

PROJECT PLAN

An Assessment of Contamination in Lagoon and Marine Sediments of Vieques Island, Puerto Rico

NOAA | National Centers for Coastal Ocean Science
Center for Coastal Monitoring & Assessment
NATIONAL STATUS & TRENDS PROGRAM

April 23, 2007



NOAA | NOS | National Centers for Coastal Ocean Science
Center for Coastal Monitoring and Assessment (CCMA)
Coastal and Oceanographic Assessment Status & Trends (COAST)

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Plan Period: FY2007-2008

Location: Vieques, Puerto Rico

Topic: Pollution

Ecosystem: Coral Reefs

I. PROJECT OVERVIEW

The island of Vieques lies approximately 11 km southeast of the main island of Puerto Rico. Vieques is 34 kilometers long, 5 km wide and is home to a population of 9,300. Between 1940 and 2003, the U.S. Navy used portions of Vieques for both the storage and firing of munitions for training purposes. The western side of the island served as a storage area for munitions and other materials related to these operations, while the eastern side was used for military training exercises that included naval gunfire and aerial bombardments. With the departure of the Navy, these areas have now been transformed into the Vieques National Wildlife Refuge operated by the U.S. Fish and Wildlife Service. Efforts are currently underway to characterize chemical contamination and habitats as part of the assessment and restoration activities on Vieques. CCMA's Biogeography and COAST Branches have been working in close partnership with NOAA's Office of Response and Restoration (ORR) to develop an integrated characterization of coral, algal, fish and macro-invertebrate community structure, coupled with a comprehensive assessment of contaminant concentrations in nearshore habitats of Vieques.

For the contaminant portion of this integrated ecosystem assessment, sediments and coral tissues will be collected from sites around Vieques. Collection and analysis of samples will be performed using NOAA National Status and Trends (NS&T) Program protocols, a well documented, quality assured and controlled "industry standard" that has been in place since 1984, to document chemical contamination in the Nation's coastal and estuarine waters. For the contaminants component of the ecosystem assessment, sediments and coral tissues will be analyzed for both organic and inorganic contaminants. In addition, sediments will be analyzed for residues of energetic materials that may be present as a result of their use in historical military training exercises.

II. OBJECTIVES

The goal for this portion of the ecosystem assessment in Vieques is to characterize chemical contaminants in sediments and coral tissues in the nearshore waters of Vieques. Objectives include: 1) collect and analyze sediments from sites throughout the nearshore waters – site selection will be performed using a spatially-articulated random-stratified technique to optimize for statistical generalization throughout the sample region; 2) collect and analyze sediments from these same sites for residues of energetics (*i.e.*, explosives); 3) collect and analyze coral (*Porites astreoides*) tissues for residues of organic (*e.g.*, PAHs and PCBs) and inorganic (*e.g.*, trace elements or metals) contaminants, and; 4) using the data generated by NOAA's Biogeography Team, determine and quantify linkages between contaminant concentrations and indices of coral ecosystem condition (*e.g.*, coral community structure).

III. PRODUCT DISTRIBUTION PLAN

Data and interpreted results generated from this project – including a robust biological and chemical characterization – will be integrated into one report and made available in hardcopy and on the web *via* Agency data portals, through peer reviewed publications, along with presentations at professional meetings. In addition the integrated report, including all data collected, will be provided to ORR at the end of this project in hardcopy and CD-ROM.

IV. PARTNERS

- NOAA Office of Response and Restoration
- NOAA CCMA Biogeography Team
- Puerto Rico Department of Environmental and Natural Resources
- U.S. Fish and Wildlife Service

V. PROJECT TASKS

1. Project Planning - Meet with project partners to develop the study design, work out sample collection and analysis schedules, and decide upon products to be generated (April 2007).
2. Contract Management – Develop and monitor modification to the COAST/NS&T contract with TDI-Brooks for the analysis of samples from Vieques (November 2007).
3. Field Work –There will be two components to the contaminant portion of the ecosystem assessment. The first will involve the collection of coral tissues concurrently with the

biogeographic data collection. Coral tissues (*Porites astreoides*) will be collected at approximately 30-40 sites. Corals will be collected by SCUBA using a coral punch and hammer. The second component will involve the collection of sediment samples from 50-70 selected sites in the nearshore waters of Vieques (Figure 1). The collection of both corals and sediments will be completed by the first week of June 2007.

4. Additional Data Collection – A parallel effort to assemble existing data on human population and land use will be performed to enhance the analysis of the in situ data. As available, additional water quality data that may be available from agencies such as the Puerto Rico Environmental Quality Board will be incorporated into the assessment and database (July 2007).
5. Analytical Chemistry – TDI Brooks International, Inc. will be responsible for quantifying contaminant concentrations (*i.e.*, organic, inorganic and energetics) in the sediments and coral tissues. Analytical protocols for trace elements, PAHs (polycyclic aromatic hydrocarbons), PCBs, pesticides, and butyltins (among other chemicals) can be found in Lauenstein, G.G., and A.Y. Cantillo. 1993. Sampling and Analytical Methods of the National Status and Trends Program National Benthic Surveillance and Mussel Watch Projects 1984-1992: Overview and Summary of Methods - Vol I. NOAA Tech. Memo 71. NOAA/CMBAD/ORCA. Silver Spring, MD. 157pp, or downloaded at: <http://www.ccma.nos.noaa.gov/publications/tm71v1.pdf>. Estimated time for the completion of chemical contaminant analysis is October 2007.
6. QA/QC – TDI Brooks, Inc. will perform QA/QC procedures as documented in the contract statement of work during analysis of all samples. Data generated will be reviewed for appropriate QA/QC (*e.g.*, blanks, matrix spikes, appropriate r^2 for standard curves, etc.) by TDI-Brooks and subsequently by NOAA personnel (August – December 2007).
7. Data Analysis and Distribution – Information on the results of the analysis of sediments and coral tissue contaminants will be included in the integrated Biogeography/COAST assessment report. If appropriate, a manuscript will also be produced from the contaminant results and submitted to a refereed journal. Information from this project will also be distributed through the NS&T Program Data Portal: http://www8.nos.noaa.gov/cit/nsandt/download/bi_monitoring.aspx. (August 2007 – July 2008).

VI. METHODS

The sample sites identified in Figure 1 were selected using a stratified random sampling design. Nearshore waters around Vieques were divided into five north and five south strata, and then sample sites randomly located over soft sediments in these strata. Coral samples will be collected concurrently and collocated with the Biogeography Program dive sites. Coral samples will be collected between May 14th and May 23rd. The number of coral

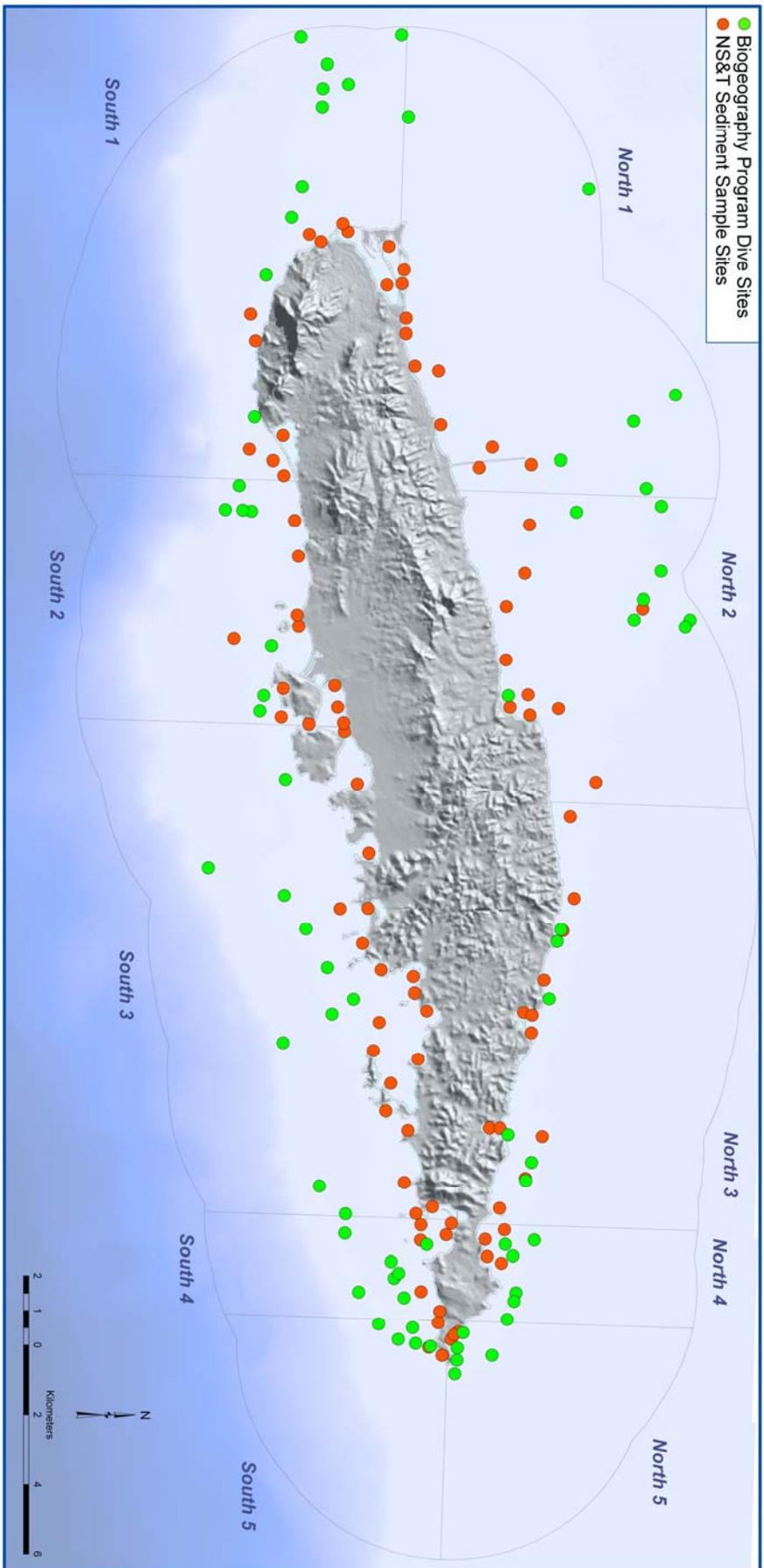


Figure 1. Location of coral (green) and sediment (red) sampling sites.

samples ultimately collected are dependant on the availability of *P. astreoides* (mustard hill coral) at the dive sites. Coral tissue samples will be collected using titanium punches and a hammer. Sediments for contaminant analysis will be collected between May 15th and June 3rd, 2007, using a modified Van Veen grab, or diver as necessary from 50-70 sites. If a particular grab does not result in an appropriate amount of sediment, a second grab will be made and composited with material from the first. A schedule of sampling events is presented in Table 1. Where unexploded ordinance is a concern, as may be the case on the eastern end of Vieques (Figure 2), Navy personnel or a Navy contractor will accompany or be present when NOAA personnel are retrieving sediment samples. In these areas, sediments may be collected using a small plastic sediment scoop.

Because the coral tissues and sediments will be analyzed for chemical contaminants, a series of protocols will be used to avoid contamination of samples by equipment and cross contamination between samples. All equipment will be rinsed with acetone followed by site water just prior to each deployment, to reduce the possibility of contaminating the sediment sample. Personnel handling the samples will also wear disposable gloves. The sediments to be analyzed for contaminants will be placed into three certified clean jars, one for organic chemical analysis, one for metal analysis, and a third for energetics, capped and then placed on ice in a cooler. A subsample of the material from the grab will also be taken for grain size analysis and placed on ice in a cooler.

At the end of each day, sediment and coral samples for contaminant analysis will be placed in a freezer; samples for the grain size analysis will be placed in a refrigerator rather than frozen to avoid altering the grain size structure of the sediment. Samples will be shipped overnight to the analytical laboratory, and chain of custody forms will accompany all shipments.

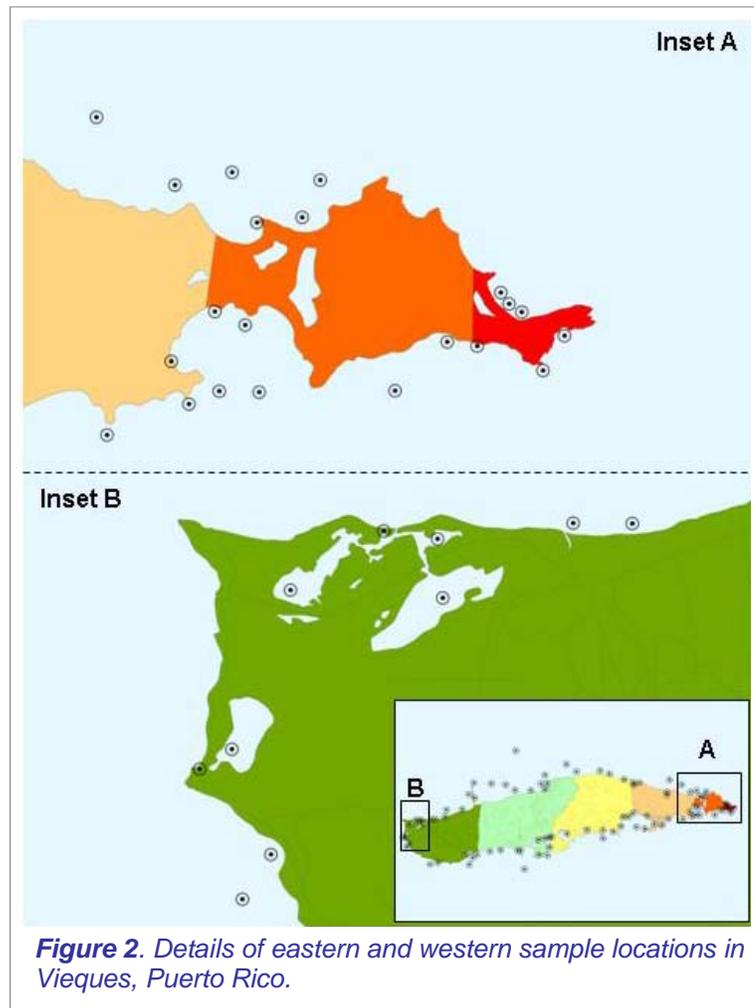


Figure 2. Details of eastern and western sample locations in Vieques, Puerto Rico.

At each coral or sediment site, a series of water quality parameters (dissolved oxygen, temperature, salinity and conductivity) will also be measured using a YSI® salinity/conductivity/temperature meter. The instrument probe is submerged to a depth of approximately one meter. Secchi depth will also be measured at each site.

Table 1. Tentative schedule of contaminant sampling during May and June, 2007 in Vieques, Puerto Rico. Personnel assignments also are shown.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			2	3	4	5
6	7	8	9	10	11	12
13 Pait, Christensen	14 Pait, Christensen	15 Pait, Christensen	16 Pait, Christensen	17 Pait, Christensen	18 Pait, Christensen	19 Pait, Christensen
20 Pait, Christensen, Hartwell, Mason	21 Pait, Christensen, Hartwell, Mason	22 Pait, Christensen, Hartwell, Mason	23 Pait, Christensen, Hartwell, Mason	24 Pait, Hartwell, Mason	25 Pait, Hartwell	26 Pait, Hartwell
27 Pait, Hartwell	28 Hartwell, Whitall	29 Hartwell, Whitall	30 Hartwell, Whitall	31 Hartwell, Whitall	1 Hartwell, Whitall	2 Hartwell, Whitall

VII. MILESTONES

This project will be carried out in Fiscal Years 2007 and 2008. The chart below (Table 2) details the timeline for the major activities. Milestones include the completion of the field work, chemical analysis of the samples, completion of the QA/QC on the data, preparation of the report, and drafting of the journal article. The analysis of the samples collected for contaminants will begin as soon as they are received by the NS&T contractor. The sample analyses are expected to be completed by October 2007. As the data are received, COAST personnel will conduct a further QA/QC data review. Data analysis and preparation of products will occur primarily in FY2008.

Table 2. Schedule of project tasks detailed in section V of the plan.

	Fiscal Year 2007 and 2008																		
	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	
1. Project Planning		●	●	●	●	●	●												
2. Contract Management						●	●	●	●	●	●	●	●	●					
3. Field Work								●	●										
4. Other Data Collection				●	●	●	●	●	●	●									
5. Analytical Chemistry								●	●	●	●	●	●						
6. Data QA/QC											●	●	●	●	●				
7. Data Analysis and Distribution											●	●	●	●	●	●	●	●	●

VIII. PRODUCTS

1. Draft report on chemical contaminants in sediments and corals (December 2007)
2. Final report on chemical contaminants in sediments (April 2008)
3. Data available on NS&T Data Portal (June 2008)
4. Draft journal article(s) on chemical contaminants in sediments and in coral tissues (July 2008)

IX. PERSONNEL

The roles of the personnel participating in the contaminants component of the integrated ecosystem assessment for Vieques are shown below (Table 3). The specialties of these scientists are included on the following page.

Table 3. NOAA/CCMA COAST Branch personnel assigned to the project.

	Pait	Lauenstein	Hartwell	Whitall	Christensen	Mason	Johnson	Perez	TDI-Brooks (Juan Ramirez)
1. Project Planning	●	●	●	●	●	●	●		
2. Contract Management	●	●							●
3. Field Work	●	●	●	●	●	●			
4. Other Data Collection	●					●	●		
5. Analytical Chemistry	●	●							●
6. Data QA/QC	●	●	●	●		●	●	●	●
7. Data Analysis and Products	●	●	●	●	●	●	●	●	

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