COASTLINES

Information About Estuaries and Near Coastal Waters

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Information About Estuaries and Near Coastal Waters
Winter 1996, Volume 6, Number 1

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US Ports

Accepting the Challenges of The 1990s

Over the past two decades, American seaports have faced two major challenges; maintaining sufficient depth in navigation channels for ships to reach shore safely, and maintaining adequate access to the port from the land side to allow movement of cargoes to the nation's interior. Today, ports continue to grapple with these issues but, to their credit, most have begun to realize hard-fought successes.

Dredging

Ports have spent millions of dollars, and more than a decade studying, justifying, restudying, and rejustifying dredging projects that had originally been identified in the late 1970s--in many cases before environmental issues were seriously factored into the dredging equation. In some instances, new projects have begun, but by and large, Congressional authorization and regulatory approvals for channel deepening have been slow in coming. The challenge has not necessarily been the actual dredging of the channels as much as it has been the disposal of the dredged materials. The search for disposal areas which both protect human health and are environmentally sound can be difficult, as well as costly and time-consuming. US ports have sought to move through this process with a combination of long-range, environmental planning and innovative mitigation techniques. In many cases, acceptance of these costs as the price of doing business has been difficult, but necessary.

The US west coast ports may be the most vivid examples of success in dredging-related issues. Dredging issues on the west coast have centered on one major port, the San Francisco Bay area's Port of Oakland. That is not to say that the problem has gone away at other ports, but Oakland has been the hardest hit of the seven major container ports on the west coast because of the lack of the ability to dredge. After many years, Oakland only recently started the actual process of dredging its channel. The other major ports; Seattle, Tacoma, Portland, Los Angeles, and Long Beach are disposing of dredged materials either on land or creating new land. One of the lessons learned from the Oakland project was that much more

effort was needed in long term planning for dredging and disposal. As a result, a long term management strategy for dredged materials disposal is in the trial stages of development; the process includes all Federal, State, and local agencies, the ports, and the public.

Changes in the patterns of international waterborne cargo transportaion have forced US ports to change---or lose out on business.

Land Side Access

Changes in the patterns of international waterborne cargo transportation, reflected by the development of new technologies in marine equipment and intermodal land transportation, have forced US ports to change--or lose out on business. The use of land-oriented transportation rather than all-water services began in earnest in the 1980s. East and Gulf Coast seaports were no longer assured of a share of the growth market--that of waterborne cargo originating from the Pacific Rim. Throughout the 1980s and the early part of the '90s, the majority of the cargo destined for midwest and eastern regions arrived on the US west coast and then was shipped over land, utilizing innovative, double stack railroad technology.

To resolve land side access problems, ports have literally created corridors for trucks and rail services and given up huge quantities of valuable waterfront land to create rail capacity at their terminals. On, or near-dock rail eliminates congestion and reduces energy utilization and air pollution caused by over-the-road traffic coming to and from marine terminals. Each port has dealt with the problems of land side

access in its own way. Reducing the number of truck movements, improving rail access directly to maritime facilities, and creating new access corridors are the most common methods.

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Examples from the Pacific Coast

In response to access problems, the major container ports of the US west coast, where the majority of the newer, larger vessels from the Pacific Rim will dock, have kicked into an expansion mode. The Ports of Seattle and Tacoma, WA; Portland, OR; Oakland, Los Angeles, and Long Beach, CA are preparing to spend millions of dollars each, and have dedicated a minimum of 200 acres of land to either increase facilities now operating, or to create new facilities. All of these ports have experienced double digit increases in container volumes in the last ten years and they expect to continue this upward trend through the '90s.

- The Port of Seattle will increase two of their major container terminals by 90 acres each, including development of "on-dock" rail facilities to reduce highway transportation moving to and from these terminals. Seattle, by virtue of the depths of the Puget Sound has never required dredging.

- The Port of Tacoma has recently completed a dredging project, using the disposed material, some of which comes from a Superfund site, to create 25 acres of new land. Completion of a new access route will create opportunities on over 500 acres of property for new terminals and intermodal facilities.

- The Port of Portland is facing some difficult environmental issues in its planned channel deepening. In addition, the port expects increases in its overall commitment to intermodal cargo with substantial expenditures for expanded rail facilities.

- The Port of Oakland anticipates development of over 500 acres of abandoned federal property to capitalize on the benefits of a deeper channel. Oakland's plans include the creation of a major intermodal rail facility; a single terminal for all four of the major railroads serving Oakland.

- The Ports of Los Angeles and Long Beach have launched developments that will total nearly 2,000 acres of additional port facilities over the next ten years. The Port of Los Angeles has created over 300 acres of land and plans completion of an additional 580 acres. The creation of this land will be initiated with the beginning of a dredging project to deepen their channel to 63 feet in order to accommodate larger vessels. In addition to this project, Los Angeles has joined with Long Beach to create a combination rail and road access from both ports linking them to national rail and road systems. The twenty mile long corridor will reduce congestion in surrounding communities, minimize the environmental impacts from increased traffic, and expedite the distribution process.

All of these dredging and land expansion projects have faced close scrutiny of their environmental impacts, and have had to balance economic realities and social needs with the requirements to protect natural resources over the long run. Both Los Angeles and Long Beach have engaged in a process of buying environmental credits, purchasing acres of wetlands to preserve their natural habitats in exchange, on a one for one basis, for the ability to create or develop land in the port areas. Both ports have been engaged in the rehabilitation of a number of wetlands in the southern California area for some time.

US seaports will continue to be faced with challenges in business, and environmental protection. The current challenges have necessitated additional environmental awareness and compliance, but, by and large, ports are moving forward with development plans.

For further information on ports and port equipment matters, contact Martin Pilsch at the Urban Harbors Institute, UMASS-Boston, 100 Morrissey Boulevard, Boston, MA, 02125-3393, (617) 376-2295.

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About the Urban Harbors Institute....

The Urban Harbors Institute provides contemporary solutions to age-old problems.

Historically, urban harbors have been centers for commerce and culture throughout the world. Consequently, they are intensely used and often suffer major environmental degradation. The Urban Harbors Institute (UHI) at the University of Massachusetts, Boston campus was created to utilize a multi-disciplinary approach to explore these issues. The Institute undertakes its mission in close affiliation with the University's Environmental Sciences Program and various non-profit organizations, private industries, and government agencies.

The Institute's mission is carried out through a combination of applied research, conferences, courses, and publications on port and waterfront planning, marine transportation, harbor management, international coastal zone management, and environmental education. In addition, the Institute provides technical assistance and consultation regarding policy formulation to federal, state, and local governments, non-profit organizations, private industries, and community groups.

Three diverse projects demonstrate UHI's range of problem-solving approaches to studying urban harbor issues on the national, international, and local levels.

The National Water Transportation Study

Waterborne transportation has existed for centuries as a critical factor in port and harbor development, yet no national comprehensive record of its attributes exists. As a result, important decisions regarding the future of water transportation cannot be guided entirely by past experiences. To remedy this, and to guide the formulation of water transportation policy, the US Department of Transportation has commissioned UHI to conduct a national study of water transportation and its intermodal characteristics. Pursuant to this, the Institute developed a National Water Transportation Database, conducted a study on the Impact of the Americans With Disabilities Act of 1990 on the waterborne passenger vessel industry, co-sponsored the Landside Access to Cargo Ports Roundtable, and published numerous reports on

intermodalism, port access, subsidies, and the community impact of ferries.

The results from these studies have been used nationally to formulate water transportation policy, and locally to inform discussions about the future of water transportation.

The World Bank Study Tour

The Black Sea is presently experiencing extraordinary stress from pollution, and adverse economic and environmental impacts are evident in coastal zones throughout the region. To assist in analyzing these problems, the World Bank provided financing for UHI to assist Bulgaria, Romania, Turkey, Ukraine, Russia, and Georgia in developing legal and institutional capacities to manage sea resources through an integrated coastal zone management plan.

To provide a frame of reference for this process, the Institute developed a training program in coastal zone management (CZM) for visiting Black Sea officials. The goal of the program was to identify American CZM practices which could be applied to the Black Sea Region. To facilitate this, the Institute discussed the nature of American CZM programs and provided site visits in Massachusetts, Rhode Island, and North Carolina.

The Saugus River Project

Closer to home, UHI provided technical assistance in the wake of coastal and riverine flooding in the Saugus River area of Massachusetts. The State Executive Office of Environmental Affairs requested that UHI evaluate the potential for non-structural solutions to the flooding problems. The Institute developed a plan which addressed flood risks to residential, industrial, and commercial structures, as well as public infrastructure and safety based on criteria established by the Army Corps of Engineers. UHI also offered suggestions for implementing the plan.

By bringing academics, regulators, and industrialists together to provide a multi-disciplinary focus to solve coastal problems, the Urban Harbors Institute hopes to help meet the environmental, economic and cultural challenges of our coasts and harbors.

For more information about these projects or the Urban Harbors Institute, please contact Rich Delaney, Urban Harbors Institute, University of Massachusetts-Boston, 100 Morrissey Boulevard, Boston, MA 02125-3393, (617)287-5570.

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Watershed Management and Dredging

Approximately 400 million cubic yards of sediment are dredged and disposed of each year by numerous interests in the United States, including federal, state, and local governments and private entities, to maintain and improve waterborne navigation. Port dredging is done to create and maintain sufficient depth so that ships, boats, and smaller vessels can move safely in and out of our nation's harbors, bays, and estuaries. Disposal of the dredged materials requires a federal permit, and can be very controversial, especially if the sediments are contaminated by toxic pollutants.

Over the years, dredging-related laws have become more numerous and have created a more complex permit process. The laws have increased the number of agencies directly involved in the permit process, broadened the US Army Corps of Engineers' responsibility to include protection of non-navigational resources, and established an elaborate system of checks and balances. A 1980 Government Accounting Office study of the dredged material permitting process identified 17 Federal statutes with which dredged material disposal projects need to comply, and that generally require additional coordination with, and review by, other agencies and the public.

Comprehensive dredged material management within a region offers an opportunity to address many of the concerns which have been raised about the current complex, project-by-project permitting process. Through comprehensive dredged material management planning, all of the dredging needs of a region can be considered at once; a variety of dredged material disposal alternatives can be considered and integrated to meet such needs; and a long-term, comprehensive plan is developed to meet dredging needs and promote protection of the environment. However, in order to maximize the benefits of comprehensive dredged material management planning, it should be linked with broader watershed planning.

In December, 1994, the federal Interagency Working Group on the Dredging Process, which was convened at the direction of the Secretary of Transportation, Federico Pena, made 18 recommendations for improving the dredged material permitting processes. In particular, the Working Group recommended that dredged material managers work with watershed planners to identify point and nonpoint sources of

sediment and sediment pollution, and to implement watershed planning. This type of coordinated planning within a watershed framework can help reduce contaminant loadings at their sources, which will result in long-term benefits for downstream dredging operations. Additional benefits to adopting a watershed approach for dredged material management planning include:

- Dredged material managers can access an established network of stakeholders informed about the resources within a watershed.
- Technical information about, and monitoring of, the resources in a watershed can be shared between dredged material managers and watershed managers.
- Watershed planning can identify critical or degraded habitats that may provide opportunities to use dredged material beneficially in habitat creation or restoration.
- Increased cooperation and coordination can improve the efficiency of the permitting process, including reducing the time needed to process dredging permits, and increasing opportunities to use regional permits to cover a collection of similar activities.
- Improved coordination of navigation channel dredging with sediment remediation dredging operations reduces both costs and future contamination of navigation channels.
- Wider recognition of dredged material disposal as a priority problem within watersheds.

There are also a number of obstacles to conducting dredged material management planning within a watershed framework:

- Perception among the dredging community that there may be additional costs, both in time and money. In many cases, however, the coordinated approach is likely to reduce costs in the long run.
- Dredged material management may not be a high priority for water quality planners and regulators, who tend to be focused on water quality problems instead of sediment contamination.
- The science involved in identifying upstream sources of downstream contaminated sediments may not be adequate to compel necessary actions.

There are several activities underway to support this new approach. Guidance is being developed by the National Dredging Team, consisting of the US EPA, the US Army Corps of Engineers (ACOE), NOAA's National Marine Fisheries Service and Office of Coastal Resources Management, the US Fish and Wildlife Service, and the Maritime Administration, to serve as a basis for preparing long term plans for dredged material disposal for ports and harbors across the country. The plans will be prepared by Local Planning Groups (to be created), to be chaired by the ACOE along with the Ports. The ACOE is already

developing plans for federal dredging projects, and this new guidance expands that effort to include non-federal projects, and broadens stakeholder involvement to include environmental advocacy group and State agencies with economic, resource, or regulatory concerns about dredging. In addition, EPA is currently preparing a primer on conducting dredged material management from a watershed perspective.

For more information, contact Tom Chase, U.S. EPA Oceans and Coastal Protection Division, (4504F), 401 M Street, SW, Washington, DC 20460, (202)260-1952.

SIDEBAR...

In addition to the National Dredging Team, Regional Teams are also being established. These groups, made up of regional representatives of the same federal agencies as the National Team, also include representatives of state, Tribal, and local agencies with jurisdiction in the areas of dredging and dredged material disposal. The Regional Teams will be chaired by EPA and the Army Corps of Engineers. One of their goals is to provide a forum for key stakeholders such as Port Authorities, environmental advocacy groups, and others with economic, resource, or regulatory concerns.

To contact the Regional Dredging Teams in your area, contact the Regional EPA office or the US Army Corps of Engineers District or Division office.

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Partnerships in Corpus Christi Bay, Texas

Located in the center of the Corpus Christi Bay National Estuary Program (CCBNEP) study area is the Port of Corpus Christi Authority (PCCA), the sixth largest port in the nation based on tonnage. The principal commodities handled at the port are crude oil, refined petroleum products, bulk minerals and grains. The 45-foot deep shipping channel, approximately 32 miles long, crosses Corpus Christi Bay to connect the Gulf of Mexico with dock facilities and tributary channels within the port complex.

Corpus Christi Bay and the adjoining Laguna Madre entered the National Estuary Program in December of 1993, and are currently in the planning phase. Several priority issues identified by the CCBNEP are of vital interest to the PCCA, including the overall condition of living resources, wetlands, estuarine ecology, water and sediment quality, estuarine circulation, human and economic uses of the bay, identification and remediation of pollution sources, freshwater inflow, dredging and the beneficial use of dredged material, and bay debris.

Because the regional economy is in large part dependent on the safe and efficient passage of deep draft ships and intracoastal barges used in international and domestic commerce, maintenance dredging and channel improvement is a necessity. About three million cubic yards of dredged material are handled annually. While the majority is pumped to contained dredged material placement areas or placed offshore in EPA approved ocean disposal sites, approximately one million cubic yards are deposited in open water placement sites within Corpus Christi Bay.

From the perspective of the port authority, a thorough understanding of the environmental effects and physical fate of dredged material placed in the open water is needed in order to develop appropriate management actions in the context of the CCBNEP Management Conference.

A Cooperative Effort

In 1994, the PCCA, in partnership with the US Army Corps of Engineers, Galveston District, proposed conducting a $500,000 study to assess the environmental and physical consequences of open water

placement of material from maintenance dredging in the Bay. However, in order to coordinate with CCBNEP characterization studies and to determine if the proposed work met the needs of the state and federal resource agency and citizen environmental interests in the region, the PCCA convened stakeholder meetings. Participants, including representatives from federal, state, and local government agencies, environmental interest groups, industry, and citizens groups were invited to evaluate and critique the purpose and methodology of the proposed work, and to suggest enhancements to the scope to make the study as comprehensive as practicable. Because of this input, the study will reduce the cost of dredging, and provide a much clearer sense of the impacts of open water disposal in the Bay.

Current Status

The project was initiated in August 1995, prior to dredging scheduled for October 1995. One study focus is to investigate the effect maintenance material placement has on benthic infauna and rate of benthic recovery. This portion of the study is being conducted by the US Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi. The three major objectives are to map the extent of disturbance from dredged material placement on the bay bottom, to determine the rate of benthic recovery following disturbance, and to place the disturbance and recovery data in context of conditions in the Bay system.

The other significant project focus is to monitor the short and long-term fate of dredged material placed in the authorized sites. This portion of the work is being performed by the Conrad Blucher Institute, Texas A&M University, Corpus Christi, TX. Major objectives of the work address the influence of maintenance activities on turbidity, material movement from the placement areas back into the channel, and acquisition of data needed to predict the movement of fine grained sediments. Meteorologic, wave climate, hydrologic, and other necessary physical measurements are being collected from a fixed platform station located in a placement site and a mobile platform. This study should be completed by November 1996 and will be available to help people all over the world to predict the effects of dredging in their ports and harbors.

For further information on the project, contact Paul Carangelo at the Port of Corpus Christi Authority, P.O. Box 1541, Corpus Christi, TX 78403, (512) 882-5633.

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New Habitats in Sarasota Bay

Harbors, bays and estuaries are critical to the lives of many species of marine fish, shellfish, and bird life. NOAA's National Marine Fisheries Service estimates that 70% of all commercially-harvested fish spend a significant stage of their lives in an estuary. Humans also use these water bodies heavily--and these two uses often come in conflict, often with detrimental effects to the natural resources. The Sarasota Bay National Estuary Program, concerned with the impacts to living resources, has developed a series of mitigation approaches.

In its level of development and historic disruption of natural resources, Sarasota Bay is similar to many other harbors and embayments around the country. Nearly 39% of its tidal wetlands and 43% of its seagrass meadows have been lost, largely to dredging for the intracoastal waterway and filling for development of canal communities. More than 75% of the original shoreline has been modified, mostly due to seawalls. These changes resulted in major losses of suitable habitats for shorebirds, juvenile fish, shellfish, and other organisms. The resulting impact to the ecosystem has been felt by the commercial and recreational industries of the region.

While there may be no real substitute for natural habitats, some engineering options are available to partially mitigate the losses. The Sarasota Bay National Estuary Program (the NEP) is looking at four approaches.

Reforming Seawalls

Widespread construction of seawalls and bulkheads meant the loss of large amounts of shallow subtidal and intertidal areas where fish spawn and live a critical part of their juvenile lives. Because they are basically smooth, vertical slabs of concrete or steel, seawalls provide very little in the way of protection or habitat for fish.

The NEP, with funding from the US EPA and the Florida Department of Environmental Protection, sponsored the development of inexpensive seawall modules to attract larval, juvenile and adult fish. In a

pilot project, these were deployed and monitored over a period of almost two years. The results showed fish abundance over 100 times greater at the modules compared with equal lengths of typical seawall, suggesting that artificial habitat modules have great potential for improving fisheries habitat value.

Shoreline Softening

The City of Sarasota is planning the development of a bay-side community park on a site presently delineated by a seawall. The original plans for the park called for reinforcement of the seawall and construction of a boat pier. The NEP suggested to the city that additional environmental, recreational, and aesthetic benefits could be achieved if the seawall was broken up and a tidal pool established in order to integrate habitat restoration with the other concerns.

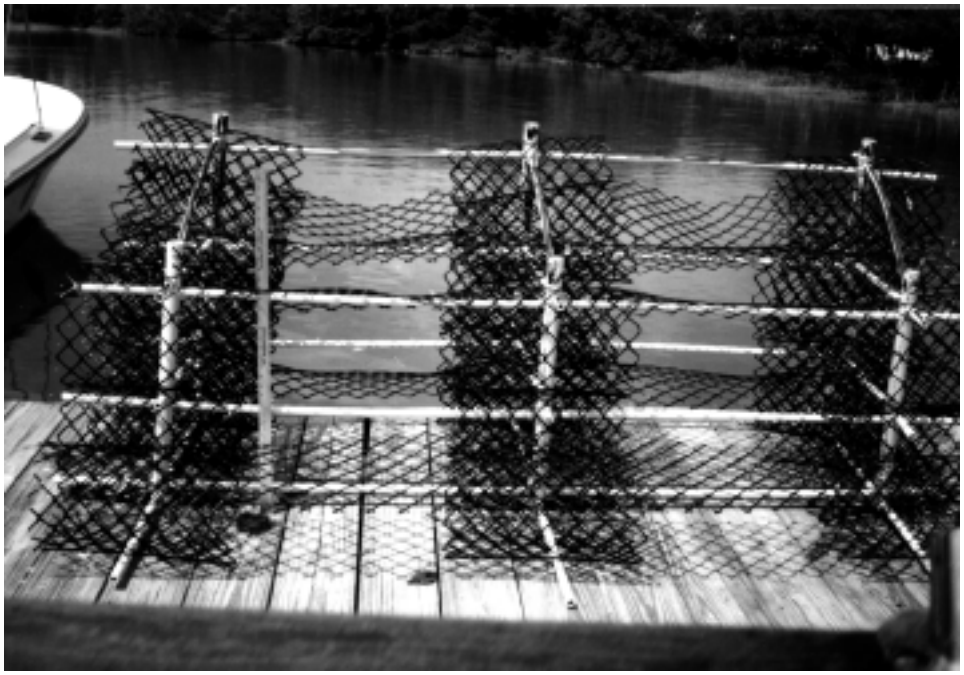
The conceptual design now calls for cutting approximately 300 feet of seawall at the mean tide level and distributing the material near shore in formations which both mitigate wave energy and foster shellfish habitat. At one end of the seawall, an opening will be made to allow tidal flow into an excavated pool. Native plants will be used to protect the shoreline from erosion, provide wading bird habitat, and mitigate stormwater runoff.

Bay Bottom Improvements

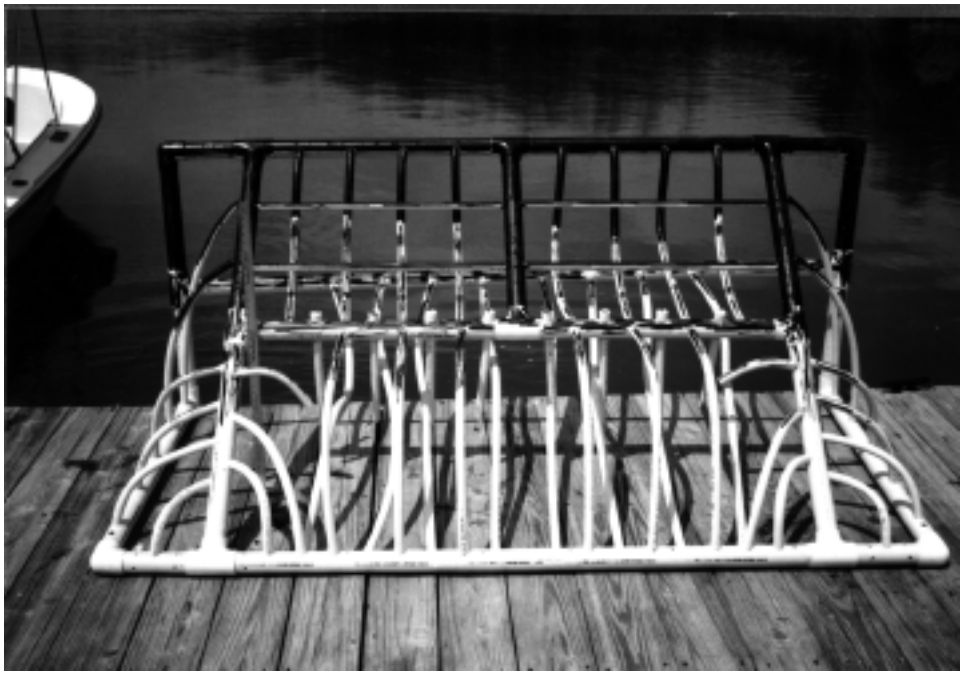
More than 4,500 acres of Sarasota Bay bottom have been damaged through dredging for coastal development. In the 1950s and 1960s, dredge and fill operations were conducted in order to build waterfront property. This often resulted in "pockets" with water depths of 12 to 18 feet in otherwise shallow bay areas. Many of these areas were originally productive seagrass beds providing living areas for fish and shellfish.

Because such holes have low velocity currents or poor circulation, over time they have collected fine sediments and organic material--sometimes up to four or more feet thick. The net result is a bottom habitat far different from the natural bay bottom; one with anoxic sediments which support very little plant or animal life. These areas contribute to bay water quality problems by acting as a source of turbidity during storm events or when prop wash from boats re-suspends fine-grained materials.

To help mitigate these problems the NEP has designed a program to carefully fill the holes (while avoiding harm to adjacent seagrass beds). Around the holes, artificial reef structures will be placed to provide substrate for epiphytes and other organisms, habitat for larger animals, and to control erosion. The artificial reef structures consist of PVC posts driven into the sand, steel piles connected with old fishing net, or concrete block piles. These techniques are expected to improve water transparency, prevent further losses of seagrasses and shoreline habitat, and restore lost habitats.



Seawall modules to increase fish habitat



Channel Markers as Habitat

Many areas in Sarasota Bay are identified by regulatory or navigation markers. The NEP is testing the use of artificial habitat structures such as "reef balls" which allow the markers to be used as anchors and locators for small scale habitat enhancement projects. If proven to be a viable approach, it may be possible to establish a policy calling for the placement of these structures when new markers are installed or old ones are replaced.

The Big Picture

Significant questions remain about the effectiveness of wide-scale use of such habitat enhancement. Past projects have shown dramatic increases in abundance of fish around individual artificial structures. A critical question is whether the very high abundance observed reflects a general increase in fish populations or merely the result of attraction and concentration of fish from nearby areas. If substantially larger amounts of artificial habitat were to be deployed, would fish density at artificial habitats remain as great, would the same number of fish be distributed at lower density over the additional artificial habitat, or would an intermediate condition of increased number, but decreased density occur? Quantitative answers to these questions will provide information valuable in understanding fish/habitat relationships in bays and estuaries. From a practical standpoint, these answers are essential for evaluating the cost effectiveness of artificial habitat approaches.

For Further Information

For more information on these projects, contact Susan Walker or Jaime Doubek at the Sarasota Bay National Estuary Program, 5333 N Tamiami Trail, Suite 104, Sarasota, Florida 34234, (941)359-5841.

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Port Townsend, WA: Cooperation to Help the Sound

Port Townsend, WA is an historic fishing port on the Kitsap Peninsula in Puget Sound with a population of 7,740. If you look over a road called Sims Way, just as you're passing northwest of the port, you'll see below you a piece of land that looks overgrown and vacant. Far from being a neglected patch of dirt, this piece of land is actually a very sophisticated biofiltration system helping to remove pollutants from stormwater runoff. This is the result of a collaboration developed by the city of Port Townsend and the port of Port Townsend.

The Puget Sound Water Quality Authority sees it as a model for the kind of "innovation and cooperation that must be used if we're going to provide effective protection for Puget Sound," according to Authority's Executive Director Nancy McKay.

For decades, stormwater has drained from about 80 acres north and west of this site and across Sims Way, picking up toxic chemicals, petroleum wastes, and debris. "The polluted stormwater then poured onto the wetlands that lie to the northwest of the port, contaminating that critical habitat," says McKay. Stormwater from port property flowed into the same area, increasing both the erosion and sedimentation of the wetland. The contaminated water, too much for the wetlands to filter or absorb, then ran into Port Townsend Bay, and Puget Sound.

"As the city and the port have grown, the problem has grown. The wetlands, which are on port property, are extremely important to migrating waterfowl and urban wildlife. These are designated as critical areas under the local comprehensive plan," she notes.

In 1993, the city approached the port about building a biofiltration swale adjacent to the existing wetlands to "pretreat" the stormwater. The port already pays into the city's stormwater fund, and could have declined to help because the problem was within the city's jurisdiction. Instead, when asked, the port management not only cooperated, but fully participated by committing staff, and more than one-

third of the funds for the project.

The project eventually evolved into a partnership between the city and the port, that also included a high school student and the school district, the Friends of Kah Tai Lagoon, Washington State University's Cooperative Extension Program, and the Washington Department of Transportation.

The city submitted a proposal to the Puget Sound Water Quality Authority for help in funding the $80,000 project. The city and port each contributed about a third of the costs. Jefferson General Hospital contributed about $5,000 as mitigation costs for the runoff from the hospital parking lot. The Authority provided about a third of the cost using funds from a 1993 congressional appropriation.

During public review of the project, a citizens group, the Friends of the Kah Tai Lagoon, asked for changes in the design. The port and city determined that the changes would improve the project and agreed to them, even though the changes doubled the cost of the design.

The project was built to convey stormwater into a swale to filter out pollutants and debris and to control the rate of flow. The water then seeps into the wetlands in volumes where it can again be naturally filtered, before running into Puget Sound.

The project partners also saw the educational value of the project. Washington State University Extension's local Water Watcher Program incorporated the project into its adult education program, and Port Townsend High School students were actively involved in reviewing the project and monitoring water quality at the site.

The contribution of Port Townsend High School junior Sara Westerman was particularly noteworthy, says McKay. She was part of the school's Mentorship Program and was assigned to work on the project on a day-to-day basis, becoming an "invaluable member of the team."

"For her part, Sara tells us she feels extraordinarily lucky to have been part of this project. She says the wetland was a dying place, and now people have joined together to bring it back to life" said McKay.

"The Port Townsend stormwater/wetlands project is about finding that resource we often find so elusive these days; the resource of each other, of working together to solve difficult environmental problems," commented McKay.

"For the past decade, the Puget Sound Water Quality Authority has worked to build partnerships which would help to clean up and protect Puget Sound", explained McKay. "The stormwater/wetlands project in Port Townsend is an example of how such partnerships can work. Despite some obstacles and initial disagreements, the people decided to solve a complicated problem -- and did."

For more information, contact Barbara Fenster at the Puget Sound Water Quality Authority, P.O. Box 40900, Olympia, WA 98504-0900, (360) 407-7300.

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Purging Ships Of Aquatic Invaders

As Asia's clams and crabs take America's Pacific ports by storm, many people are pointing the finger at ships' ballast, where aquatic species often hitch a transoceanic ride. At least 2.4 million gallons of ballast water arrive in US harbors from foreign ports every hour, according to a recent Sea Grant 1 study The average ship coming into San Francisco Bay to tank up on oil or load bulk cargo may unload 3 to 13 million gallons of ballast water with its accompanying menagerie of foreign invaders. In the face of this onslaught, concerned officials and scientists are considering control options ranging from simple precautions such as not taking on ballast water at night when more critters are out in the water column, to complex on-board ultrasonic treatment and tough preventive laws.

The current preferred method for purging ballast of unwanted plants and animals is for ships to dump ballast from the previous port at sea and then replace it with ocean water. The theory is that the saltwater organisms in the replacement ballast are unlikely to survive if discharged in the fresher, more temperate waters of a subsequent estuarine port. This prevention method is outlined in 1993 guidelines from the International Maritime Organization, which recommends ballast exchange in waters at least 2000 meters deep.

But deep sea ballast exchange may not be a magic pill. Indeed, the Sea Grant shipping study says a combination of different ballast exchange, treatment, and management options may be more effective. The study describes and evaluates 32 different control alternatives, including: specialized shoreline treatment facilities to provide and accept ballast water; on-board mechanical filtration to prevent organism uptake; on-board extermination of organisms by agitation or salinity alteration, chemical, thermal, ultrasonic, ultraviolet treatment, or oxygen deprivation; passive disinfection by increasing the length of the voyage; micromanagement, in which ships refrain from ballasting in disease hot spots or at night when more organisms may be present; and ballast exchange in calmer waters closer to port.

Many of these measures are long-term, requiring changes in the way ships are designed and ports are equipped. Whatever the approach, shippers are likely to prefer an international standard so that the regulations aren't different in every port. Currently, no international law exists, just the maritime

organization guidelines. In the US, the Great Lakes -- already ravaged by a European Zebra mussel and threatened by other exotic species -- is one of only two regions that mandate at-sea ballast exchange. As local lore has it, the first time the Coast Guard notified a vessel entering the Lakes region that it was planning to test the salinity of the ship's ballast water, the captain poured table salt into his tanks to comply.

"Spot checks with good enforcement and high penalties bring a high level of compliance," says marine biologist Andrew Cohen, who has just completed a major study of exotic species intrusions for the US Fish & Wildlife Service. "There's no reason why the same laws couldn't be applied to the San Francisco Bay, with great benefit." Cohen says one exotic aquatic species has been introduced into San Francisco Bay every 24 weeks since 1970!

Environmentally, all ports and harbors benefit from an international standard. Even though less than 3% of all the exotic species arriving via ship's ballast actually become established, according to the Sea Grant study, it only takes one species to do great damage. In Suisun Bay, an estuary in the northern part of San Francisco Bay, a single species of Asian clam was recently credited with grazing the entire phytoplankton food supply down to aquatic stubble.

For further information, contact Ariel Rubissow Okamoto at the San Francisco Bay National Estuary Program, 2101 Webster Street, Suite 500, Oakland, CA 94612, (415) 989 2441.

1The Role of Shipping in the Introduction of Nonindigenous Aquatic Organisms to the Coastal Waters of the United States (other than the Great Lakes) and an Analysis of Control Options, Carlton, Reid & vanLeeuwen, National Sea Grant College Program/Connecticut Sea Grant Project, Report No: CG-D-11-95

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.

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Partnerships Provide Public Access on the Hudson

The lower portion of the Hudson River Estuary, flanked on one side by Manhattan and on the other by New Jersey, is one of the most highly developed shorelines in the world. In the late 1960s and early 1970s, the post-industrial waterfront of Hudson and Bergen Counties in New Jersey reflected the conditions of many port and harbor areas that had "turned their backs on the water". It contained a series of abandoned factories, railroad yards and rotting piers, and, despite the incredible vistas of the New York City skyline, almost no public access.

In 1966, the "The Lower Hudson" Study included a remarkable proposal--a pedestrian walkway along the River. This was remarkable not so much in the concept, but rather in the difficulties in implementation. The walkway would extend for 18.5 miles through nine different municipalities and cross hundreds of parcels of private property. Two mechanisms were proposed to create the public access system; construction on public properties, and regulatory requirements for the development of walkway segments as a provision of permission for construction along the shoreline. In 1980, the Waterfront Development Act expanded the jurisdiction of the New Jersey Department of Environmental Protection (NJDEP) to 500 feet from the water's edge--and provided the authority to require walkway construction with any major construction project. In the 1980s, economic interests re-discovered the waterfront, this time for water-enhanced commercial and residential use rather than water-dependent industrial use--and the segments of the walkway began to be put in place. The economic down-turn of the 1990s, and legal challenges to regulatory exactions as seen in US Supreme Court cases such as Lucas and Dolan, have had a chilling effect, but there is still progress.

At present, approximately seven miles have been completed with five more miles in the pipeline. While these are scattered somewhat unevenly across seven communities, and in some cases are poorly linked, each new segment brings the day closer when the entire 18.5 miles will be open to the public. The NJDEP has issued more than fifty Waterfront Developments permits, each requiring public access.

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The success to date reflects adherence to the original plan, despite over 30 years of changing economic, political, and regulatory conditions. The partnerships forged between government, commercial development, and public interest groups have shown that the benefit to the public far outweighs the difficulty in implementing a project of this magnitude. And the owners of commercial properties along the waterfront will enjoy financial gain when the walkway facilitates access for additional customers and provides an amenity to increase property values.

All of this work was recently recognized by a Top Honor Award from the Washington, DC-based Waterfront Center in their Excellence in Waterfront design competition.

For additional information, contact William Neyenhouse of NJDEP at (609) 984-0273.