

## Integrated Mapping, Monitoring, and Assessment throughout the Nation's Coral Reef Ecosystems

In Cooperation with NOAA's Coral Reef Conservation Program

### Background

Worldwide, long-term monitoring efforts have identified a complex array of factors, from coastal development and pollution to fishing activities, that have substantial negative impacts on coral reef ecosystem health. The resulting decline in the ability of these ecosystems to provide services, such as sustenance and coastal protection as well as economic benefits, has become a serious concern for US jurisdictions. In response, NOAA's Coral Reef Conservation Program (CRCP) has targeted key thematic areas to help ameliorate these impacts and preserve these ecosystems. Working in partnership with CRCP, NOAA's Center for Coastal Monitoring and Assessment (CCMA) is providing scientific and technological expertise to conduct integrated mapping, monitoring and assessment activities addressing four major thematic areas:

### Coral Reef Conservation Management Needs

CCMA has successfully implemented a tiered approach that emphasizes developing strong collaborative partnerships, identifying local conservation and research priorities, and implementing targeted place-based management activities to assist jurisdictional efforts in reversing the degradation of US coral reef ecosystems. Integrated CCMA activities include: 1) targeted seafloor mapping in high priority conservation areas; 2) mapping and monitoring the condition of benthic and fishery resources at territorial, regional, and national scales; 3) evaluating the efficacy of marine protected areas; 4) characterizing the effects of coral bleaching events on coral ecosystems; 5) supporting research on human dimensions; and 6) characterizing chemical contaminants and their effects. CCMA's strong collaborative partnerships with jurisdictions have resulted in the development of strategic local long-term monitoring programs and resource assessment tools, such as geographic information system (GIS) maps.



#### Example Products:

- State of Coral Reef Ecosystems Report  
<http://ccma.nos.noaa.gov/stateofthereefs>
- Tortugas Integrated Biogeographic Assessment  
<http://ccma.nos.noaa.gov/ecosystems/coralreef/tortugas.html>
- Main Hawaiian Island Marine Protected Area Assessments  
[http://ccma.nos.noaa.gov/ecosystems/coralreef/hi\\_rfh.html](http://ccma.nos.noaa.gov/ecosystems/coralreef/hi_rfh.html)
- National Coral Reef Ecosystem Monitoring Program  
[http://ccma.nos.noaa.gov/ecosystems/coralreef/coral\\_grant.html](http://ccma.nos.noaa.gov/ecosystems/coralreef/coral_grant.html)

### Land-Based Pollution and Water Quality

Land-based sources of pollution affecting coral reef resources have been identified as a focus area for priority action in the Local Action Strategies of many US jurisdictions. To address this issue, CCMA partnered with local and federal government agencies and academic institutions to develop an assessment framework to link the presence and distribution of land based pollutants with the condition of coral reef ecosystems. The framework integrates: 1) chemical contamination in sediments and coral tissues; 2) systemwide nutrient flux; and 3) coral cover to assess the impacts of land-based pollution on coral reef ecosystems. In addition, CCMA has partnered with the US Department of Agriculture (USDA) to quantify effects of agrochemicals (nutrients and pesticides) on the Jobos Bay National Estuarine Research Reserve System (NERRS) community structure. The assessment of chemical contaminants and their effects in coral reefs is an extension of CCMA's National Status and Trends (NS&T) Program, which has monitored contaminants in the Nation's coastal waters (including Puerto Rico, southern Florida and Hawaii) for over 20 years.



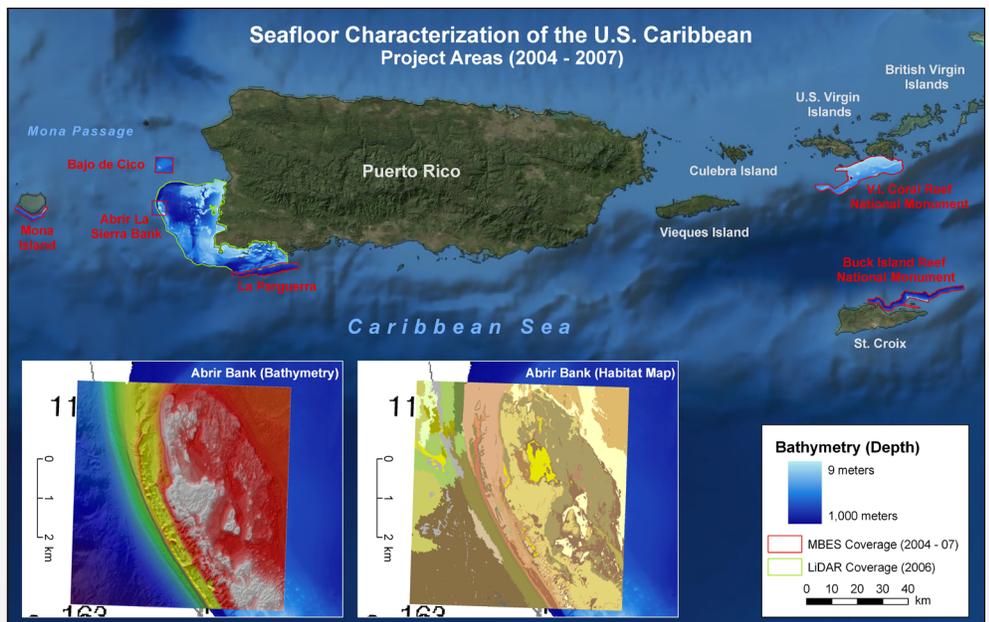
#### Example Products:

- Mussel Watch Database  
[http://www8.nos.noaa.gov/cit/nsandt/download/mw\\_monitoring.aspx](http://www8.nos.noaa.gov/cit/nsandt/download/mw_monitoring.aspx)
- "An Assessment of Chemical Contaminants in the Marine Sediments of Southwest Puerto Rico"  
<http://ccma.nos.noaa.gov/publications/southwestpuertorico.pdf>
- Summit to Sea Assessment to Characterize Land-Based Sources of Pollution  
[http://ccma.nos.noaa.gov/ecosystems/coralreef/summit\\_sea.html](http://ccma.nos.noaa.gov/ecosystems/coralreef/summit_sea.html)



## Fishing Impacts

CRCP has identified the need to understand and address the threat of fishing pressures on the condition of US coral reef ecosystems. In response, CCMA has partnered with academic institutions and government agencies to develop novel approaches for designating and evaluating the effectiveness of fishery closures such as Marine Protected Areas (MPAs). CCMA has mapped benthic habitats and monitored biological resources in regions with declining fisheries; conducted initial characterizations of fishery closure areas such as Bajo de Cico, Tourmaline Bank and Abrir la Sierra; and helped implement a fishery closure at Grammanik Bank in the US Virgin Islands. The Center has also led the development of reef fish sampling designs and monitoring protocols, which are being used to evaluate MPA efficacy, delineate MPA boundaries, and assess reef fish assemblages in the US Caribbean, Gulf of Mexico and Hawaii. CCMA scientists are also tracking fish movements using acoustic technologies to determine habitat preferences, ontogenetic movements, residence times and movements across MPA boundaries.



### Example Products:

- Seafloor Characterization in the US Caribbean  
[http://ccma.nos.noaa.gov/products/biogeography/usvi\\_nps/overview.html](http://ccma.nos.noaa.gov/products/biogeography/usvi_nps/overview.html)
- Reef Fish Monitoring Guide  
[http://ccma.nos.noaa.gov/ecosystems/coralreef/fish\\_protocol.html](http://ccma.nos.noaa.gov/ecosystems/coralreef/fish_protocol.html)
- Comparison of Reef Fish Habitat Utilization Patterns Within and Outside Hawaii Marine Protected Areas  
[http://ccma.nos.noaa.gov/ecosystems/coralreef/hi\\_rfh.html](http://ccma.nos.noaa.gov/ecosystems/coralreef/hi_rfh.html)

## Education and Outreach

Education and outreach activities are integral components of CCMA's program to map, monitor, and assess coral reef ecosystems and are tailored to meet specific needs identified by individual jurisdictions. CCMA's education and outreach efforts include: 1) developing strong partnerships with state, territorial, federal, non-governmental organization and academic constituents; 2) identifying and developing products, computer-based tools, and materials that are customized to the needs and capabilities of jurisdictional partners; 3) actively engaging and educating the public and media in addition to the management and scientific communities about important coral conservation, management and scientific findings; and 4) developing innovative web-based products that educate and provide access to monitoring data collected by CCMA.



### Example Products and Activities:

- Reef Fish Database  
[http://www8.nos.noaa.gov/biogeo\\_public/query\\_main.aspx](http://www8.nos.noaa.gov/biogeo_public/query_main.aspx)
- Benthic Habitat Viewer Database  
<http://www8.nos.noaa.gov/bhv/bhvMapBrowser.aspx>
- Workshop: St. Croix, USVI 2006-Transfer of Methodology for Monitoring Purposes
- Workshops: 6 jurisdictions 2000-2007 Methods for conducting and applying shallow-water habitat mapping
- Video: NOAA and NPS-Partners for Protection and Resource Management
- Habitat Digitizer  
<http://ccma.nos.noaa.gov/products/biogeography/digitizer/welcome.html>



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