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Information About Estuaries and Near Coastal Waters
December 2001 - Issue 11.6

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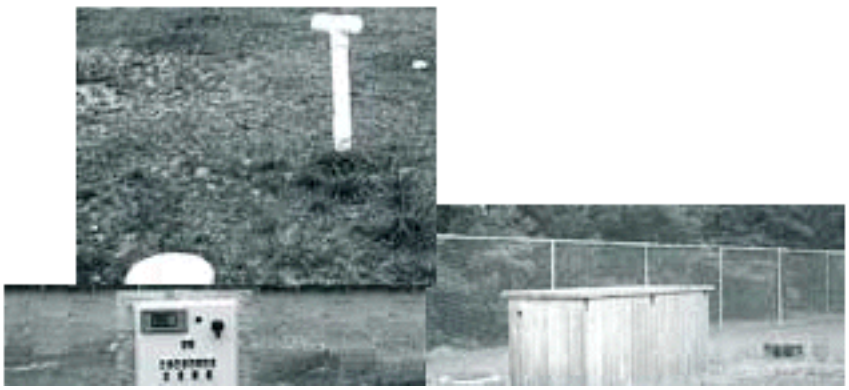
Buzzards Bay Project Releases Septic System Test Center Results

The Massachusetts Alternative Septic System Test Center recently published initial test results of the effectiveness of alternative septic system designs in preventing pollution. The Alternative Septic System Test Center was constructed at the Massachusetts Military Reservation on Cape Cod by the Buzzards Bay Project National Estuary Program (BBP), in collaboration with the Massachusetts Department of Environmental Protection (DEP), Barnstable County Department of Health and the Environment (BCHED), and the University of Massachusetts Dartmouth's School for Marine Science and Technology. The Test Center was established to help meet the Commonwealth's need for cost-



effective wastewater disposal systems that are suitable for sites with limited space, poor soils, and high water tables, or where advanced pollutant removal is required.

The Center's mission is to: 1) evaluate the performance and operation costs of new and innovative wastewater disposal technologies in a carefully controlled and unbiased manner; 2) provide this information to regulators and consumers; and 3) assist vendors in getting their technologies approved for use in Massachusetts more quickly and at a lesser cost. The goal is that the Test Center will lead to alternatives to the conventional septic system, with improved benefits to the environment. The Test Center was completed in 1998, with the first technologies installed in 1999. Three replicates of each technology are installed at the facility, and tested for two years.

Fact sheets describing the interim results of the first four wastewater treatment technologies tested are designed to aid homeowners, coastal managers and health agencies in choosing the appropriate technology for their needs. Each fact sheet contains information about the technology's theory of operation, testing objectives, test loadings, siting considerations and installation notes, estimated costs, permitting, operation and maintenance issues, and how to contact the manufacturer. The sidebar summarizes some of the interim findings that are listed on the four fact sheets. Another three fact sheets are expected to be released by the time this newsletter goes to press.

A special focus of the testing is the improved nitrogen removal efficiencies of innovative technologies. Three of the technologies tested, the Waterloo Biofilter®, Mahoney and Associates Amphidrome System, and the BioMicrobic's MicroFast® System, discharged less than half the nitrogen of a conventional system designed to meet Massachusetts sewage disposal system regulations. One of the technologies, Geoflow Inc. Dripline with Rootguard™, was a shallow soil absorption system dosing system that allowed for nutrient uptake by lawns. While the lawn over the soil absorption system was luxurious and needed more frequent mowing, this technology was not as effective at nitrogen removal as

the technologies that recirculated flow between anaerobic and aerobic environments. However the system's effectiveness could be increased by linking it to other advanced nitrogen removal technologies to achieve very high combined nitrogen removal rates. These results will help planners evaluate the use of innovative wastewater technologies to protect nitrogen-sensitive coastal waters and other areas from the cumulative impacts of septic systems.

The complete fact sheets, as well as additional information about other alternative wastewater treatment and disposal technologies, can be downloaded from the BBP website (http://www.buzzardsbay.org/ EXIT disclaimer). A full listing of permitted innovative technologies that are approved for use in Massachusetts can be found at the DEP Web site at http://www.state.ma.us/dep/bspt/it/files/idep/stepping.htm. EXIT disclaimer

Interim Findings of System Performance

Waterloo Biofilter®
This technology exceeds secondary treatment (i.e., Total Suspended Solids (TSS) and Biological Oxygen Demand (BOD) less than 30 mg/l) to allow for the reduced separation distance to groundwater, or reduced soil absorption system size. BOD and TSS concentrations at the base of the Soil Absorption System (SAS) for this technology and the standard Massachusetts Title 5 system are similar. This technology discharged below the regulatory standard of 19 mg/l TN to allow for use in nitrogen sensitive areas. At the SAS base, the system was estimated to remove 64% of nitrogen inputs compared to 20% for a conventional system during the same period.

ECO-Ruck®
The ECO-Ruck, with SAS does provide the equivalent of secondary treatment (i.e. TSS and BOD less than 30 mg/l). However, it does not allow for the reduced separation of groundwater, or reduced soil absorption system size because it incorporates the SAS in the design. This technology did not discharge below the regulatory standard of 19 mg/l TN to allow for use in nitrogen sensitive areas. BOD and TSS concentrations at the base of the SAS for this technology and the conventional system are similar. This technology was withdrawn from the program because of poor performance.

MicroFAST®
The MicroFAST exceeds secondary treatment (i.e., TSS and BOD less than 30 mg per liter) to allow for the reduced separation to groundwater, or reduced soil absorption system size. BOD and TSS concentrations at the base of the SAS for this technology and the conventional system are similar. This technology discharged below the regulatory standard of 19 mg/l TN to allow for use in nitrogen sensitive areas. At the SAS base, this system was estimated to remove 60 percent of nitrogen inputs compared to 22 percent for a conventional system during the same period.

Note: None of these systems were tested for seasonal or intermittent use or for high hydraulic loading conditions.

Conventional Title 5 System
The Septic System Test Center confirmed that conventional Massachusetts Title 5 systems remove BOC, TSS and fecal coliform bacteria to a sufficient degree necessary to protect public health. Although conventional systems are not designed to remove nitrogen, as a result of biological and chemical processes in the SAS, they were found to reduce nitrogen in the influent wastewater by approximately 19-22%, depending upon the test period. The performance of the conventional systems in removing pollutants was used as the baseline to compare the performance of alternative technologies evaluated at the Septic System Test Center.

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Boston Harbor Beach Study Suggests a Change in Beach Management

Overview of Boston Harbor Beach Monitoring Program

Many beach managers are faced with new requirements for monitoring water quality at bathing beaches. Under the new EPA guidance, testing at bathing beaches is more frequent and the indicator *Enterococcus* is used to protect ocean beach users from poor water quality conditions. A recent study at Boston Harbor beaches suggests that this management strategy alone may not be effective for meeting management goals.

Funded by an EPA EMPACT grant, the Massachusetts Water Resources Authority (MWRA), greater Boston's water and sewer authority, undertook a joint effort with the Metropolitan District Commission (MDC), the agency charged with managing Boston metropolitan area beaches, to study water quality at four Boston Harbor beaches. The sampling was designed to better understand rainfall effects, beach

water quality variability and the effectiveness of bacterial indicators at predicting water quality. Monitoring occurred daily in the summers from 1996 through 2000 and included sampling for *Enterococcus,* fecal coliform and measuring rainfall in 15-minute intervals.

The study beaches included Constitution Beach in East Boston, Carson Beach in South Boston, Tenean Beach in Dorchester and Wollaston Beach in Quincy. Each beach is affected by numerous pollution sources, including combined sewer overflows (CSOs), street runoff and storm drains, and urban stream and/or river inputs. Many of the contamination sources are related either directly or indirectly to rainfall. The intense monitoring program provided a unique opportunity to evaluate the relationship between rainfall and bacterial indicators.

Relationship of bacterial indicators and rainfall

The five-year study revealed that, in general, bacterial water quality was highly variable in both wet and dry weather. Nevertheless, counts generally increased with increasing rainfall. Dry weather contamination - where elevated bacteria counts were observed when no rain had fallen - occurred at all beaches. On average, each beach met the EPA's standard for *Enterococcus* and the former Massachusetts standard for fecal coliform in dry weather. Carson Beach, with more CSOs discharging near the beach than any other beach in the study, had the best water quality, while Tenean and Wollaston beaches, which are heavily impacted by storm drain runoff, had the worst.

Fecal coliform vs. *Enterococcus*

For all beaches, fecal coliform was a more sensitive indicator than *Enterococcus* in wet and dry weather - *Enterococcus* counts were consistently lower (with more nondetects) than fecal coliform counts, and *Enterococcus* limits were met more often than fecal coliform limits (Table 1). Wet weather results from Tenean Beach failed to meet fecal coliform limits 58% of the time, and failed to meet *Enterococcus* limits 27% of the time. The cleanest beach, Carson beach, had similar posting rates for each indicator in both wet and dry weather. Fecal coliform appeared to be a slightly more conservative indicator than *Enterococcus*, as implemented at Boston Harbor beaches.

Beach Study
Table 1

Impact of Rainfall on Frequency of Beach Posting

	Beach	% of samples exceeding standards for:	
		Fecal coliform (> 200 colonies per 100mL)	***Enterococcus* (> 104 colonies per 100 mL)**

Dry weather (no rainfall for at least three days)	Constitution	11%	3%
	Carson	3%	3%
	Tenean	18%	5%
	Wollaston	17%	6%
Wet weather (rainfall > 0.2" within 48 hours of sampling)	Constitution	25%	19%
	Carson	23%	12%
	Tenean	58%	27%
	Wollaston	39%	26%
All weather	All beaches	19%	10%

Implementing the *Enterococcus* standard: Can beach water quality be successfully predicted?

The second phase of the study focused upon how well *Enterococcus* counts predict beach water quality. Beach water quality postings are based on samples collected the previous day because testing for bacteria takes a day to complete. According to EPA guidelines, if an *Enterococcus* count is above 104 colonies per 100 mL on water collected yesterday, the beach will be closed for swimming today. MWRA analyzed the data to learn how often beaches were posted correctly and how well *Enterococcus* results predicted beach water quality compared to how well rainfall predicted beach water quality.

Four variables were used to evaluate the accuracy of predicting water quality for posting swimming advisories:

- *Enterococcus* counts above 104 colonies per 100 mL on the previous day;
- More than 0.2 inches of rainfall in the 24 hours prior to sample collection;
- More than 0.08 inches of rainfall in the 24 hours prior to sample collection; and
- Either a previous day's *Enterococcus* violation or more than 0.08 inches of rainfall in the 24 hours prior to sample collection.

Since far more samples were collected in the study with low *Enterococcus* counts than high counts, *Enterococcus* violations occurred relatively infrequently at harbor beaches overall. Given these frequencies, there is a high probability that yesterday's *Enterococcus* and/or rainfall measures will correctly predict a clean beach, or low *Enterococcus* counts. All four variables correctly predicted that a beach was suitable for swimming between 75% and 90% of the time. However, as shown in Table 2, the four variables differ markedly in their ability to predict high *Enterococcus* counts- that is, how often a beach was predicted to be safe for swimming, when it actually was unsafe for swimming.

Beach Study
Table 2.

Predicting Water Quality Using Enterococcus and Rainfall: In hindsight, how accurate were the predictions?

Potential predictors used to prompt a swimming advisory	**% of time water quality was poor, but beaches were not posted**
Post beach only if results of previous day's Enterococcus sample is > 104 colonies/100mL	75.4%
Post beach only if rainfall in past 24 hours is > 0.2 inches	58.7%
Post beach only if rainfall in past 24 hours is > 0.08 inches	51.1%
Post beach if either previous day's *Enterococcus* sample is >104 colonies/100mL OR past 24-hour rainfall is > 0.08 inches	40.3%

From the perspective of accurately predicting poor water quality, the use of *Enterococcus* is less protective than rainfall. Using rainfall as a predictor vastly improved the ability to predict violations. The cutoff of 0.2 inches of rainfall, if used to trigger a swimming advisory, was less protective than the lower

cutoff of 0.08 inches, which is expected given that posting frequencies would rise as the rainfall threshold is lowered. Using either elevated *Enterococcus* or rainfall to predict violations reduced the incorrect prediction by nearly half, to 40.3%.

These results show that samples collected the previous day and tested for the *Enterococcus* standard function poorly as predictors of water quality. The value of using the previous day's *Enterococcus* count as the sole trigger for daily advisories is limited. Beach managers should consider using other factors, such as rainfall, that do not have a 24-hour lag time.

Conclusion

This five-year study illustrates the many complexities that confront beach managers. While comprehensive monitoring provides assurance to bathers and captures the variability of water quality, this monitoring is more valuable as part of a long-term water quality assessment than as a short-term management tool. While routine *Enterococcus* monitoring may be helpful in determining variability in water quality and in exposing contamination sources, it is not a particularly useful predictor of water quality on a day-to-day basis. Until real-time enumeration techniques are available on a wide and affordable scale for bacterial indicators, rainfall monitoring remains an essential component of a successful beach management program, particularly at beaches known to be impacted by rainfall-related contamination sources.

For further information, contact Kelly Coughlin, Massachusetts Water Resources Authority, 100 First Avenue, Boston, MA 02129 Phone: (617) 788-4717 Kelly.Coughlin@mwra.state.ma.us or Ann Michelle Stanley, Harvard School of Public Health, astanley@whoi.edu.

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Return of the Natives: Restoring Fish Runs on the Blackstone River

It's hard to imagine today, but the Blackstone River in Rhode Island and Massachusetts once supported large annual spawning runs of Atlantic salmon, American shad and river herring. By the mid-1800s, however, the fish runs of the Blackstone were gone, a casualty of industrial development.

Earlier this year, the Narragansett Bay Estuary Program initiated a collaborative project to restore shad and herring to the Blackstone River. The restoration will re-establish a vital ecological link between the

Blackstone watershed and Narragansett Bay, enhance fresh- and salt-water fisheries, and provide recreational and educational opportunities to an urban area. Recognizing the Blackstone's unique situation, the Bay Program is partnering with state and federal agencies, non-governmental organizations, and business interests to develop and implement a restoration plan that produces economic as well as environmental results.

The Blackstone River is the largest tributary to Narragansett Bay. From its headwaters in Worcester, Massachusetts, it flows southeasterly for about 48 miles, meeting salt water in Pawtucket, Rhode Island. There it becomes the tidal Seekonk River, an estuarine arm of Narragansett Bay. The Blackstone drains a watershed of 475 square miles, encompassing highly urbanized areas around Worcester and along the lower river, as well as less-developed, largely forested lands in northern Rhode Island and south-central Massachusetts.

The Blackstone River Valley is often called the birthplace of the American Industrial Revolution, and this legacy is important to the culture of the region as well as the physical condition of the river today. The first dam across the river at Pawtucket Falls was built circa 1718. By the late 1800s, there were hundreds of mills along the Blackstone, and thousands of families emigrated from French Canada and elsewhere to work in them.

For all its economic benefits, development of the Blackstone River and its surroundings was not without environmental cost. Many older residents of the Valley recall the Blackstone as little more than an open sewer, running different colors depending on the dyes being used in the mills that day. The dams prevented the fish from moving upstream; deprived of access to historic spawning habitats, the annual runs withered. Atlantic salmon were extinct on Narragansett Bay by the mid-1800s. Herring and shad persisted elsewhere in the Bay, but the Blackstone runs were lost. Today, tiny remnants of the Blackstone's shad and herring runs - perhaps a few hundred fish swim up the Seekonk to spawn, with marginal success, at the base of the Main Street Dam.

Thanks to the Clean Water Act and other factors, the water quality of the Blackstone is much better than it was just a few decades ago, and is continuing to improve as state and local governments upgrade wastewater and stormwater systems. The river is once again an environmental asset, with a new bikepath alongside, tour boats, and ongoing wetland and waterfront restoration efforts. But the dams remain. In most cases, they have outlived their original uses. Some are used for hydroelectric generation; others provide recreational opportunities or water supplies in the ponds they create.

The Narragansett Bay Estuary Program recognized that fish passage restoration could play a major role in the rebirth of the Blackstone. It recognized, too, that many organizations, ranging from environmental groups to hydroelectric facilities, have a legitimate interest in shaping restoration efforts. The Bay Program initiated a collaborative project to plan and implement fisheries restoration on the Blackstone River. Start-up funding was provided by the Rhode Island Aqua Fund and the Blackstone River Valley Heritage Corridor Commission.

In the spring of 2001, the Bay Program convened the Blackstone River Fish Restoration Steering Committee. Members include state and federal resource agencies, an historical museum, fishing groups, environmental organizations, and generators of electricity. The team commissioned a soon-to-be-completed study of the historic fisheries of the Blackstone by the University of Rhode Island, and a gillnet survey of the Seekonk River by the Rhode Island Division of Fish and Wildlife.

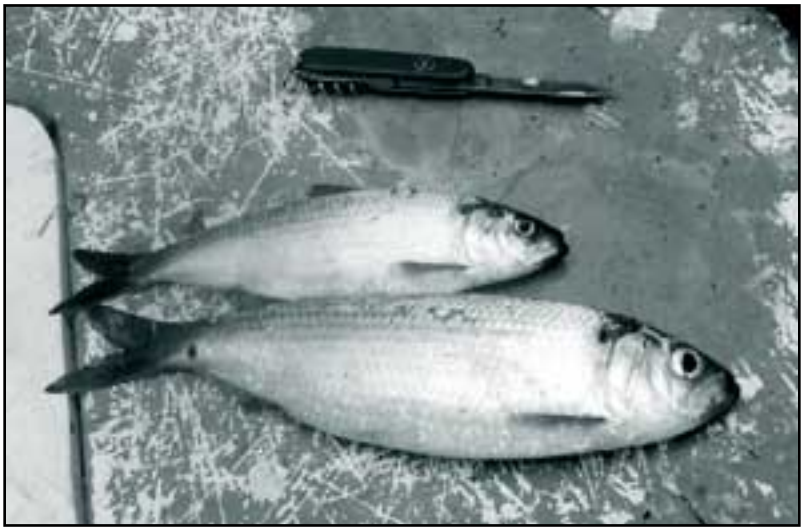
Based on this information, along with extensive public involvement, the Steering Committee developed a draft Blackstone River Fisheries Restoration Plan. The plan establishes quantitative restoration goals for shad and herring, and identifies preferred alternatives for re-establishing fish passage over the dams of the lower Blackstone. Atlantic salmon are not a target species of the restoration, as the Steering Committee determined that the availability of suitable and sufficient habitat for this species was questionable.

The plan outlines a four-phase process for restoring herring and shad to the Blackstone River. Phase I will restore fish passage over the first four dams of the lower Blackstone, providing access to several hundred acres of high-quality spawning habitat in the Lonsdale reach of the Blackstone between Cumberland and Lincoln, Rhode Island. Phase II will restore passage further along the main stem of the river, roughly up to the Massachusetts border. Phase III will restore fish passage to the Blackstone's largest tributary, the Branch River in northern Rhode Island. Finally, Phase IV will restore yet-to-be-determined areas in the Massachusetts portion of the Blackstone River watershed.

A public meeting on the restoration plan held in November, 2001, in Pawtucket, Rhode Island, provided an opportunity for the Steering Committee to obtain public comments, which will be incorporated into the final plan. Once the plan is distributed, the Committee will turn its attention toward additional engineering and cost estimates, and seeking funding for construction of fish passage facilities on the lower Blackstone River. Preliminary estimates put construction costs for four Denil-type fish ladders and downstream passage facilities at about $1.8 million.

For further information, contact Thomas Ardito, Policy and Outreach Coordinator, Narragansett Bay Estuary Program Office of Water Resources, R.I. Department of Environmental Management, 235 Promenade St., Providence, RI 02908; Phone: 401-222-4700 ext. 7237; Fax: 401-521-4230; E-mail:

tardito@dem.state.ri.us.



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New Technology Could Put the Brakes on Oil Spills in Speedy Rivers

According to a recent U.S. Department of Commerce report, entitled "Control of Oil Spills in High Speed Currents: A Technology Assessment," 58% of all oil spills totaling 100 gallons and larger (from 1993 to 1999) occurred in fast-current (greater than 1 knot) waterways. In fast-current situations, conventional oil booms cannot contain the spilled petroleum because the force of the fast-moving water simply pushes the oil under the boom and beyond.

A small-scale model of the submergence plane oil boom on its back to reveal the planar surfaces that force the oil down before being captured in the containment area.

To prevent this situation, researchers funded by the Cooperative Institute for Coastal and Estuarine Environmental Technology, a partnership between the University of New Hampshire (UNH) and the National Oceanic and Atmospheric Administration, have developed a new submergence plane oil containment system that significantly increases the capacity to protect habitats in fast-current environments. In experiments at the U.S. oil spill testing facility, a 40-foot version of the new system

consistently contained high-viscosity oil in currents of speeds up to 2 knots, doubling the critical velocity of conventional booms. Bay Defender III, a larger version of the boom (100 feet wide), was successfully field tested in Great Bay, New Hampshire, in May, 2001. Researchers are currently refining the logistics of the boom deployment and exploring commercialization options.

The boom uses a flexible, submerged plane design, and was created by M. Robinson Swift, Barbaros Celikkol (both from UNH) and Robert Steen (currently with Wright-Pierce Engineering of Maine). Because the largest version of the boom is only 100 feet wide, smaller conventional booms are used as "lead-ins" to widen the system's effective capture area by directing spilled oil to Bay Defender III. The leading edge of the specialized boom has aluminum struts that angle the oil down and back. When the oil reaches the end of the angled plane, it floats up and into an area contained by the aft barrier. The containment area captures the oil but allows water to escape through holes cut into a flexible, plastic material. Skimmers are then used to remove the oil from the containment area.

Now that most of the design challenges have been met, researchers and oil-spill response professionals are concentrating on fine-tuning the logistical challenges of using Bay Defender III. On the Piscataqua River, which forms the southeastern boundary between New Hampshire and Maine, this has involved significant collaboration with oil companies, boat towing operators, the New Hampshire Department of Environmental Services and other agencies. Principal investigator M. Robinson Swift notes that the Piscataqua River Cooperative, an organization that includes members from Sprague Energy, Northeast Petroleum, and the Public Service Company of New Hampshire, has played an integral role in the development of better technologies for oil spill response.

Testing the 40-foot version of the submergence plane oil boom at OHMSETT, a national oil-spill response facility in New Jersey. Captured oil can be seen in the containment area of the boom.

A significant project challenge was finding the best place to deploy Bay Defender III. In the case of the Piscataqua River, the research team drew on previous work that showed that during flood tides, a relatively narrow convergence zone (the area to which most floating material is drawn) occurs upriver from the oil terminals. The team decided that this would be an ideal oil slick interception point since the current speed is approximately 1.6 knots, well within the capacity of Bay Defender III.

Assembling the 100-foot wide Bay Defender III on the New Hampshire side of the Piscataqua River.

Perhaps the most significant non-design challenge is coordinating the deployment operation itself. In New Hampshire, Portsmouth Tow supervised the marine and navigational challenges associated with towing and mooring a large boom system in fast currents. Two field tests were held in May to ensure that deployment was possible and that the boom itself would hold up to forces exerted upon it during deployment.

In related work, UNH researchers have developed a hydrofoil/fast-sweep Vessel of Opportunity Skimming System (VOSS) that uses design concepts similar to the Bay Defender III. The key difference in the systems is that the Bay Defender III is a moored containment system, while the VOSS is designed to function while attached to a marine vessel.

Efforts to commercialize these technologies are ongoing. UNH researchers are working with a New Hampshire-based manufacturer who has the ability to mass produce the specialized oil booms, and are in discussions with possible clients in the U.S. and Canada.

For further information, contact M. Robinson Swift, University of New Hampshire; Phone: (603) 862-1837; E-mail: mrswift@christa.unh.edu; Steve Root, Portsmouth Tow; Phone: (603) 436-0915; or Kalle Matso, CICEET; Phone: (603) 862-3508; E-mail: kalle.matso@unh.edu. Visit the CICEET web site at http://ciceet.unh.edu. EXIT disclaimer

Deploying the Bay Defender III, with 100-foot conventional boom lead-ins, in the Piscataqua River.

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Leveraging Funds in the National Estuary Program:

A Pilot Study of the Coastal Bend Bays & Estuaries Program

A recent pilot study, conducted by EPA's Coastal Management Branch (CMB), examined how much additional financial support or "leveraging" is generated by the "seed" funding provided through EPA to support the operation and implementation of the 28 National Estuary Programs (NEPs). Leveraging occurs when federal funds are used to generate funds and support through other sources, such as by supporting staff to write grant proposals, working with state and local partners, and combining resources (financial and personnel) to launch programs that would otherwise be beyond the reach of any individual participant.

The purpose of this pilot study was to (1) document the success of the NEPs in stretching limited EPA funding to support a wide range of projects; (2) develop a standard methodology for defining and measuring leveraging; (3) illustrate the breadth and creativity of funding sources used to support estuary programs; and (4) assist NEPs with collecting funding information required for periodic reporting to EPA.

The pilot study was performed in cooperation with the Coastal Bend Bays & Estuaries Program

(CBBEP) of Texas. Information was collected through a site visit and interviews with project managers and program partners throughout the bays area. In order to measure the amount of leveraging at CBBEP, CMB developed the following guidelines and criteria to help quantify leveraging resources:

- Funding or in-kind support must either support CBBEP operating activities (e.g., staff) or support CCMP implementation;
- The CBBEP must have played some role in obtaining the support;
- Resources should have been committed during the first three years of CCMP implementation (FY1999 through FY 2001); and
- Projects and funding need not be under the administrative control of CBBEP to be counted.

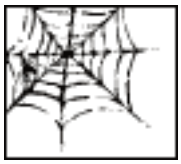
Research showed that in many cases, CBBEP is supporting projects that may pre-date it, or that solicit a variety of organizations for support. In these instances, the value of the entire project was not counted as leveraging. Thus, the leveraging estimate should be viewed as conservative.

Once the issue of what to include as leveraging was addressed, a number of questions arose concerning how to quantify the financial value of the support. Concerns included the double-counting of resources, including resources committed outside the time period for the pilot project, valuing in-kind contributions, appraising services, valuing time and materials, estimating use of equipment/facilities, appraising office space, and quantifying volunteer contributions.

For this study, the leveraging ratio is computed as the ratio between the leveraged dollars and EPA funds received by the NEP. For example, if CBBEP received $10,000 from EPA and raised $90,000 from additional sources, the leveraging ratio would be 9.0. During the three years from September, 1998, through August, 2001, CBBEP received $1.13 million in EPA funds. Through a combination of appropriations, grants, and in-kind contributions, CBBEP raised an additional $8.88 million. This results in a leveraging ratio of $7.87 raised for every $1 of EPA support. Based on CBBEP's operating budgets for the three years, a total of $1.6 million was devoted to salaries, benefits, rent, facility costs, travel, supplies, and other operating costs. Of the total, 19 percent came from EPA funds for a leveraging ratio of 4.18 for the period. When only the last two years of the period are examined, EPA supplied only 2 percent out of CBBEP's $1.2 million operating budget, which translates to a leveraging ratio of over 45. This illustrates CBBEP's success at shifting EPA funds to support projects directly, rather than using these funds to support administration and salaries.

CMB hopes to replicate this study with other NEPs and compare leveraging ratios. While there may be no "right" or "wrong" way to quantify leveraging, consistency is important. Therefore, when replicating this study with another NEP, the CMB will follow the criteria and methodology for defining and measuring leveraging that was established at the CBBEP.

For further information, contact Tim Jones, US EPA (4504 F) Office of Wetlands, Oceans, and Watersheds, Washington, DC 20460; Phone: (202) 260-6059; Fax: (202) 260-8742/9960; E-mail: jones.timothy@epa.gov.



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Report on Introduced Species in U.S. Coastal Waters

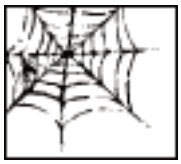
Dr. James Carlton of Williams College and Mystic Seaport, presented his research on the implications of introduced invasive species for the nation and local communities at separate briefings before Administration officials and Congress on Monday, October 22, in Washington, D.C.

The study reports that the rate of introduced species entering and taking hold in U.S. waters continues to rise, posing a growing threat to the biodiversity and health of native coastal ecosystems. Every year, more than 45,000 commercial ships and hundreds of thousands of recreational vessels ply the open oceans. The vessels transport marine life around the world at an astonishing rate. Fishing activities, home aquaria industry, and marine debris are among the other primary sources of introductions. The report estimates that the cost to monitor and repair the resulting damage ranges in the millions of dollars, and offers a series of recommendations to address this problem.

This report on the problems posed by introduced marine species is the third in a series of scientific reports that will assist the independent Pew Oceans Commission with its review of national ocean policies. In addition to introduced species, the Commission is reviewing coastal development, marine pollution, fishing, aquaculture, ocean governance, and marine protected areas. The Commission intends to issue its formal recommendations to the President and Congress next year.

For further information, contact Justin Kenney, Pew Oceans Commission; Phone: (703) 516-0605; E-mail: kenneyj@pewoceans.org. Additional information about the Pew Oceans Commission is available at

www.pewoceans.org EXIT disclaimer



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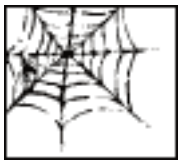
Smart Growth Fact Sheet

The EPA Office of Wetlands, Oceans and Watersheds (OWOW) Smart Growth Team has developed a preliminary Smart Growth and Water Quality Fact Sheet that presents the links between land use and water quality. The fact sheet incorporates guidelines for growth and water quality that were developed for the National Water Program. It defines the EPA's role in land use decisions as a resource for state and local decision makers, and provides a list of Internet and resource tools to help identify and assess resources and risks to water quality.

The Smart Growth team is currently soliciting comments on the preliminary fact sheet and expects to complete new Smart Growth text for OWOW's website soon.

For further information, contact Jamal Kadri, Smart Growth Team, Office of Wetlands, Oceans and Watersheds; Phone: (202) 260-3848.



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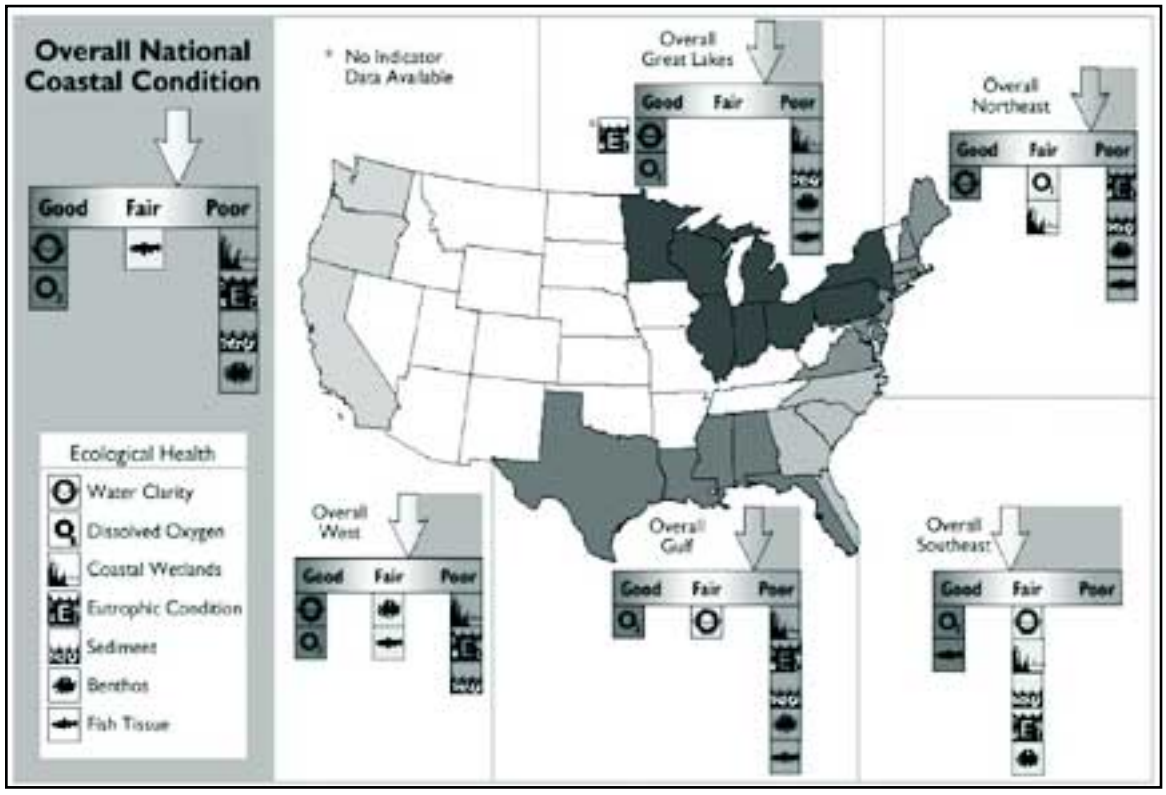
Condition of the U.S. Coastal Waters is Fair to Poor



A disproportionate percentage of the U.S. population lives within 50 miles of the coast, and the activities of municipalities, commerce, industry, and tourism have created environmental pressures that threaten the very resources that make our coasts so desirable.

The U.S. EPA has released the first-of-its-kind National Coastal Condition Report, describing the overall condition of the U.S. coastal waters as "fair" to "poor," varying from

region to region. The Report, released in November, 2001, primarily evaluates estuaries in the continental United States. Indicators of coastal conditions were based on water quality, sediment quality, biota, habitat, and ecosystem integrity, as they relate to ecological and human health.

The Report is designed to inform decision-makers on protecting coastal resources and increasing public awareness of the extent and seriousness of pollution in coastal waters. It will also serve as a benchmark for assessing the future progress of coastal management programs.

The Report is based on information from a variety of sources, including EPA, the National Oceanic and Atmospheric Administration, the U.S. Geological Survey, and the U.S. Fish and Wildlife Service. It highlights several exemplary federal, state, tribal, and local programs that assess coastal conditions.

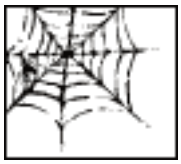
On an overall national level, water clarity and dissolved oxygen are rated as "good" - the highest quality. Fish tissue contaminants are rated "fair," and eutrophic condition, sediment contamination, benthic condition and coastal wetlands loss are all rated "poor." Regional ratings range from "poor" in the northeastern, Gulf of Mexico, western, and Great Lakes parts of the country, to "fair" in the southeastern part. The Report describes the condition of coastal waters, not the causes or sources of coastal impairment. However, it does list pollutants and estuarine stressors, such as pathogens and excessive organic matter, and their point and nonpoint sources including, urban stormwater runoff.

The accuracy of these estimates of coastal conditions is within 95-98%, based on the large amount of data available for assessment. Data availability varied for different parts of the country. Sufficient data were available for estuaries on the northeastern, southeastern and Gulf coasts. Partial data were available for estuaries along the west coasts and Great Lakes. There were significant data gaps for Alaska, Hawaii, the island territories, and near-shore coastal waters. The data sets from EPA's National Coastal Assessment program included samples taken from 1990 to 2000 at over 1,000 randomly selected sites, representing about 80% of the nation's estuarine resources.

EPA plans to update the Report in 2005 and assess trends over time. The Report will be available on EPA's website at http://www.epa.gov/owow/oceans/nccr/index.html in early 2002. EPA also issued a Coastal Research and Monitoring Strategy that evaluated national needs for coastal research and

monitoring, and recommended an integrated framework for protecting vital coastal resources. The Strategy is available at http://cleanwater.gov/coastalresearch/.

For further information, contact Barry Burgan, US EPA; E-mail: burgan.barry@epa.gov



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Summer Institute in Coastal Management

May 27 to June 21, 2002

The University of Rhode Island's Coastal Resources Center (CRC) Summer Institute in Coastal Management program provides participants with practical skills to design, implement, and learn from integrated coastal management programs and experiences from around the world. Participants learn to formulate effective strategies for the management of coastal ecosystems and learn to apply integrated, interdisciplinary approaches in solving coastal problems. While the program looks at coastal management challenges globally, its emphasis is on those faced by developing nations.

Program Content

The Summer Institute emphasizes issues of concern to coastal planners and managers, including:

- Implications of ecological and socioeconomic trends;
- Coastal development activities such as mariculture, tourism, shorefront construction, and their impacts;
- Common coastal problems such as, loss of habitats, coastal hazards, erosion, degradation of water quality, use conflicts, overfishing; and
- Linking local-level program initiatives with national-level policy development.

Participants learn how to design management programs utilizing sustainable development as the primary objective, and using an array of regulatory and non-regulatory implementation techniques. Techniques to build broad public support for programs are emphasized.

Professional skills-building sessions may include practice in raising funds, writing proposals, budgeting and communicating clearly and persuasively and facilitating groups.

Participants are paired with program advisors who work with them during the four weeks to ensure the program experience is positive and tailored to the individual. The high advisor to student ratio provides opportunities for discussion and exchange that complements the formal classroom experience.

Participants

This program is for professionals interested in integrated coastal management, including:

- Professionals in natural resources, fisheries, and environmental agencies;
- National, regional, district, and municipal-level planners;
- University lecturers and researchers;
- Staff from nongovernmental environmental and community development organizations;
- Project managers in bilateral and multilateral development organizations and regional development agencies, and
- Professionals studying at the graduate level in the United States.

Participants typically have a wide variety of educational backgrounds in the natural and social sciences. Previous participants range in age from their early twenties to early sixties. Most have advanced degrees in addition to substantial professional experience.

Institute Faculty

Program instructors are drawn from coastal management practitioners at the CRC. CRC associates from field programs in the United States, Latin America, Africa, Asia, and the Western Pacific also act as program trainers. In addition, faculty from other URI departments, including marine affairs, oceanography, resource economics, ocean engineering, political science, and sociology participate in specialized sessions. The program also includes guest speakers from other universities, national organizations, state coastal management agencies, local town governments, and the private sector.

The program fee of $5,000 covers all costs of the training program, including tuition, meals, housing, field trips, reading materials, and special events. The fee also covers the cost of limited health and accident insurance for the duration of the program (please ask for details). Fees do not cover the cost of travel to and from Rhode Island. Participants should bring additional funds for personal expenses.

For further information, contact Kim Kaine; the Graduate School of Oceanography, University of Rhode

Island; E-mail: kkaine@gso.uri.edu or apply on-line at http://www.crc.uri.edu EXIT disclaimer
Participation is limited to 25 individuals.

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The National Marine Debris Monitoring Program Keeping Watch On America's Shores

Historically, the ocean has been a dumping ground for human debris, with 60-80% of marine debris estimated to be from land-based sources. Since 1996, hundreds of volunteers with the National Marine Debris Monitoring Program (NMDMP) have been keeping watch over their shores. From the tip of Maine to the Florida Keys, from Texas to the Virgin Islands, and from California to Alaska and Hawaii, volunteers have been documenting marine debris pollution on their local beaches to assess the amounts and potential sources of debris entering our coastal areas.

The NMDMP, coordinated by The Ocean Conservancy (formerly the Center for Marine Conservation) with funding and support from the U.S. EPA, is a scientific study that examines the occurrence of 30 debris items on the U.S. coastline. Trained NMDMP volunteers monitor selected beaches and conduct monthly beach cleanups. The program is designed to answer two specific questions: 1) Is the amount of debris on our coastlines decreasing, and 2) What are the major sources of the debris? An outgrowth of The Ocean Conservancy's hugely successful International

Coastal Cleanup, the NMDMP takes the idea of beach cleanups a step further by standardizing the data collection using a scientifically valid protocol to determine the status and trends of marine debris pollution. As a result, volunteer participants become real "citizen scientists."

The program began as a five-year pilot in 1991, and was designed by a working group composed of representatives from The Ocean Conservancy, EPA, National Oceanic and Atmospheric Administration, the National Park Service and selected researchers. The program was launched in 1996, with 40 randomly selected monitoring sites along the Gulf of Mexico. In five years, the NMDMP has expanded its coverage to over 130 sites along the East, West and Gulf Coasts (including Puerto Rico and the U.S. Virgin Islands) and the shores of Hawaii and Alaska. Eventually the program will include 180 sites monitored by hundreds of volunteers.

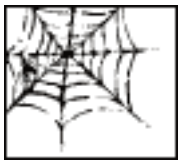
Although the sites are chosen randomly, they are chosen carefully. The U.S. coastline has been divided into nine regions, based on the types of marine debris found there and the prevailing currents. Twenty marine debris-monitoring sites per region are randomly selected from a comprehensive list of beaches that fit the NMDMP criteria. Each beach must be composed of sand to small gravel, have a length of at least 500 meters (1/3 mile), have clear direct access to the sea, and be accessible to volunteers year-round. Care is also taken to select beach sites where monitoring will not adversely affect any endangered or protected species, such as sea turtles, sea birds, marine mammals, or protected coastal vegetation. Trained volunteers then conduct marine debris surveys at the designated beach monitoring sites every 28 days.

The data collected by each volunteer survey team is sent to The Ocean Conservancy's Office of Pollution Prevention and Monitoring in Virginia Beach, Virginia, where it is added to our growing national database. NMDMP data summaries are available from The Ocean Conservancy's NMDMP website (http://www.cmc-ocean.org/nmdmp/). EXIT disclaimer Federal agencies, conservation organizations, state governmental agencies and universities are some of the potential data users. Visitors to the website can view a map showing the nine NMDMP study regions, view a list of NMDMP monitoring sites in a selected region, and access the site-specific data summaries. The NMDMP website also contains a

detailed description of the NMDMP protocol and how the program works.

The NMDMP is a volunteer program unmatched in the United States and gives individuals and organizations an opportunity to be involved in a nationwide effort to identify and document a serious pollution problem: marine debris.

If you or your organization would like to find out how to participate in this worthwhile program, contact The Ocean Conservancy's Office of Pollution Prevention and Monitoring; Phone: (757) 496-0920; or E-mail: nmdmp@oceanconservancyva.org



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United States Environmental Protection Agency | Office of Water (4504F) | EPA842-F-01-006Z December 2001

San Juan Bay National Estuary Program

New Approaches to Community Participation

Background

Since 1992, the San Juan Bay Estuary (SJBE) has had the distinction of being the only tropical ecosystem in the U.S. EPA National Estuary Program (NEP), and the only one located outside the continental United States. The SJBE constitutes an extraordinary mosaic of coastal and marine ecosystems located amid the San Juan Metropolitan Area on the northern coast of Puerto Rico. For centuries, the SJBE has provided irreplaceable natural, recreational, and commercial resources for Puerto Rico's residents and visitors. People and businesses are attracted to its busy port, beaches, beautiful parks, and historical and natural areas, all of which are vital to the region's economy. However, the needs of a growing population result in the exploitation of the system's natural resources, with the degradation and destruction of many components of the estuarine system.

In an effort to stop further degradation and to initiate a public process conducive to the restoration and conservation of this important natural system, the San Juan Bay Estuary Program worked with local, state, and federal agencies, citizens, educators, and private entities to develop a Comprehensive Conservation and Management Plan (CCMP). Completed in October, 2000, the CCMP lays out 49 Action Plans that address the system's most pressing issues, categorized in four priority areas: (1) water and sediment, (2) habitat, fish, and wildlife, (3) aquatic debris, and (4) public education and involvement.

Long term success in implementing CCMP Action Plans will largely depend on the advocacy of local citizens and communities. Their quality of life is most dramatically affected by SJBE system's environmental degradation, and could significantly improve if the CCMP is successfully implemented. A major goal of the SJBE Program is to provide the tools for encouraging and empowering these stakeholders to take an active role in the CCMP implementation process.

The National Estuary Program

Estuaries and other coastal and marine waters are national resources that are increasingly threatened by pollution, habitat loss, coastal development, and resource conflicts. Congress established the National Estuary Program (NEP) in 1987 to provide a greater focus for coastal protection and the demonstrate practical, innovative approaches for protecting estuaries and their living resources.

As part of the demonstration role, the NEP offers funding for member estuaries to design and implement Action Plan Demonstration Projects that demonstrate innovative approaches to address priority problem areas, show improvements that can be achieved on a small scale, and help determine the time and resources needed to apply similar approaches basin-wide.

The NEP is managed by the U.S. Environmental Protection Agency (EPA). It currently includes 28 estuaries: Albemarle-Pamlico Sounds, NC; Barataria-Terrebonne Estuarine Complex, LA; Barnegat Bay, NJ; Buzzards Bay, MA; Casco Bay, ME; Charlotte Harbor, FL; Columbia River, OR and WA; Corpus Christi Bay, TX; Delaware Estuary, DE, NJ, and PA; Delaware Inland Bays, DE; Galveston Bay, TX; Indian River Lagoon, FL; Long Island Sound, CT and NY; Maryland Coastal Bays, MD; Massachusetts Bays, MA; Mobile Bay, AL; Morro Bay, CA; Narragansett Bay, RI; New Hampshire Estuaries, NH; New York-New Jersey Harbor, NY and NJ; Peconic Bay, NY; Puget Sound, WA; San Francisco Bay-Delta Estuary, CA; San Juan Bay, PR; Santa Monica Bay, CA; Sarasota Bay, FL; Tampa Bay, FL; and TIllamook Bay, OR.

The Problem

Since the 1930s, rampant development in the San Juan Metropolitan Area has spawned a vast array of squatters and low-income communities scattered along many of the estuary's shorelines. Many of these communities face critical environmental conditions caused by the lack of appropriate infrastructure, raw sewage discharges, storm drain pollutants, filling of wetlands, and illegal trash dumping.

Citizens of every social, educational, cultural, and economic background live throughout the estuary drainage basin. Individual and community concerns reflect this diversity of conditions and differ widely between each group in environmental and water quality issues related to the SJBE. Challenged by this fact, the SJBE Program actively pursued close contact with communities, giving special attention to some of those most critically affected by environmental degradation and polluted water bodies.

Even though many of these communities had strong leadership to improve their quality of life, their initiatives were seriously limited by the lack of human resources, as low socio-economic and educational levels are prevalent in these communities. Providing needed support and empowerment to turn these communities into effective allies of environmental protection became not just a priority, but a wise investment in the long term protection and sustainable development of the SJBE system.

Project Overview

Recognizing the critical importance of developing usable models for other watershed communities facing similar problems, the SJBE Program implemented a pilot environmental education demonstration project in the community of Juana Matos. Working in close collaboration with community leaders, this project represented the first step to empower a group of citizens to participate in the environmental and social reconstruction of their community.

Las Cucharillas Marsh

In recent years, the leaders of Juana Matos, located in the eastern shore of the San Juan Bay in the Municipality of Cataño, have been actively dealing with the numerous health, public safety, social, economic, and environmental justice issues currently affecting their quality of life. Encouraged by community leaders' enthusiasm and commitment to protect the endangered Las Cucharillas Marsh, the SJBE Program worked closely with leaders in the design, planning, and implementation phases to develop a successful environmental education project in Juana Matos. Las Cucharillas Marsh contains the highest diversity of waterfowl documented in all the SJBE, and plays an important role in flood protection and water quality improvement in the area. This unique and attractive ecosystem is currently threatened by pollution, filling, and urban engulfment, despite its designation in 1979 as a Wildlife Reserve by the Department of Natural and Environmental Resources (DNER).

Project Implementation

The project known as La Comunidad Viviente ("The Living Community") focused on building leaders' abilities to guide their community towards sustainable development of both community and natural resources. From March 29 to July 30, 1999, collaborators, invited specialists, and SJBE Program staff facilitated several interactive sessions highlighting basic information on the values, natural components and dynamics of the SJBE and Las Cucharillas Marsh. Other introductory discussions on ecosystem management, conservation, and sustainable development were presented, with the active participation of many "Juanamateans." Case studies on sustainable development, ecotourism, environmental justice, community organization, and community-based enterprises provided the opportunity for site visits and interchange of information with other community leaders throughout the island. Field laboratories included a community clean-up activity, a pilot wetland restoration-reforestation project, and several interpretative field trips throughout Las Cucharillas Marsh habitats. A local church served as the meeting and coordination place during the weekly sessions.

Community children and youths were also active participants of La Comunidad Viviente. Special environmental education sessions were designed for children, to respond to the particular interest and attention span of this audience. These fun sessions not only provided a highly educative entertainment, but also provided parents with childcare while they participated in the meetings.

Most of the technical and informational materials used during the project are under the custody of the community. Two prominent local leaders volunteered to keep the materials at their houses, as an "Environmental Library" available for use by all community members. The impact of La Comunidad Viviente has prompted a renewed interest among "Juanamateans" on the natural history and resources of their community, particularly among children and young adults. This interest has repercussions in the local schools, which have repeatedly included presentations by La Comunidad Viviente leaders in their science and environmental courses.

Juana Matos Community: a common view

Because of the strengthened sense of community and self worth, many of the community's long-fought struggles for social and environmental justice have found new support in the wider perspectives and deepened awareness gained through this project.

The SJBE's "call of alarm" (through public media, educational activities, bird counts) and related actions in the CCMP prompted renewed interest by local agencies, private industries and academic institutions in the protection of Las Cucharillas Marsh. The most recent proposals to declare Las Cucharillas Marsh a Natural Reserve have used the SJBE Program as an advisor, focusing attention on the willingness of local communities to participate as co-managers of the area.

Based on subsequent evaluations with community leaders on the "next steps," the second phase of La Comunidad Viviente began in August 2001. A preliminary meeting with potential participants was conducted to assess needs and areas of interest. The meeting identified some critical areas for community self-action, such as proposal writing and fundraising strategies, which will be addressed in a series of intense workshops. A qualified expert in this field has been contacted to design and facilitate the workshops. Upon completion of this second phase, technical support and assistance will be provided to the community when a proposal for a defined community project is submitted.

The rich contribution of community members, based on their impressive empirical and experiential knowledge in every area (particularly those pertaining to the ecology and natural dynamics of Las Cucharillas Marsh) turned the project into a mutually rewarding learning experience for both facilitators and participants. Evaluations of the project revealed gained knowledge and understanding and a clearer community vision of their environmental goals. Although there may still be a long way to go, this community has made significant strides towards self-management

Community children participating in a reforestation activity

Lessons Learned

1. Active participation by community leaders in the planning, design, and execution of community projects is critical for guaranteeing their success.

The SJBE Program collaborated with community leaders during every stage of the development of La Comunidad Viviente in shaping a project to fit the community's particular cultural, environmental, social, and economic profile.

2. Recruiting local community members will not only enhance the feeling of community ownership of the project, but will help the project by providing necessary skills.

Gifted community leaders turned less-educated Juana Matos' adults into invaluable resources. Knowledge of natural and social history, the impact of development on local resources, logistics and coordination, community networking, carpentry, engineering and architecture represent just some of the areas in which "Juanamateans" excelled.

3. Subsequent phases of a project should be developed within a critical period of time, to build on project momentum between participants.

The initiation of La Comunidad Viviente second phase was delayed for various reasons. This led to a decrease of "momentum" in the community's willingness to participate. A significant amount of energy has been exerted to arouse renewed interest, reestablish contacts, and convene the project's

participants.

4. Community work will require a substantial investment of time, both in the short and long term.

Experience taught the SJBE Program that much more time than initially expected was needed to implement La Comunidad Viviente. The many factors that prompted change after change in our project agendas and schedules were as unpredictable and diverse as human behavior. After the completion of a project, the support and advice the sponsor can provide to the community is critical in the long term for enhancing the transition process of the community to others levels of action.

5. Your credibility before a community will be your most powerful, honorable, and rewarding ally.

Always be clear about your intentions. Never promise anything you cannot deliver.

For further information, contact:

Agustin F. Carbo, Director, San Juan Bay Estuary Program, Avenue Fernandez Juncos #400, Segundo Piso, San Juan, Puerto Rico, 00901-3299; Phone: (787) 725-8162; Fax: (787) 725-8164. Or visit the website at http://www.estuariosanjuan.org/ EXIT disclaimer

Previous Publications in the Demonstration Projects Series

Report Title	National Estuary Program	Date	Publication #
New Options for Dredging in Barataria-Terrebonne	Barataria-Terrebonne Basin, LA	1997	EPA842-F-97-002H
Coquina Bay Walk at Leffis Key	Sarasota Bay, FL	1997	EPA842-F-97-002I
"Pilot Project Goes Airborne"	Narragansett Bay, RI	1997	EPA842-F-97-002J
The National Estuary Program: A Ten-Year Perspective	General NEP Discussion	1998	EPA842-F-98-003K
Rock Barbs In Oregon's Tillamook Bay Watershed	Tillamook Bay, Oregon	1998	EPA842-F-98-003L
The Weeks Bay Shoreline & Habitat Restoration Project	Mobile Bay, AL	1998	EPA842-F-98-003M
Evaluation of Shrimp Bycatch Reduction Devices in Texas Coastal Bend Waters	Corpus Christi, TX	1998	EPA842-F-98-003N

Evaluating Simple, Cost Effective Solutions for Reducing Stormwater and Urban Runoff	Santa Monica, CA	1999	EPA842-F-99-0040
Bay Scallop Restoration Project in Chincoteague Bay	Annapolis, MD	1999	EPA842-F-99-004P
Clear Creek Wetland Restoration Project	Galveston Bay, TX	1999	EPA842-F-99-004Q
The Tampa Bay Watch High School Wetland Nursery Program	Tampa Bay, FL	1999	EPA842-F-99-004R
Punta Gorda Waterfront Juvenile Fisheries Habitat Project	Punta Gorda, FL	2000	EPA842-F-00-005S
Indian River Lagoon National Estuary Program	Indian River Lagoon, FL	2000	EPA842-F-00-005T
Tillamook Bay National Estuary Project	Tillamook County, OR	2000	EPA842-F-00-005U
Broad Marsh River Stormwater Remediation Project	Buzzards Bay, MA	2000	EPA842-F-00-005V
Morro Bay National Estuary Program	Morro Bay, CA	2001	EPA842-F-01-006W
Santa Monica Bay, Innovations in Treating Urban Runoff	Santa Monica, CA	2001	EPA842-F-01-006X
Albemarle-Pamlico Estuary Program	Washington, NC	2001	EPA842-F-01-006Y