Research Supporting Coastal & Ocean Management: Puerto Rico & U.S. Virgin Islands 2005-2006

POLLUTION

NCCOS Transfers Watershed Analysis, Data Display and Map Creation Tools to Managers
NCCOS led a workshop of fifty attendees on watershed analysis, data display and map creation in ArcView GIS at the 9th Virgin Islands NonPoint Source Pollution Conference, "Preventing Pollution in the Caribbean, Reshaping our Communities for the Future." The NCCOS workshop used data from the Summit-to-Sea project to publicize the availability of this data, to demonstrate how such data may be used and displayed in GIS projects, and to provide examples how this type of data may be used in watershed analyses of pollution sources. NCCOS and WRI recently released this data in a CD titled "Coastal Data CD for US Caribbean – analysis of land-based sources of threat to coral reef ecosystems." The goal of the conference was to drive change in common practices to improve water quality throughout the islands by increasing awareness, knowledge and skills of regional resource managers and scientists in addressing nonpoint source pollution in the territory and the wider Caribbean. Workshop attendees, which included regional resource managers and scientists, will use the data and training to advance their own work in watershed planning and pollution prevention. For additional information contact Aurelie.Shapiro@noaa.gov.

Incorporation of Water Quality Data into U.S. Caribbean Coral Reef Monitoring Database Improves Managers' Access to Information for Managing Pollution and Run-Off
NCCOS has been characterizing and assessing fish and benthic communities throughout the U.S. Caribbean as part of the Caribbean Coral Reef Ecosystem Monitoring project since 2000. *The Status of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005* identified coastal development run-off and pollution as severe to moderate level threats in both the U.S. Virgin Islands and Puerto Rico. The newly incorporated water quality data will help coastal and ocean managers as they work to address these issues. The water quality measurements were added to the standard monitoring protocols for this project in 2003. At each site, surface and at-depth measurements are collected for the following parameters: temperature (°C), conductivity, turbidity, and chlorophyll *a*. These data are now publicly accessible along with fish and benthic habitat data at: http://www8.nos.noaa.gov/biogeo_public/query_main.aspx and on NOAA's CoRIS website, at http://www.coris.noaa.gov/. For more information contact Sarah.Davidson@noaa.gov.

NCCOS Characterizing Chemical Contamination and Coral Health in Puerto Rico
NCCOS is conducting a pilot project in southwestern Puerto Rico to characterize chemical contamination in the reefs, assess linkages that may exist between anthropogenic stressors and coral health, and develop a multidiscipline assessment framework that can be applied to other coral reef ecosystems. The project design and preliminary results were presented at the Non Point Source Pollution Conference, increasing awareness, knowledge levels and skills of the participants to address nonpoint source pollution. Prospective partners for additional work in the region were identified. For more information contact Tony.Pait@noaa.gov.

Summit-to-Sea Project Results Assist Coral Reef Management
Results of NCCOS' Summit-to-Sea Project - a study of the linkages among terrestrial watershed characteristics, erosion, sediment delivery to coral reefs, and changes in the marine environment - were published in *International Journal of Tropical Biology and Conservation*. The article describes the initial processing of project data, methods to map terrestrial and marine components of island ecosystems with satellite imagery, and statistical techniques to identify local changes in coral reef ecosystems. Data from the project - including digital elevation models, satellite-derived bathymetry, watershed delineation and erosion factors, annual and monthly precipitation data, and soil and geologic data for Puerto Rico and the USVI – is being distributed on a CD to coastal managers. For more information, contact Aurélie.Shapiro@noaa.gov.

EXTREME EVENTS

NCCOS Enables Tsunami Impact Modeling of Puerto Rico and the U.S. Virgin Islands by Providing Benthic Habitat and Bathymetry Data

NCCOS provided a suite of bathymetry data for the U.S. Caribbean and Pacific territories to support efforts to build a comprehensive tsunami impact model. The multispectral IKONOS imagery with inferred bathymetry was originally used for benthic habitat mapping. NCCOS also provided 60nm^2 of high resolution multibeam bathymetry, collected in 2004 and 2005 and a historical bathymetry model derived from GEOphysical DAta System (GEODAS) archival soundings. Once completed, the tsunami impact model will be used to plan for coastal land use and future disaster recovery efforts. For more information, contact Ada.Otter@noaa.gov.

Hurricane Damaged Seagrass in Puerto Rico Recovers Faster Than Expected

Seagrass beds damaged by small boats, dislodged and grounded near the Naval Station at Roosevelt Roads, Puerto Rico, by Hurricane Georges in September, 1998, recovered faster than expected. Upon grounding, the boats created unvegetated areas that, over months and years, migrated across the seagrass flats. The process strongly resembled naturally-occurring current driven movement of unvegetated areas in seagrass flats where erosion of sediment and seagrass occurs at the leading edge and backfill and regrowth occurs at the trailing edge of the moving void. Prediction accuracy for post-injury recovery rates could substantially improve if further study documents this mechanism. NCCOS and NOAA Damage Assessment Center scientists sampled damaged sites and determined habitat recovery rates for calibration of a seagrass injury and disturbance recovery model. For more information contact Jud.Kenworthy@noaa.gov.

NCCOS Monitoring Documents Massive Bleaching Event in the U.S. Virgin Islands

Widespread bleaching or the loss of symbiotic algae occurred in 21 coral species or 53% of corals at 91 randomly selected sites with depths from 9-91 feet in the Buck Island National Reef Monument (BIRNM), St. Croix, U.S. Virgin Islands during October 16-27, 2005. Researchers from NCCOS and the South Florida-Caribbean Network of National Parks found that some species were more than 90% bleached (e.g., *D. labrynthiformis, Agaricia* spp., *Mycetophyllia* spp., and *M. annularis*), whereas other corals had no bleaching (e.g., *A. cervicornis*; *D. cylindricus*, *Eusmilia* spp., and *Scolymia* spp.). Based on satellite data from the National Environmental Satellite Data and Information Service, water temperatures in the northeastern Caribbean were warmer than normal (above 28.5^o) for about 12 weeks and may have contributed to the observed bleaching event. Prolonged bleaching can be lethal to corals and, along with disease and pollution, may have contributed to the loss of about 10% of the world's coral reefs within the past decade. For more information contact Chris.Jeffrey@noaa.gov or visit http://ccma.nos.noaa.gov/ecosystems/coralreef/reef_fish.html.

Ciguatoxin Detected for First Time in Lab Animals, May Lead to Human Exposure Test

For the first time, NCCOS scientists have detected the toxin that causes human ciguatera fish poisoning in mice exposed to the three classes of ciguatoxins found in the Caribbean, Pacific, and Indian Oceans. As human ciguatera fish poisoning has the highest public health impact of all harmful algal bloom poisonings - exceeding cost estimates for all shellfish poisonings combined by more than twenty-fold, application of this method to confirm exposure in humans will help protect human health and local economies. NCCOS and collaborators are designing the method for clinical applications and pursuing an application to human biomonitoring. Results of this novel study were published in the journal *Toxicon*. For more information contact John.Ramsdell@noaa.gov.

MARINE PROTECTED AREAS

Benthic Habitat Acreage Estimates Help NPS Managers Zone for Appropriate Recreational Use in and around Marine Parks in the Virgin Islands

In response to a request from the National Park Service (NPS), NCCOS calculated benthic habitat acreage estimates of the marine sections of Virgin Islands National Park, Coral Reef National Monument, and Buck Island National Monument in the U.S. Virgin Islands. The NPS will include these estimates in their General Management Plans for these three park units. Managers and planners will use the estimates as baselines as they draft plans for activities that occur in and around the parks, especially for proposing updates to recreational use regulations in the marine zones. NCCOS created the near shore benthic habitat maps used to calculate the acreage estimates in 2001, along with maps for the near shore environments of Puerto Rico. The maps may be

accessed on the following website: http://ccma.nos.noaa.gov/about/biogeography/welcome.html . For more information contact Kate.Eschelbach@noaa.gov.

NCCOS Data Used to Evaluate Management Zone Effectiveness of U.S. Virgin Island Marine Park
Data collected NCCOS to characterize and understand the East End Marine Park ecosystem in St. Croix is being used to evaluate the effectiveness of management zones within the marine park. The marine park encompasses 155 km^2 of U.S. Virgin Islands territorial waters and protects resources using four use-zones: open fishing areas, recreational areas, no-take zones, and a turtle wildlife preserve. The NCCOS data, which includes information about the marine park since its inception in 2003 and is the most comprehensive data set for the region, is being used by the Ocean Conservancy to evaluate the current park populations of fish and invertebrate species. The Ocean Conservancy's technical report will be published in March 2006. For more information, contact Chris.Caldow@noaa.gov.

Habitat Studies to Contribute to National Monument Boundary Evaluation
Data collected by NCCOS and the National Park Service (NPS) will be used to evaluate a potential modification to the boundaries of the Virgin Islands Coral Reef National Monument. The NPS is considering incorporation of an area which currently separates two portions of the Monument and would provide protection to an area of healthy coral as well as the associated commercially and ecologically important reef fish species. NCCOS scientists have been evaluating the health of the reef inside and outside the Monument boundaries since 2001. For more information, contact Kimberly.Woody@noaa.gov.

Online Coral Reef Database to Assist Researchers and Managers in Caribbean
The Coral Reef Ecosystem Assessment and Management Database is now available online. The database includes fish and habitat data gathered over the last four years from field studies in La Parguera, Puerto Rico and the U.S. Virgin Islands. Researchers, coastal managers, and interested members of the public can download data sets, or can query the database to provide reports on species biomass, richness, abundance, and diversity. While the data sets can be large, the reports are automatically downloaded faster as zip-files. There is also a data dictionary and metadata for all of the data sets. Online-access to this information enables better research and management by NCCOS' partner agencies in the Caribbean region, including the U.S. National Park Service, University of Puerto Rico, and others. For more information contact Tom.McGrath@noaa.gov, or access the database at http://www8.nos.noaa.gov/bpdm_web/query_main.aspx.

NCCOS Developing Management Tools for Caribbean Coral Reef Ecosystems
Scientists are characterizing and mapping species distribution patterns to develop tools for Caribbean coral reef ecosystem managers. NCCOS and its partners (University of Puerto Rico, National Park Service, and Virgin Islands Department of Planning and Natural Resources) monitored and assessed marine resources at over 200 sites in protected and unprotected tropical nearshore environments of Puerto Rico and St. Croix, USVI, including reef, seagrass, mangrove, and unconsolidated sediment habitats. They also characterized water quality and the size and spatial structure of fish assemblages, recording 138 species in Puerto Rico and 127 in St. Croix. For more information contact Chris.Caldow@noaa.gov.