COASTLINES

Information About Estuaries and Near Coastal Waters

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Fall 1997, Volume 7, Number 4

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ALABAMA WATER WATCH ADOPTS COASTAL MONITORING PROTOCOL

The Alabama Water Watch program began in late 1992 and is dedicated to the water quality monitoring of the state's streams, lakes, and coastal waters. The program helps interested groups become more aware of their aquatic resources and conducts training workshops to certify citizen volunteers as water quality monitors. Volunteers not only collect valuable water quality information, but the knowledge and experience they gain in doing so will be a major factor leading to better water quality and better water policy in Alabama. In cooperation with the Water Watch program, the Weeks Bay Watershed Project, coordinated through the Weeks Bay National Estuarine Research Reserve, formed its own chapter and has entered its third year of water quality monitoring with volunteers sampling at over two dozen sites.

One of the most important activities of Alabama Water Watch, and the first step of citizen involvement, is a six-hour basic certification workshop in which volunteers are trained in the program's goals and use of a specially-designed water quality test kit. About half of the workshop is spent in the field with "hands on" water quality monitoring by the participants.

Upon completion of the workshop, volunteers begin testing at a specific stream, lake, or coastal site of their choosing. Sites are selected based on whether they are convenient, safe, physically and legally accessible, and can provide useful water quality information. All groups monitor the same six parameters: temperature, dissolved oxygen, total alkalinity and hardness, pH, and turbidity. Some groups choose to test for a wider range of features such as nitrates, nitrites, and salinity in order to provide a

more complete picture of water quality. In addition to the basic certification workshops, Water Watch conducts regional meetings where citizen monitors can meet, share and interpret water data, and develop action plans. Water Watch also offers specialty workshops for other kinds of water testing and "train the trainer" workshops where experienced monitors learn how to train others.

The workshops, besides training citizens in chemical testing, introduce volunteers to the value of biological monitoring of stream organisms to further evaluate water quality. Simple techniques for sampling aquatic "bugs", or benthic macroinvertebrates, are used to calculate a biotic index of stream conditions. Additionally, bacteriological monitoring has become an important part of Water Watch to address health and safety issues. Relatively new and simple techniques for analyzing water for E. coli and total coliform bacteria have been introduced through the workshops, and, within the first months of use, citizens have detected and resolved several contamination problems in Alabama waters.

A critically important aspect of a citizen monitoring program is to keep data credible through effective Quality Assurance/Quality Control (QA/QC). When the Water Watch program began, there had been little precedent for a statewide QA/QC plan designed for citizen-collected data. Water Watch developed one of the first in the nation to receive approval from the US EPA.

Using the Weeks Bay Watershed as a pilot coastal monitoring project, Alabama Water Watch has added a coastal monitoring section to its basic workshop to address issues specific to volunteer monitoring in brackish water. The mixture of fresh and salt water alters the ionic composition of the water, adding another level of complexity to evaluating water quality. Monitors sampling in brackish water will delete the tests for total alkalinity and hardness, replacing them with a test for salinity.

The purpose of the Weeks Bay citizen monitoring program is to gather trend data that will aid scientists and managers in understanding whether water quality is improving or degrading in the watershed. The data may indicate sources of pollution and particular "hot spots" in the watershed and will be used to direct efforts and funding to assist landowners with water quality improvement projects.

To date, ten workshops have been held at the Weeks Bay Research Reserve, including three basic certification workshops, four teacher workshops (training teachers to train their students), two re-certification workshops, and one advanced workshop. Between June, 1996, and June, 1997, Weeks Bay volunteers completed nearly 300 data forms. As of early 1997, the Weeks Bay Water Watch chapter has 30 certified monitors and 32 stations within the 200 square mile watershed.

After five years of work statewide, the Alabama Water Watch program continues to show a groundswell of interest from the citizens. In its first two years, nearly 50 citizen groups participated in training workshops. By early 1997, volunteers were monitoring more than 200 sites on 100 streams and lakes within the state. More than 2,000 citizens have become certified water monitors, and almost half of the 50 active groups were teachers and their students. The Alabama Water Watch program exemplifies the strong interest and commitment of its citizens to protect and conserve water resources.

The Alabama Water Watch and Weeks Bay Watershed Project are funded in part by grants from the U.S. Environmental Protection Agency, Region IV (Clean Water Act, Section 319), and the Alabama Department of Environmental Management.

For further information, contact the Alabama Water Watch office, Department of Fisheries, Auburn University, AL 36849, phone: 1-888-844-4785.

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New Directors for National Estuary Programs

Recently there have been changes in personnel at several of the National Estuary Programs. The new names include the following:

Ms. Mary Knight, Director, Mobile Bay NEP, (334) 990-3525
Mr. Kerry St. PŽ, Acting Director, Barataria-Terrebonne NEP, (800) 259-0869
Ms. Katherine Groves, Director, Casco Bay Estuary Project, (207) 780-4820
Ms. Melissa Mooney, Director, Morro Bay NEP, (805) 528-7746
Mr. Bud Watson, Director, Partnership for the Delaware Estuary, (800) 445-4935
Mr. Steve Nelson, Project Director, Tillamook Bay NEP, (503) 322-2222

Coastal Zone '97 Conference

The Coastal Zone '97 Conference held in Boston, Massachusetts, in July of this year was attended by over 1,000 participants from over 30 nations. Conference evaluations indicate that managers, academics, policy makers, engineers, and students alike agreed that participation in CZ '97 contributed to their understanding of coastal zone management issues. The conference summary, due out later this fall, will elaborate on participants' evaluation findings and highlight the major points of the conference. Watch for information about obtaining a summary in an upcoming issue of Coastlines.

In priority sequence

Seventh Annual Report on Beach Pollution from National Resource Defense Council

In July of 1997, the NRDC published their annual report surveying beach closings and beach monitoring programs nationwide. The report, entitled "Testing the Waters VII: How Does Your Vacation Beach Rate?", indicates that there were at least 2,596 individual closings and advisories for U.S. ocean, bay, and Great Lakes beaches in 1996. The survey went on to note that approximately 83% of beach closings and advisories in 1996 were based on detection of bacterial levels exceeding beach water quality standards. The principal sources?--- polluted runoff from non-urban areas, sewer spill and overflows, urban stormwater runoff, and combined sewer overflows.

In addition to identifying which beaches were closed, the NRDC report also looks at which beaches are monitored and to what degree. Many popular resort beaches within the U.S. do not require any monitoring of their water quality for swimmer safety. On the plus side, the NRDC identifies previous "beach bums" which have cleaned up their act. Only seven states are reported to comprehensively monitor all their beaches -- Connecticut, Delaware, Illinois, Indiana, New Hampshire, New Jersey, and Ohio. Other states have regular monitoring programs for some or part of their recreational beaches and still other states have no monitoring whatsoever. Before picking your next beach vacation, the NRDC suggests that it may be wise to scrutinize this report and become a more informed beachgoer.

A copy of this publication may be found on the Web at http://www.nrdc.org/nrdcpro/ttw/titinx.html or contact the NRDC Publications office at (212) 727-2700 or NRDC, 40 West 20th Street, New York, NY, 10011.

Annual "Best Beaches" Survey

In May of 1997, Dr. Steve Leatherman of the University of Maryland released his annual survey of the nation's "top 20 beaches". His methodology for ranking beaches is based on a variety of factors, including physical factors such as sand softness, the number and size of waves, and whether the beach is prone to rip currents; biological factors such as the color and condition of the water; whether wildlife such as birds and pests such as mosquitoes are present; and human use and impacts such as lifeguard protection, whether views are far-reaching or blocked by tall buildings or other structures, and if traffic or crowds cause excessive noise.

Most of the twenty beaches listed are in either the states of Hawaii or Florida, with this year's #1 ranked beach being Hulopoe, Hawaii. Interestingly enough, the two states with the highest ranked beaches, have limited water quality monitoring done for swimmer safety according to the NRDC survey (see above).

Texas Coastal Wetlands: A Handbook for Local Governments

The Texas General Land Office has released a practical "how to" guide for coastal officials interested in voluntary initiatives to conserve, restore, or create coastal wetlands. This guide provides information on

the role of local governments in coastal wetlands management and tools that municipalities, counties, conservation and reclamation districts, ports and navigation districts, river authorities, and regional councils of governments can use to keep wetland systems intact.

To request a copy, contact Claire Randle at 1-800-850-Beach (within Texas only) or (512) 475-2330, or E-mail:claire.randle@glo.state.tx.us

Dock Design with the Environment in Mind: Minimizing Dock Impacts to Eelgrass Habitats

A CD-ROM is available that allows the user to design docks that have minimal ecological impacts on eelgrass habitats. Research done by Dave Burdick and Fred Short on eelgrass bed habitat was used to make this interactive CD-ROM. The disk guides the user through a series of design decisions in regard to orientation, height, width, and type of dock by an engineer and an ecologist. Then, after their dock design choices have been made, the computer selects one of the five possible outcomes.

Also on the CD-ROM are three other topics, including a video on the functions and values of eelgrass, the scientific basis of the dock design program, and the limits of the study and future research needed to improve our ability to protect eelgrass habitats without excluding marine development.

For further information contact, David Burdick or Fred Short, Jackson Estuarine Laboratory, University of New Hampshire, phone: (603)862-2175 or E-mail:dburdick@christa.unh.edu or fts@christa.unh.edu.

North Pacific Right Whale Sighting

Earlier this year the possible sighting of a right whale calf in the northern Pacific, the first in 150 years, took marine biologists by surprise. Last July, Pam Goddard, a fisheries researcher with the National Marine Fisheries Service, snapped 18 photos of what she assumed to be a humpback whale pod in Bristol Bay, Alaska. Upon further study the pictures revealed that they weren't humpbacks but endangered right whales, sighted and identified in the region only about 10 times in the past 25 years. Because there was a calf present amongst the adults and it was a pod sighting rather than single individuals, it gives scientists hope that Pacific right whales may rebound from a population that has shrunk to a few hundred.

Coastal Tool Catalog

NOAA's Coastal Services Center is offering a new web site focused on providing tools for the management of coastal ecosystems. This interactive, searchable database contains an inventory of models, spreadsheets, geographic information systems, bibliographies, and other information tools designed to support coastal decision makers. Both public- and private-sector information system developers and coastal managers are encouraged to use the system. The initial version of the Catalog is available through the Coastal Service Center homepage at http://www.csc.noaa.gov

Save Our Streams Program Catalog

A new catalog including eductional books, videos, and equipment written to help citizens begin basic monitoring of their streams. Save Our Streams (SOS) is a hands-on stream conservation program of the Izaac Walton League of America. To order one call 1-800-BUG-IWLA.

Stream Water Quality Data on CD-ROMs

The U.S. Geological Survey recently published a two CD-ROM set consisting of stream water quality data from two national networks operated during the past 30 years. The CD-ROMs are a source of information for tracking water quality conditions in major rivers of the U.S. (618 stations from 1973-1995) and selected streams in small minimally-developed watersheds (63 stations from 1962-1995). The CD-ROMs includes measurement for 122 physical, chemical, and biological properties of water and data on watershed population and landcover characteristics. To test this resource, access one of the disks through the Internet at http://www.rvares.er.usgs.gov/wqn96. Further information on purchase or questions regarding the disks can be found at http://water.usgs.gov/lookup/get?/fs01397.

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Marine Bacteria to Combat Metal Pollution

The need for new technologies to address marine pollution is enormous. In California alone, 65,000 tons of toxic wastes are released annually into the air, water, and soil, of which a significant amount ends up in the ocean, often through runoff from urban and agricultural areas after heavy rains. As a result, the water and sediments in most of California's bays and harbors, like those elsewhere in the country, contain measurable levels of dangerous contaminants. These include excess nutrients, synthetic compounds (e.g., pesticides), sewage, and heavy metals.

Metal-contaminated sediments, often found in estuaries and bays bordered by industrial activity, are a source of special concern to coastal states. These sediments are a continuing source of metals into the overlying water, a problem that is magnified when they are disturbed by natural events like storms or human activities, such as dredging. In addition, traditional solutions for disposal and treatment of metal-contaminated sediments (sediment capping or dredging) can be extremely expensive and may have unwanted environmental impacts.

One innovative new technology that is being explored is to employ the metal-binding properties of marine bacteria to enhance the precipitation and recovery of metals in both polluted coastal waters and sediments. Dr. Bradley M. Tebo of Scripps Institution of Oceanography, University of California, San Diego is investigating the feasibility of these bacteria in accelerating metal precipitation. In conjunction with an industrial collaborator, he is also attempting to recover and recycle the precipitated metals. Magnetic separation of toxic metals from sediments could reduce the costs of disposal by 90 percent or

more by reducing sediment volume and toxicity-in addition, valuable metals would be recovered for recycling.

One organism that has been studied in some detail is a marine bacterium whose spores (but not vegetative cells) oxidize manganese. The spores of these bacteria are capable of binding and/or oxidizing a variety of different metals and, consequently, may be useful where mixed metals occur. In addition, because spores are dormant, organisms do not have to be grown and maintained in order to have metal-removing activity. These non-living spores could potentially be used to precipitate metal contaminants, and then after the metals had been removed from the spores, could be recycled. Spores have a number of other properties that make them very attractive for aerobic metal-removing processes:

- Spores obviate the need for viable bacteria to be introduced into the environment;
- Spores are naturally resistant to harsh environmental conditions;
- The spores studied bind, accumulate, or precipitate a variety of metals;
- Metal precipitation occurs over a wide range of environmentally relevant conditions (pH, temperature, metal concentration, and in both fresh and saline waters);
- Spores have a high capacity for binding ions at their surface, as well as high metal affinity and specificity;
- Spores can be re-used after their metal coats have been stripped.

It is hoped that further genetic manipulation can be used to enhance the microbes' metal-removing capabilities. Dr. Tebo has also been interested in determining whether organisms like the one under investigation are common inhabitants in coastal sediments and whether they play a role in the biogeochemical cycling of metals. If so, it may be possible to exploit native microbes to precipitate metals. Experiments have shown that the natural oxidation of manganese and cobalt in surface sediments from San Diego and Mission bays is due to microbial activities, and that populations resistant to heat treatment (presumably bacterial spores) are the main contributors.

Microbially-enhanced precipitation and magnetic separation of pollutants is a revolutionary technology that has military and industrial "dual use" applications, not only for remediating environmental pollution in waters, soils, and sediments, but also for on-line effluent treatment aimed at recovering process chemicals (e.g., precious metals), for waste volume reduction, and for pollution prevention. Making use of the natural magnetic fields of metals, spores with their metal coatings can be separated from sediments and recycled.

For further information, contact Dr. Bradley M. Tebo, Scripps Institution of Oceanography, University of California, phone: (619) 534-5470, E-mail: btebo@ucsd.edu.

Revised December 5, 1997
URL: http://www.epa.gov/owow/estuaries/coastlines/fall97/bacteria.html

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Waterfront Revitalization--Reusing Brownfields

Brownfields are those abandoned, idled, or underutilized industrial and commercial properties where expansion or redevelopment is complicated by contamination (either real or perceived). Historically, many industries were situated along the shore to provide water access for transportation, power, and cooling, thus many brownfields are located in coastal communities. This is especially true in the "rust belt", or the older industrial areas of the Northeast and Great Lakes regions. As regional economies have changed from heavy manufacturing to more diverse, service-oriented economies, many industries have abandoned these waterfront sites. Redevelopment or reuse, however, is often complicated by contamination. These sites are often found in central cities serviced by public transportation and infrastructure, yet developers and new industries tend to avoid them, choosing instead to build on greenfields at the urban fringe, thereby exacerbating suburban sprawl and the loss of natural resources.

The cleanup and redevelopment of brownfields in coastal communities present opportunities to revitalize urban waterfronts, enhance public access to the coast, and restore coastal resources. A good example of the reuse of a brownfield is in Wyandotte, Michigan. In this case, a partnership between private industry and federal, state, and local governments resulted in the redevelopment of the 84-acre BASF site (historically the location of a variety of chemical production plants) into a waterfront park and a public golf course despite environmental contamination resulting from over a century of industrial activity.

The City of Wyandotte is situated along the Detroit River just north of Lake Erie. For the past century, the majority of Wyandotte's waterfront has been occupied by heavy industry, severely limiting the

public's access to and enjoyment of the river. In 1980, when BASF began phasing out operations at the obsolete plants and consolidating its operations in Wyandotte, it became evident that the corporation did not need the 84-acre riverfront parcel.

The location presented tremendous redevelopment opportunities, but the soil and ground water on the site were contaminated from over a 100 years of chemical manufacturing. In 1980, the State of Michigan filed suit against BASF for alleged ground water contamination, primarily due to mercury, polynuclear aromatics, and chlorinated hydrocarbons. The Michigan Department of Environmental Quality ordered BASF to encapsulate the site with a clay cap and prohibited future site development. The prospect that BASF's prime waterfront location might be fenced off and never utilized stunned Wyandotte officials, who were in the process of launching a city-wide revitalization campaign and considered redevelopment of the riverfront an integral component.

(Photograph of Wyandotte site - Before)

City officials urged the state to consider alternative plans that would allow reasonable reuse of the BASF site. After six years of testing and negotiating, the state issued its first consent agreement for long term remedial action that did not require encapsulation. Rather, it required BASF to implement a plan to

prevent contaminated ground water from discharging into the Detroit River. This solution allowed the contaminated soils to be left in place and thus paved the way for future development.

BASF Corporation agreed to lease the site to the city for $1 dollar a year for public recreational use. It was decided that the northern end of the parcel would be developed as a public park and the city and BASF held a series of public workshops to determine how the remaining two-thirds of the site should be used. The workshops were attended by a broad range of stakeholders and, early in the process, a nine-hole golf course emerged as a popular proposal.

The Michigan Coastal Management Program provided the City of Wyandotte with approximately $25,000 to develop a design plan and engineering specifications for recreational use of the site. Although modest, the CZM planning funds served as a catalyst to leverage other local, state, and private funds. The BASF Corporation committed $2 million, while the City of Wyandotte contributed $4.5 million, and $1.5 million came from the Michigan Recreational Bond Fund.

(Photograph of Wyandotte site - After)

Today, the redeveloped property includes a park with a riverfront walkway and observation decks, picnic areas, jogging trails, and a rowing club, in addition to the nine-hole public golf course. User fees will allow the golf course to be self-supporting and pay for maintenance of the park. Construction costs for the park portion totaled $3.9 million. The nine-hole, par 36 golf course cost approximately $5.2 million in public funds--supported primarily from Wyandotte's tax increment finance district and the issuance of tax increment bonds.

Although many industries have simply closed their doors and walked away from contaminated sites, BASF worked closely with other partners until a workable solution was developed. In the process, the city realized the opportunity to double the amount of waterfront accessible to the public and create a catalyst for revitalization of the surrounding neighborhood, while the Michigan Coastal Management Program furthered the national goal of revitalizing waterfronts and enhancing public access to the coast.

For further information, contact Kenneth Walker, Office of Ocean & Coastal Resource Management, National Oceanic & Atmospheric Administration, phone: (301) 713-3113 X 157, E-mail:Kwalker@coasts.nos.noaa.gov.

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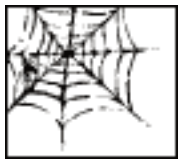

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"Pilot Project Goes Airborne"
Mapping Critical Resources in Narragansett Bay

Characteristics:

Narragansett Bay covers 147 square miles of water surface. Its watershed covers an area of 1,657 square miles, of which 39% lies within Rhode Island and 61% is within Massachusetts. Nearly two million people live in the watershed, making it the most densely populated estuarine area on the East Coast.

- The Narragansett Bay Estuary Program's Comprehensive Conservation and Management Plan (NBEP CCMP) identifies beds of eelgrass (Zostera marina) and salt marshes as critical resource areas of outstanding ecological significance. The protection and restoration of these resources are high priority initiatives of the NBEP, now a program within the Rhode Island Department of Environmental Management (RIDEM).
- Eelgrass provides valuable habitat and a food source to fish, shellfish, and waterfowl, as well as controlling bottom sediment erosion within an estuary. Likewise, salt marshes produce and export large quantities of biomass to nearby waters to form the basis of the estuarine and marine food web, and help maintain water quality by filtering pollutants and recycling nutrients.
- Local Rhode Island scientists and researchers have shown that eelgrass habitat in Narragansett Bay has severely declined over the past hundred years. These areas once were considered the most productive scallop and lobster harvesting grounds.

The Problem:

State and local environmental managers lack the tools to effectively protect critical resources in Narragansett Bay--especially eelgrass habitat--due to outdated information and insufficient resources. The development of accurate maps showing the distribution and abundance of eelgrass beds and salt marshes (including fringe marsh) is a crucial, yet costly, step in the process. The NBEP has begun to fill this need through an innovative and collaborative approach.

The Project:

The goal of the project was to develop a critical resource inventory that would serve as the basis for a bay-wide approach to resource protection and restoration. The project evolved from a pilot mapping effort using donated equipment and staff time to a much larger effort using federal and state grant funding to purchase new 1996 color aerial photographs of the bay and to professionally delineate and map the eelgrass beds, salt marshes, and other coastal features.

The National Estuary Program:

Estuaries and other coastal and marine waters are national resources that are increasingly threatened by pollution, habitat losses, coastal development, and resource conflicts. Congress established the National Estuary Program (NEP) in 1987 to provide a greater focus for coastal protection and to 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 projects that demonstrate innovative approaches 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-Palmico Sounds, NC; Barataria-Terrebone 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; and Tillamook Bay, OR.

Introduction to Narragansett Bay:

Narragansett Bay is not only an estuary of national significance, but has also been referred to as "Rhode Island's most important resource". The bay includes 147 square miles of water surface. Its watershed extends over an area of 1,657 square miles, of which 39% lies within Rhode Island and 61% is within Massachusetts. Nearly two million people live in the watershed, making it the most densely populated

estuarine area on the east coast. The waters of the bay are used for transportation, shellfishing, research, recreational and commercial fishing, boating, swimming, as well as US Navy-related activities.

The multiple demands placed upon the bay by its citizens have caused documented environmental degradation. Point and nonpoint source pollutants as well as coastal development have had major impacts on the bay. As one example, nutrient-enriched ground water emanating from densely developed neighborhoods near the bay and surface failures of septic systems in unsewered areas have caused overgrowth of nuisance seaweeds (e.g., Ulva lactuca L.) in coves and embayments. It is in these locations where eelgrass, and the marine life that depended on it, had once flourished.

At the present time, 40% of Narragansett Bay is permanently or conditionally closed to shellfish harvesting because of sewage-derived bacteria and viruses. A number of coves and embayments suffer from seasonal dissolved oxygen depletion, algal blooms, and occasional fish kills related to organic loadings. Without the identification and effective protection from human activities, ecologically critical areas (areas that function as important fish breeding, feeding and nursery areas, or support rare species or diverse natural communities) could be permanently impaired or lost.

Overview of the Project:

The NBEP organized the Aquatic Habitat Mapping Workgroup made up of environmental scientists, planners, and engineers from various federal and state agencies, universities, and nonprofit organizations who share a common interest in protecting and restoring critical resources in Narragansett Bay. Members brought to the table different technical backgrounds and skills which provided for comprehensive and creative discussions on approaches to solve both immediate and long-term problems related to the resources of concern. With limited available funding, the workgroup conducted a pilot project to map eelgrass beds using donated equipment and staff time. The results showed that the methodology utilized was not feasible for mapping the resources of the entire bay. However, research into other mapping efforts in New England which utilized remote sensing led the NBEP to purchase new aerial photographs as a basis to map critical resources. Partnerships between members of the workgroup and others--and generous donations of equipment and staff time along the way--made this mapping project possible.

Initiative Objectives:

The objectives were to develop updated Geographic Information System (GIS) maps and information on a priority subset of the critical resources of Narragansett Bay in order to: a) evaluate proposed development projects and their impacts; b) develop state and local policy and defensible regulatory programs to protect specific habitats in the bay; c) develop baseline data on which to design habitat restoration; d) monitor changes in the distribution of these habitats; and e) increase public awareness through educational efforts.

Implementing the Initiative:

In 1995, the NBEP organized the Aquatic Habitat Mapping Workgroup with representatives from the

NBEP and other RIDEM programs (GIS Program, Fish and Wildlife, and Agriculture), Save The Bay, Inc. (a major environmental advocacy group), Roger Williams University, Brown University, the RI Coastal Resources Management Council (CRMC), and the U.S. Fish & Wildlife Service (USFWS).

Since that time, the NBEP has assembled the workgroup monthly to evaluate existing habitat mapping and data, identify future mapping needs, and build coordinated projects. Because of limited resources, cooperative projects were the most effective way to accomplish the common goals. The workgroup recognized eelgrass and coastal wetlands, especially fringing salt marshes, as ecologically critical resources. It was determined that the state did not have current, accurate maps of these resources. Due to limited time, it was decided to make eelgrass a priority for a demonstration mapping project.

In July and October, 1995, members of the workgroup traveled to Rose and Goat Islands off Newport, RI, to perform a pilot eelgrass mapping project. Mapping data were collected in known eelgrass bed locations using small boats, a Trimble Pathfinder ProXL Global Positioning System (GPS) unit, and scuba divers. The information was processed using ARC/INFO GIS software to create a base map and to show locations of the existing eelgrass beds. Contributions and loans of equipment, resources, and accommodations by RIDEM, Trimble Navigation in Middletown, RI, and the Rose Island Lighthouse Foundation made the project possible.

An evaluation of the methodology used in the pilot project led the workgroup to pursue alternative approaches. The NBEP investigated efforts by other states in New England mapping eelgrass habitat using remote sensing (including Massachusetts Wetlands Conservancy Program and Maine Department of Marine Resources). The National Oceanic and Atmospheric Administration's Coastwatch-Change Analysis Program (NOAA C-CAP) had recently developed national protocols for the delineation of submerged aquatic vegetation (SAV) and coastal wetlands, recommending the use of aerial photography to develop accurate baselines against which to monitor long-term changes.

With a better understanding of the benefits of remote sensing for resource mapping, two successful grant proposals to fund a bay-wide critical resources mapping project were prepared. Save The Bay, Inc. launched a major public outreach campaign for habitat protection and restoration with funding from the Pew Charitable Trust. The James W. Sewall Co. was hired to perform the aerial overflight in the summer of 1996 utilizing the NOAA C-CAP guidelines and to produce true color aerial photographs at scales 1:12,000 and 1:40,000.

Because of its expertise in project design and photo-interpretation, the University of Massachusetts Natural Resource Assessment Group (NRAG) (formerly with the USFWS National Wetlands Inventory) was contracted to interpret the aerial photographs to identify, delineate, and classify SAV (primarily eelgrass), salt marshes, and coastal features (barrier beaches, cobble beaches, spits, bars, mud flats, oyster reefs, and coastal banks). NRAG has been successful in differentiating eelgrass beds from other SAV using 1:12,000 scale photographs. This information was then transferred to mylar U.S. Geologic Survey 7.5 minute series quadrangle base maps to be digitized and incorporated into the state GIS in order to produce resource maps.

Data from the project will be available to environmental permitting agencies and local planning groups, and will be a central component of the NBEP's efforts to develop a bay-wide approach to habitat protection and restoration. Overall, the project has created a network of agencies, technical groups, municipalities, and nongovernmental organizations ready to continue collective action to protect and restore critical resource habitat. Funding for this project was made available through the US EPA, the RIDEM Aqua Fund, and Save The Bay, Inc.

Success Stories of the Initiative and Follow-up Projects Underway:

- This has been the first successful attempt in the northeast to use remote sensing techniques to differentiate eelgrass from other SAV. Other programs found that remote sensing was useful for locating and mapping SAV beds but additional field effort was required to differentiate the signatures of eelgrass from other species.
- In the summer of 1997, the NBEP and RIDEM GIS Program started to work cooperatively with the Town of Bristol, RI by providing technical assistance in developing GIS resource mapping for the town's Harbor Management Plan. Maps showing locations of critical resources, along with policies providing protection of these resources, will be incorporated in the plan. Roger Williams University and the NBEP will work with the town on developing a public outreach and educational package. Computer hardware, ArcView software, and training will be provided to the town to maintain and update these coverages.
- Partners in this initiative have agreed upon the need for a science-based mechanism for analyzing coastal marshes so their restoration potential can be defined. As a result, the NBEP and NRAG have been working with the University of Rhode Island's Department of Natural Resources Science, USFWS, and Save The Bay, Inc. to apply an innovative approach to facilitate the efforts of decision-makers to locate and prioritize wetlands which are practical and feasible to restore. Using baseline information from the salt marsh inventory described above, along with expanded photo-analysis techniques, new GIS maps will be created to show the locations of all the potential coastal wetland restoration sites in the bay. A data base of information on each site will be developed. Another goal of this effort is to build local awareness of and support for restoration efforts and to guide communities through the necessary planning steps.
- The NBEP is in the midst of a pilot project funded by US EPA through the Clean Water Act to establish six salt marsh reference sites. Vegetation and fish species are being inventoried at these sites in order to provide a quantitative target for future restoration efforts. The NBEP workplan for 1998 includes provisions to conduct benthic invertebrate inventories and to construct hydrologic models for each of the reference marshes.

Lessons Learned:

- The project has been built on existing and new partnerships between government agencies and nongovernmental organizations that together represented a diversity of skills and resources. This collaborative tackled an incredible amount of work in a short amount of time, balancing technical expertise with public outreach and educational campaigns. The effort could not have been accomplished by any of these partner organizations working alone.

- It was found that the methodology using a GPS unit, small boats, and scuba divers is appropriate to map the perimeter of eelgrass beds on a case-by-case basis in specific conditions: a clear day with little to no wind, a small eelgrass bed, and an urgent need for mapping based on a serious threat to a known, but unmapped bed. For larger eelgrass beds and or a bay-wide mapping effort, this approach would not be feasible.
- The use of remote sensing to map eelgrass provided a synoptic view of large beds and eliminated the initial time-consuming field investigations to determine the presence/absence and areal extent of the resource. As a result, field time could be spent primarily on surveying the edges of the eelgrass beds already delineated on the aerial photographs and in determining species distribution.

For more information, contact Helen Cottrell, RI Department of Environmental Management/Narragansett Bay Estuary Program, 235 Promenade Street, Providence, RI 02908. Phone: (401) 277-4700 ext. 7273, E-mail:narrabay@earthlink.net

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COASTLINES
Information About Estuaries and Near Coastal Waters

Note: This information is provided for reference purposes only. Although the information provided here was accurate and current when first created, it is now outdated.

Disclaimer: The information in this website is entirely drawn from issues of newsletters published between 1994 and 2002 and these issues will not been updated since the original publication date. Users are cautioned that information reported at the time of original publication may have become outdated.

Public Trust Doctrine - A Gift From A Roman Emperor

The next time you're strolling down the beach, thank an emperor for the right to do so. Unless you're in Maine or Massachusetts. Then blame the colonial authorities for giving away this gift of the emperor.

Roman Emperor Justinian, in 530 A.D., gathered together his top legal scholars and ordered them to put in writing all of the laws of the Empire. Thus, the "Institutes of Justinian," the body of Roman civil law, were written. Tucked away in these numerous volumes covering every aspect of Roman life and commerce, was the provision that "By the law of nature these things are common to all mankind; the air, running water, the sea, and consequently the shores of the sea." No one, therefore, was forbidden to approach the seashore. Over the next millennium, Rome fell and the western European countries rose. But the civil law of Rome, the Institutes, formed the basis of law for many of the European countries. Most important from an American perspective, the law of England adopted much of the Roman civil law, recognizing the public nature of tidelands and waters, and giving them protection in the name of the King for the use of all English subjects.

As the Kings of England granted charters to the colonies, the English law of public shorelands came to America. With the only true highways for commerce being the rivers, bays, and open ocean, nearly all commerce depended upon ships, wharves, and harbors. Free use of the shorelands and waters was imperative, not only for commerce, but also for sustenance and survival. Early court records are replete

with the colonists using the shores for hunting; fishing; swimming, bathing and washing clothes; beaching their boats; collecting sedge, seaweed and shellfish; cutting ice; watering their cattle; preparing flax; and as a clear passage for walking, riding horses, or driving carriages from cabins to town.

So important were the shorelands to the colonists, that when the thirteen colonies formed the Union and granted to the new federal government vast expanses of land known as the Northwest Territory, the 13 states kept the shorelands under their control. As the next 37 states entered the Union, they did so on an "equal footing" with the original 13, and they, too, gained control over their shorelands. The shorelands were now given protection, in the name of the state, for the use and enjoyment of the public, both living and future generations. These rights of the public to the shorelands and waters are known today as Public Trust rights, and the shorelands and waters known as Public Trust lands and waters. States hold these lands and waters, not as they "own" upland for state parks or forests, but in trust for the benefit of the public. Hence the name Public Trust Doctrine.

So today, thanks to Emperor Justinian, you can stroll down the beach and enjoy your trust rights just about everywhere in the United States, including the five U.S. territories and commonwealths -- the Virgin Islands, Puerto Rico, Guam, American Samoa and the Commonwealth of the Northern Mariana Islands. The exceptions are Massachusetts and Maine.

In these two areas the need for wharves became the critical factor. The shorelands of the Colony of Massachusetts (which included what is now Maine), sloped so gently, and had such vast mudflats, that long wharves had to be built in order to reach water deep enough for the trading ships to dock. Without such lengthy docks and wharves, commerce was strangled. But the colonial coffers were empty, consequently the Massachusetts colonial government couldn't build them at public expense. So to encourage private citizens to build them, the common law of England was altered in 1641 and again in 1647 by a colonial ordinance, providing that the owner of waterfront land owned not just to the high water mark of the beach, but to the low water mark--which in Massachusetts could be a great ways out. The public still had some rights on the privately owned shores, according to the ordinance, but these rights were limited (and remain so today) to "fishing, fowling, and navigation." Thus, in Massachusetts and Maine, you can stroll down the beach with a fishing pole or shotgun in hand (if you have the proper licenses), but not your granddaughter's hand in hand.

But, just about anywhere else in the United States, with some limited exceptions of other "private beaches", one can stroll the beach at ease, just as long as you stay on the beach and don't trespass on the landward private property. With the proper fishing license, you have the right to fish from shore. You can swim from the beach, sail your boat over the waters, collect shells, or just collect your thoughts. You can't trespass over private land to get to the beach, but once there, these are the Public Trust rights of every member of the public in the United States.

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[Mr. Slade is the editor of the recently-completed book "Putting the Public Trust Doctrine to Work", available at $30 through the Coastal States Organization in Washington, DC, (202) 508-3860. Ed.]