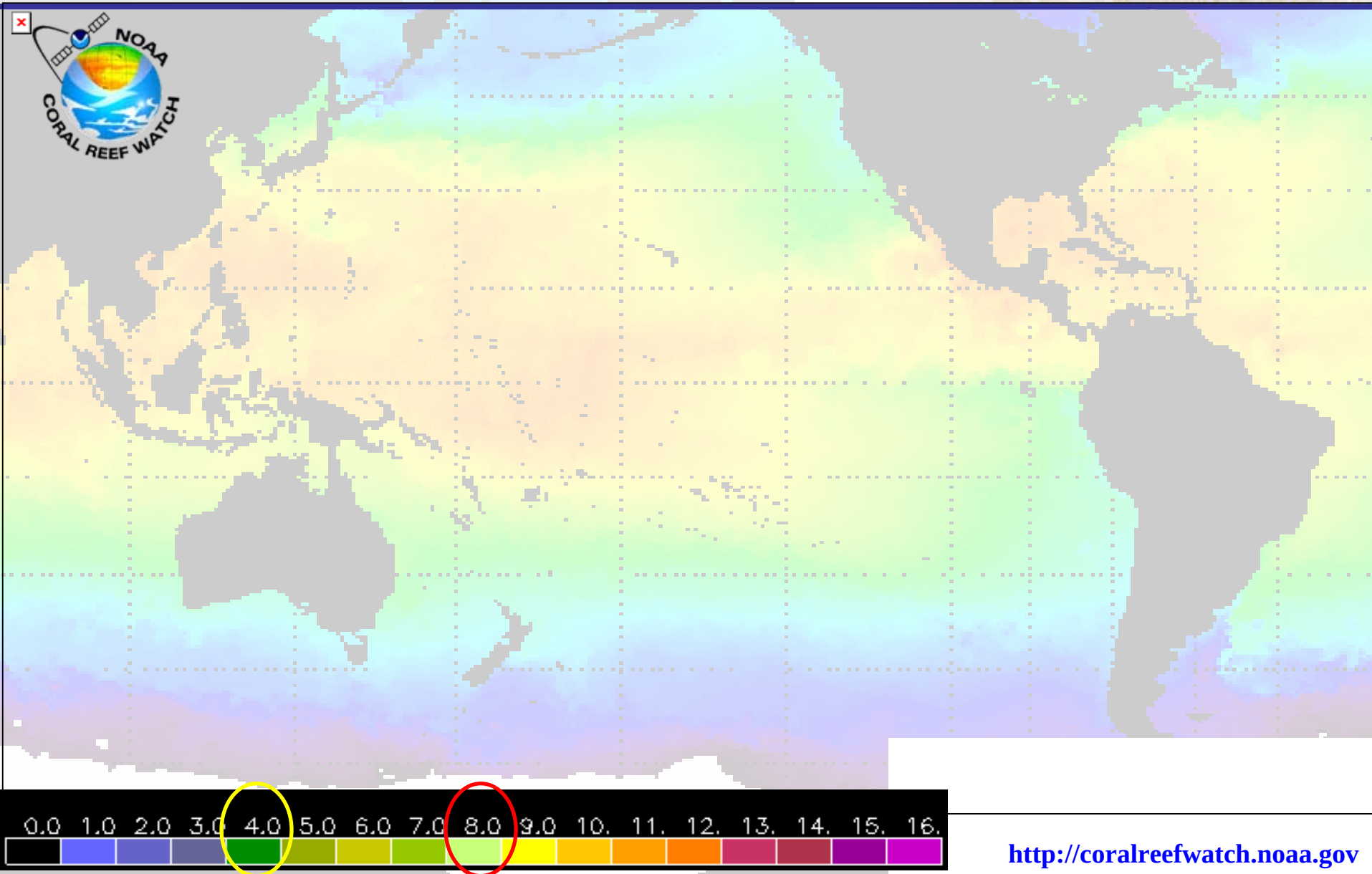
1985-2004 Maximum Thermal Stress



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Warmest Caribbean in Over 100 Years

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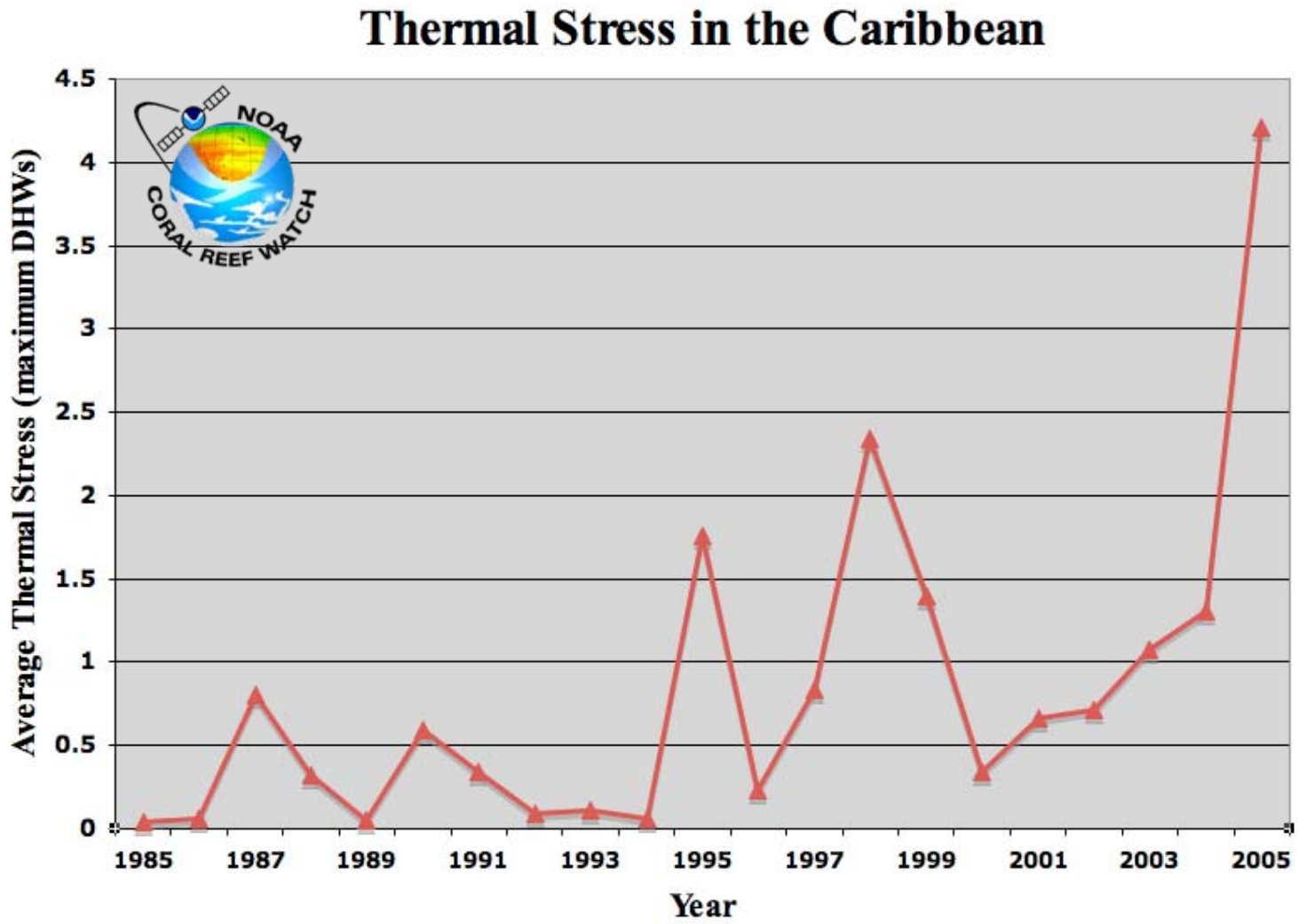

Maximum accumulated coral stress for each year, averaged across all Caribbean 50 km^2 satellite SST pixels

http://coralreefwatch.noaa.gov/caribbean2005

Warmest Caribbean in Over 100 Years

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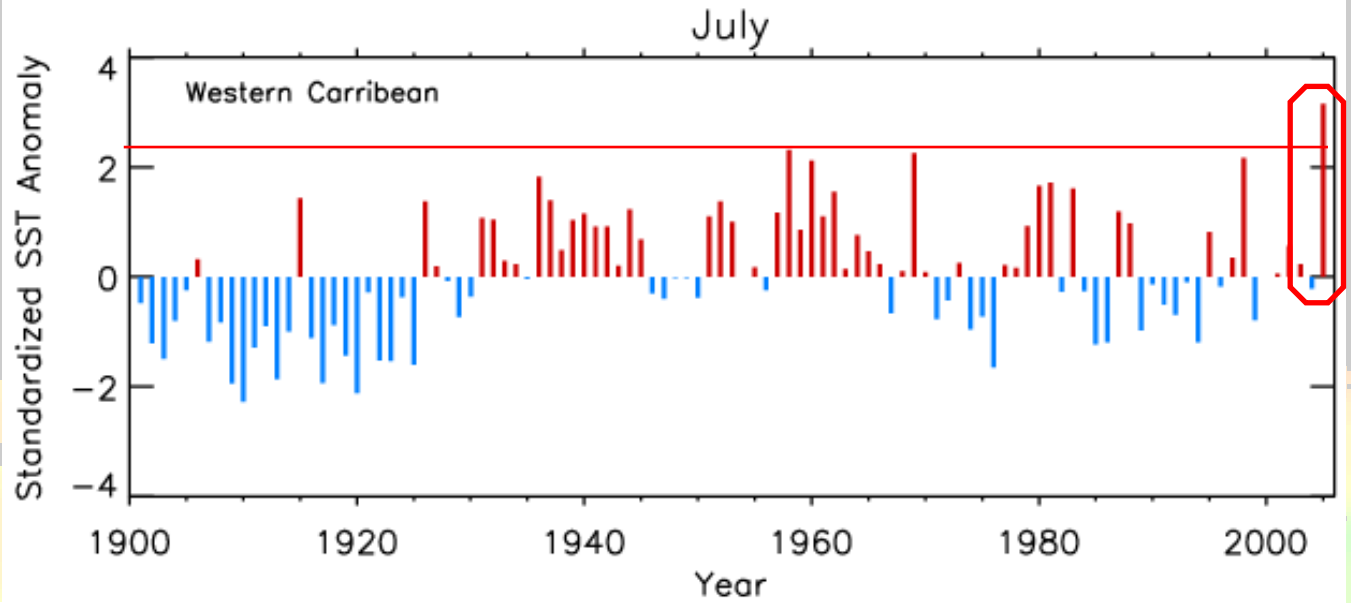
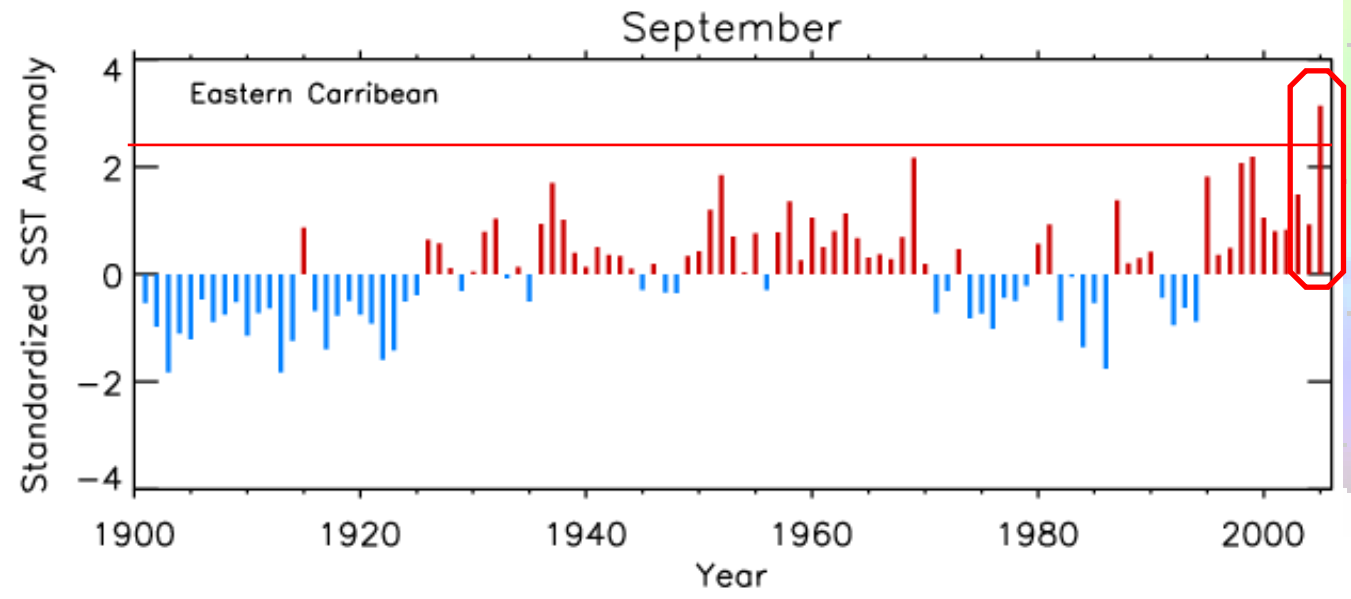


Warmest July in western Caribbean



Warmest September in eastern Caribbean

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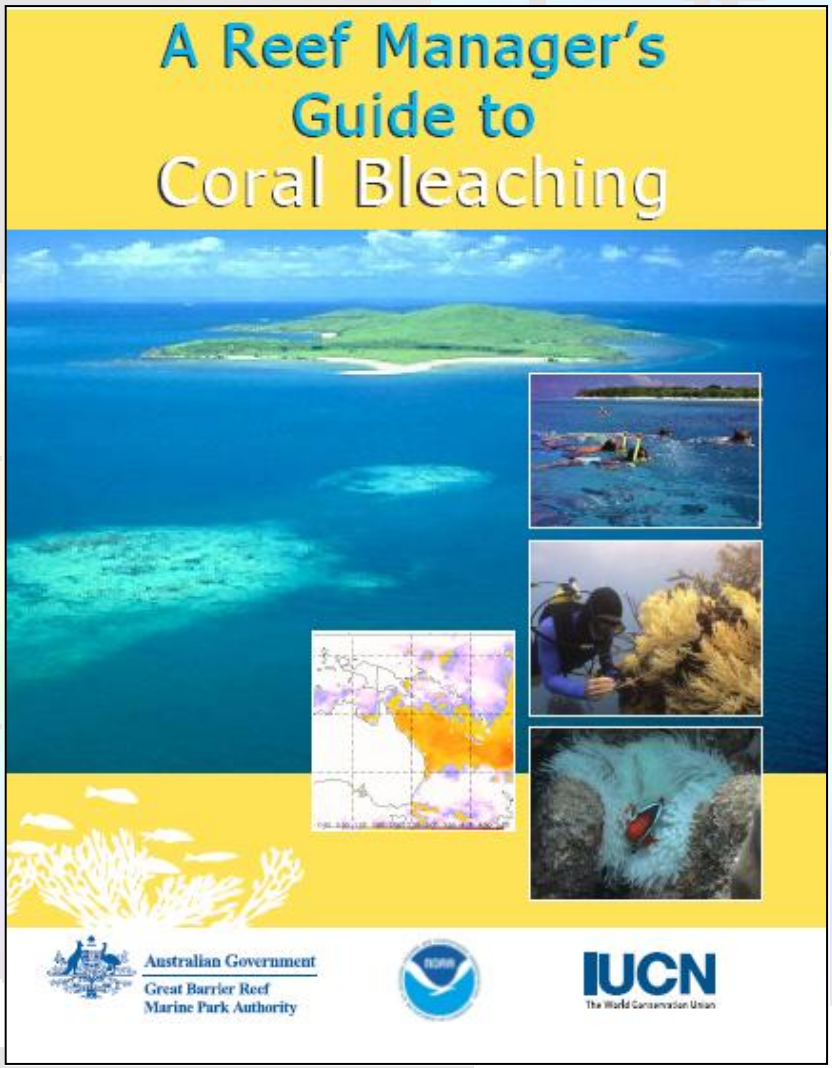
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

http://coralreefwatch.noaa.gov

Next Steps:

- Publication of results
- Further data collection to assess mortality, survival, and recovery
- Use these data to improve NOAA bleaching alerts
- Starting work on a bleaching forecast product
- PR and USVI developing plans to prepare for next bleaching (by July 2006)

Coping with Coral Bleaching



Result of international workshop, research, and planning

- **Short-term response:**
  - **Monitoring for bleaching patterns**
  - **Reducing local stressors**
- **Longer-term planning:**
  - **Use info on natural resilience for planning**
- **Communications:**
  - **Use bleaching to communicate conservation needs**