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## **Information About Estuaries and Near Coastal Waters January 2002 - Issue 12.1**

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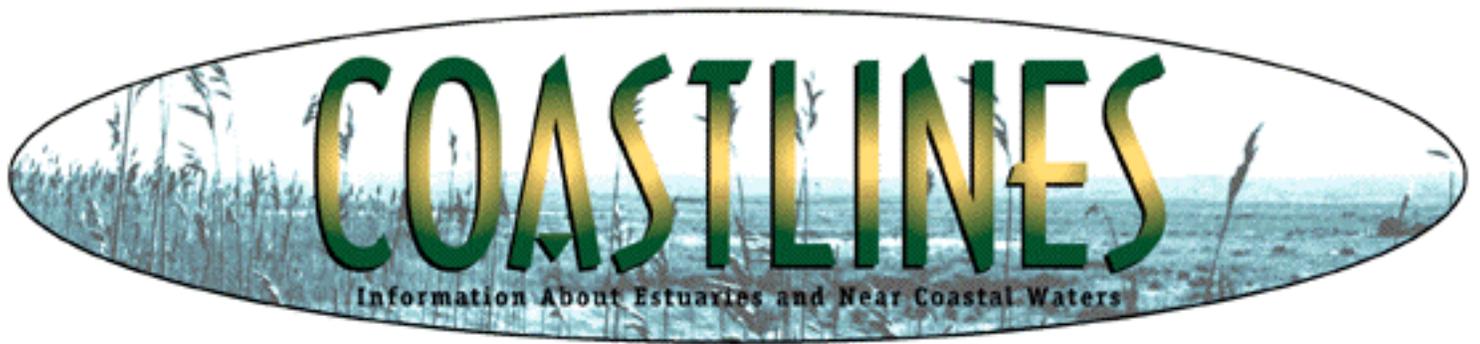
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## Beach Restoration Effort Replaces Bulkheads in Mobile Bay

The Maryland Bay Game, an innovative and creative way to educate hundreds of thousands of children and motorists about one of the nation's greatest natural resources, the Chesapeake Bay, recently completed its third successful year. The Bay Game is designed to be played in the car while traveling from Maryland's Chesapeake Bay Bridge to the state's top summer vacation spot, Ocean City. Playing the game turns restless energy and a long car ride into an educational experience. The creative use of characters or mascots, Ol' Blue, Betty Lou and Baby Blue, help both youngsters and big kids alike identify with the Bay Game's environmental, historical and cultural messages while having fun! The success of this program is due to a multi-agency, intergovernmental and public/private collaboration. The Bay Game is published by Maryland state agencies, federal agencies and private corporate sponsorships.



Mobile Bay, located along the gulf coast of Alabama, is one of the Gulf of Mexico Program's twelve priority areas for enhancing habitat and water quality. One of the goals of the Gulf of Mexico Program, which encompasses all five Gulf states, is to maintain and improve Gulf habitats that support living resources while demonstrating that coastal development and environmental problems don't have to be

synonymous. A recent beach restoration project, supported by the Gulf of Mexico Program, is an example of how place-based environmental projects can be the key to sustainable development.

Many say one of the most beautiful views of Mobile Bay is from the second green of the Gulf Pines Golf Course at the University of South Alabama. Before steps were taken to restore the beachfront, the shoreline leading up to the green was slowly being eaten away by the force of the bay. When the drop from the edge of the green to the beach grew to 10 to 12 feet, it was clear that action was required to restore the shoreline. With the help of technical and financial assistance, in the form of a \$164,500 grant from the Gulf of Mexico Program, University of South Alabama engineers found a way to restore the disappearing beach, protect the fragile intertidal habitat, and preserve the natural beauty of the area and the view from the green.

Bay shoreline erosion is a common problem throughout the entire Gulf of Mexico. A common solution to eroding shorelines is to build a bulkhead, but these structures can create additional problems. Bulkheads detract from the aesthetic beauty of the shoreline by destroying sandy beaches. More importantly, they cause the loss of critical habitats in the shallow area between high and low tides. The intertidal zone, where marsh grasses grow, serves as a nursery ground for a number of aquatic creatures, including shrimp, oysters, and crayfish. When intertidal habitat is lost, the creatures that depend on that habitat are lost as well. One bulkhead may have relatively small impacts, but when multiplied along the entire shoreline of the Gulf of Mexico, bulkheads represent a significant loss of habitat. In 1955, bulkheads reinforced eight percent of the entire bay shoreline; by 1997, bulkheads had increased to thirty percent of the bay shoreline. During the same period, several miles of beaches and more than 20 acres of beach habitat disappeared.



*Shoreline at Gulf Pines Golf Course prior to beach restoration.*



*Shoreline at Gulf Pines Golf Course after beach restoration.*

To address the shoreline erosion at Mobile Bay, engineers at the University of South Alabama designed an affordable, attractive alternative to constructing bulkheads. In August, 1998, the research team created a 300-foot stretch of beach that protects 500 feet of shoreline. The team back-filled a breakwater-protected area with sand and stone to diminish the force and energy of waves eating away at the shore. In

addition to being low maintenance, the cost of this artificial beach was competitive with bulkheads and proved successful in late September 1998, when it withstood the force of Hurricane Georges 70 mile-per-hour winds.



*Shoreline protected using bulkheads.*

During the hurricane, water levels reached about eight feet above normal and wave heights exceeded six feet. The rock breakwaters and beach fill survived the storm with minimal damage. One university official credits the artificial beach with saving the university more than \$75,000 in green repair costs.

Ecologically, there is a general consensus that it is too soon to evaluate the success of this artificial beach. However, it is apparent that the beach construction has not had the adverse effect on intertidal habitat seen with bulkheads. At this restored beach, schools of fish swim in the shallow water, crabs run along the sand and rocks, birds feed in the intertidal zone, and submerged aquatic vegetation grows right up to the rock breakwaters in places.



For further information, contact Terry Hines Smith, Gulf of Mexico Program; Phone: (228) 688-1159; E-

mail: [hines-smith.terry@epa.gov](mailto:hines-smith.terry@epa.gov); or visit the website at

<http://www.epa.gov/gmpo/pubinfo/artificialbeach.html>, [EXIT disclaimer >](#) or contact Scott Douglass,  
Department of Civil Engineering, University of South Alabama, Phone: (251) 460-6174; or E-mail:  
[sdouglas@jaguar1.usouthal.edu](mailto:sdouglas@jaguar1.usouthal.edu).

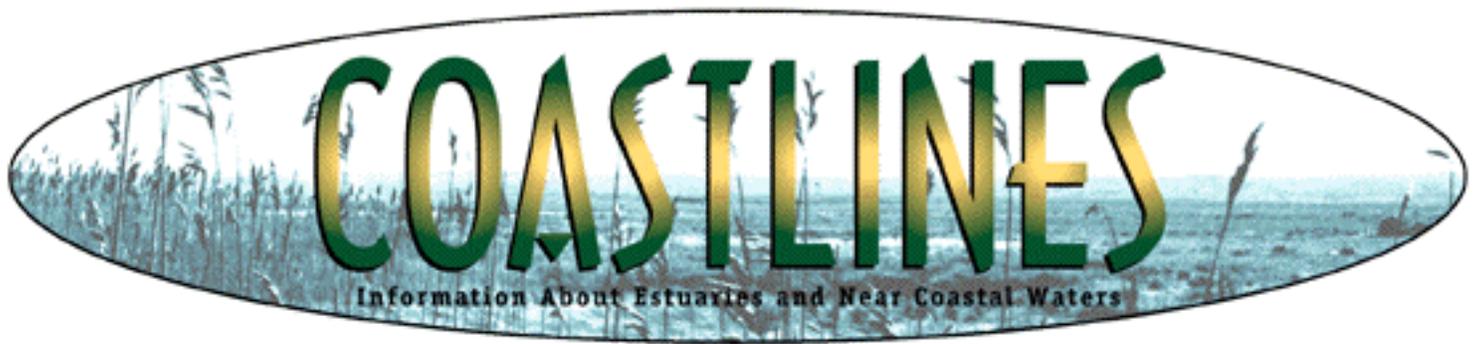
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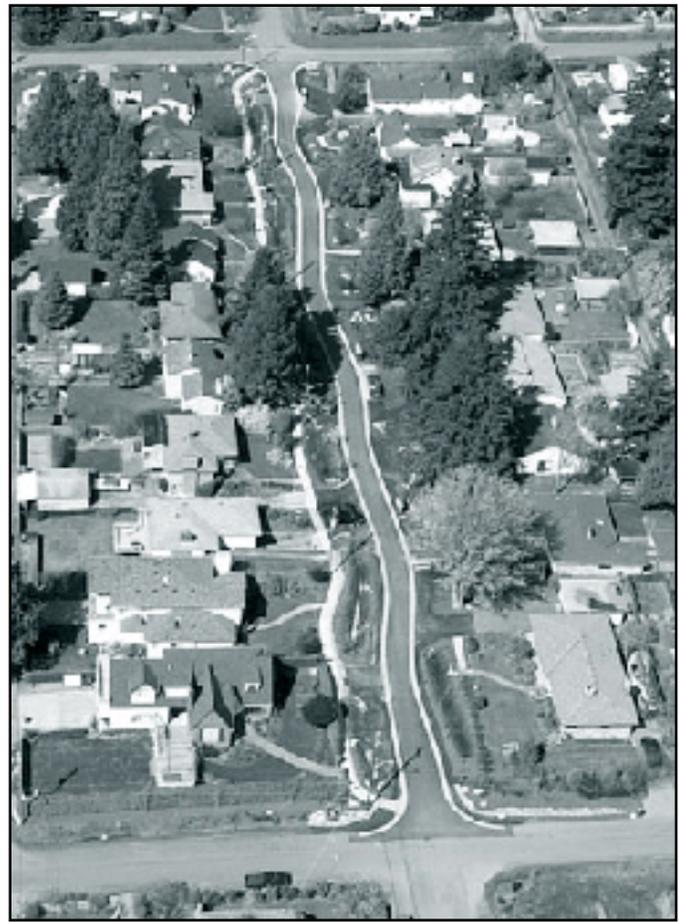
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## **Low Impact Development Practices Using Nature to Manage Stormwater**

**What is Low Impact Development?**

Stormwater engineers and coastal managers are always on the lookout for better ways to manage stormwater. It may be a new storm drain insert, a high efficiency street sweeper, or a chemical flocculant to better control erosion at construction sites. An especially promising new set of practices is, as they say, as old as the hills. These practices allow nature to manage stormwater in its own way, as it has done for millennia. These stormwater management techniques are collectively known as low impact development, or LID practices, and the Puget Sound Water Quality Action Team is promoting their use.

LID is based on the premise that nature knows best. For example, there is very little runoff in a forested area—most rainfall infiltrates to the ground, is taken up by vegetation, or evaporates to the atmosphere. Rather than collecting and conveying stormwater off-site through pipes and other conveyance systems, LID-designed sites use vegetation and small-scale hydrologic controls to capture, treat and infiltrate stormwater on-site, helping to maintain the natural hydrology as development occurs.



When a developer's site planning includes LID practices, the site's natural runoff patterns are mapped and all sensitive areas and natural drainages, such as streams and wetlands are set aside. Portions of the site's trees and other native vegetation are also set aside. The remainder of the site is the development envelope. Impervious surfaces, such as roads, driveways, parking areas and rooftops, are reduced by narrowing roads, using permeable paving materials, or by planting roof gardens. Runoff from impervious surfaces is directed to specially designed landscaped areas (called bioretention cells, or rain gardens) or to the native vegetation that was set aside, allowing runoff to be captured, filtered and infiltrated. Soils compacted during construction are amended with compost or other organic material to restore their capacity to infiltrate runoff and grow healthy plants.

While every site cannot accommodate each practice because of local conditions, each site should be assessed to determine which LID practices are most appropriate. Given the wide range of practices available, every site should include at least a few of the practices.

When combined with effective local land use planning and watershed or basin planning, LID can help protect watershed resources as communities grow.

### **Why is LID important?**

Studies show that traditional stormwater management practices have not been entirely successful in mitigating the effects of development on Puget Sound's resources. Collection and conveyance systems, stormwater ponds and other traditional stormwater facilities can not protect the Sound from the increased

runoff created when native forest is replaced by vast stretches of impervious surfaces and the remaining soil is compacted by heavy machinery.

The result? Stormwater runoff has significantly degraded many streams in Puget Sound. Habitat loss is documented as one of the factors limiting the recovery of salmon under the Endangered Species Act. A multi-year study in King County Washington showed that amphibians and birds in wetlands are more threatened by excessive fluctuations in water levels due to stormwater than by water pollution.

## **Benefits of LID**

Low impact development can provide economic and community benefits. Using LID practices, developers often can increase the amount of developable land by reducing the size of stormwater ponds. They may also be able to lower the capital costs of infrastructure. Local governments and communities benefit by better protecting streams and habitat, shellfish growing areas, and other natural resources. Neighborhoods may benefit by becoming greener and more attractive, and increasing property values. In addition, stormwater facilities are easier to oversee and less costly to maintain.

## **Limitations of LID Practices**

Of course, low impact development practices alone cannot fully protect water quality and biological resources. First, communities must choose where growth is appropriate and then implement these practices in those areas. Local land use planning should include:

- Designating urban growth areas with appropriate densities and capital facilities to reduce sprawl;
- Providing adequate vegetative buffers and development setbacks in critical areas ordinances to protect sensitive areas;
- Assessing how full build-out will alter aquatic resources;
- Using measures to protect natural hydrology and processes, such as setting goals for limiting impervious surfaces and preserving open spaces; and
- Adopting some low impact development practices for redevelopment projects.

For further information, contact Bruce Wulkan, Puget Sound Water Quality Action Team, Phone: (360) 407-7332; or E-mail: [bwulkan@psat.wa.gov](mailto:bwulkan@psat.wa.gov), or visit the website at [http://www.wa.gov/puget\\_sound](http://www.wa.gov/puget_sound).

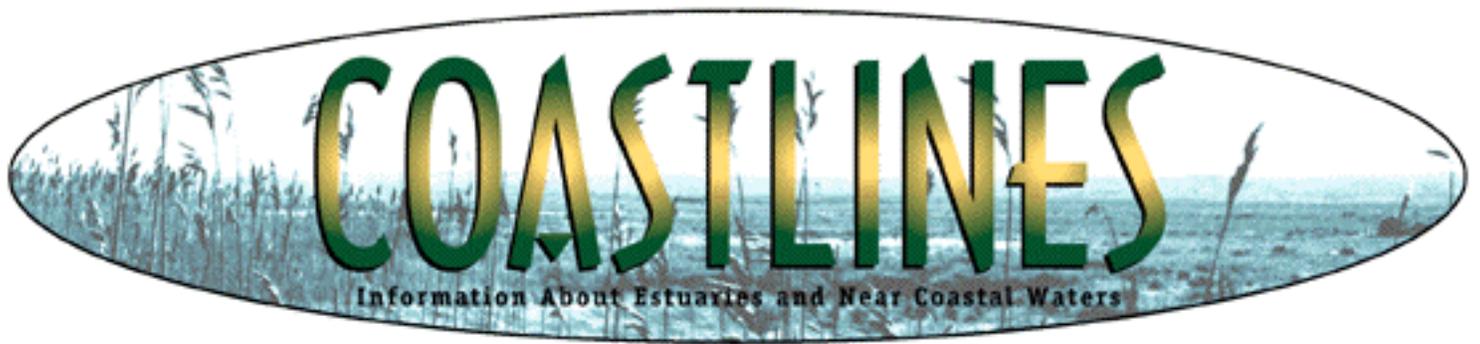
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## **Volunteer Estuary Monitoring Workshops**

The Ocean Conservancy (formerly Center for Marine Conservation), with support from the US EPA, is hosting a series of workshops for leaders of volunteer water quality monitoring programs. Workshops have already been held in Maryland and Florida. Upcoming workshops will be held in:

**Zion, Illinois - March 19-20**

**New Bern, North Carolina - April 8-9**

Topics to be addressed include:

- Defining questions/objectives;
- Quality assurance procedures, checks, and project plan reviews;
- Data management and analysis;
- Measuring water quality parameters;
- Presenting data to different audiences;
- Media, outreach, publicity;
- Volunteer recruitment, training, motivation, incentives; and
- Fundraising.

To facilitate participation by local monitoring groups, lodging will be provided based on need, distance traveled to the workshop, and funding availability. Participants receiving lodging will be asked to share a room with one other participant. A limited reimbursement (no more than \$50 per person) may also be available for travel costs. Priority will be given to the leaders of volunteer monitoring programs located

and operating near the workshop sites. There is no registration fee.

For more information and a registration form, contact Ron Ohrel, Project Coordinator, or Laura Titulaer, Program Assistant, The Ocean Conservancy, 1432 N. Great Neck Road, Suite 103, Virginia Beach, VA 23454; Phone: (757) 496-0920; Fax: (757) 496-3207;

E-mail: [rohrel@oceanconservancyva.org](mailto:rohrel@oceanconservancyva.org); or [ltitulaer@oceanconservancyva.org](mailto:ltitulaer@oceanconservancyva.org)

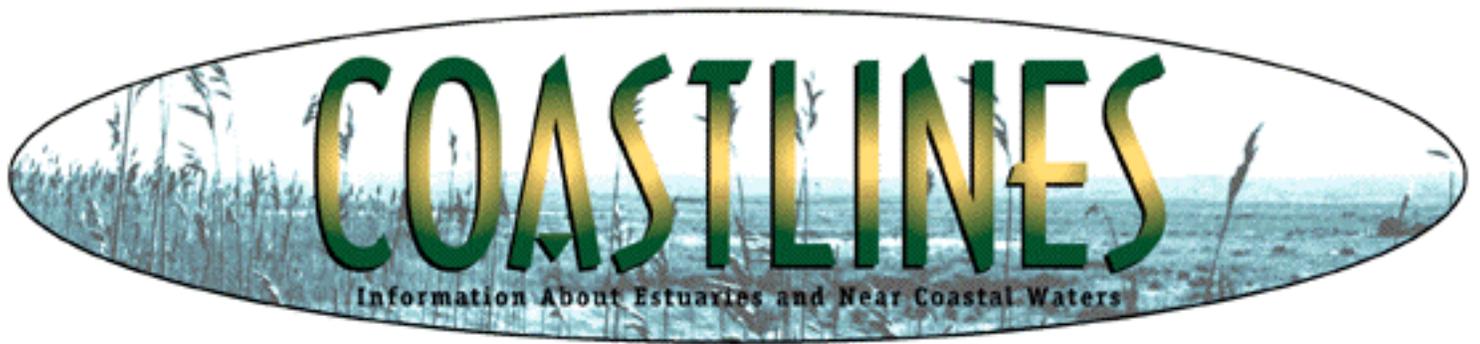
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## **NOAA and Trout Unlimited Join Forces for Coastal Habitat**

The Commerce Department's National Oceanic and Atmospheric Administration (NOAA) and the volunteer organization, Trout Unlimited, are combining forces to restore habitat vital to the conservation of America's coastal fisheries. Under the new partnership, NOAA is slated to provide up to \$1 million over a three-year period in support of Trout Unlimited habitat restoration projects. The NOAA/Trout Unlimited partnership, managed through NOAA's Community-Based Restoration Program, has provided \$210,000 in first year funding to support Trout Unlimited's fish habitat projects selected in the Embrace-A-Stream program and other Trout Unlimited coastal fishery programs. The NOAA-funded projects in the Community Based Restoration Program provide strong on-the-ground habitat restoration components that offer educational and social benefits to the public and the communities in addition to providing long-term ecological benefits for fishery resources.

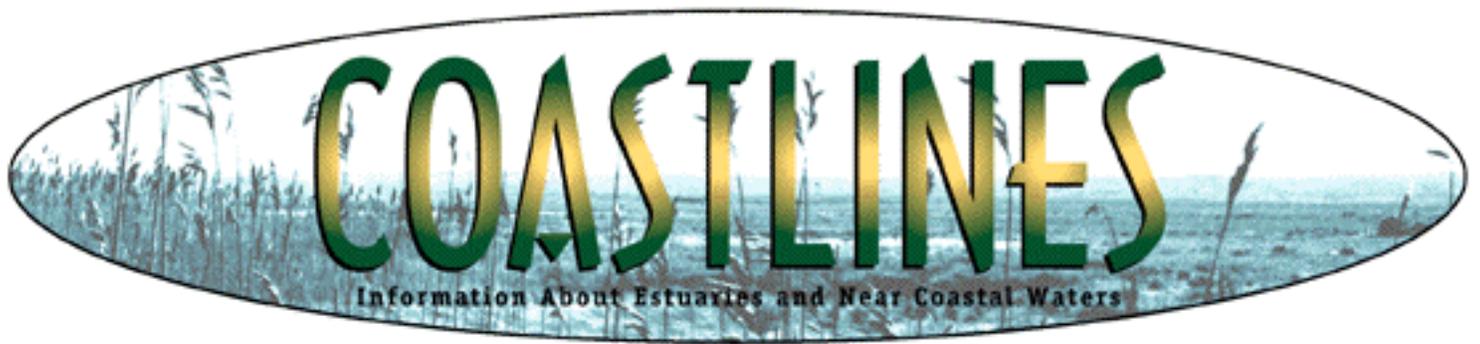
For further information on NOAA's Community-Based Restoration Program, please visit <http://www.nmfs.noaa.gov/habitat/restoration> . [EXIT disclaimer >](#)

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## **Total Maximum Daily Loads NET**

Total Maximum Daily Loads (TMDLs) Net is a new information source for state and local authorities about watershed-based approaches to the design and implementation of TMDLs for the purpose of water pollution control. The site's sponsors, America's Clean Water Foundation and the Association of State and Interstate Water Pollution Control Administrators, hope to foster communication at the local level to make sure that problem solving information, tools, and techniques are available to all communities.

For further information, visit the TMDL website at <http://www.tmdls.net/> .

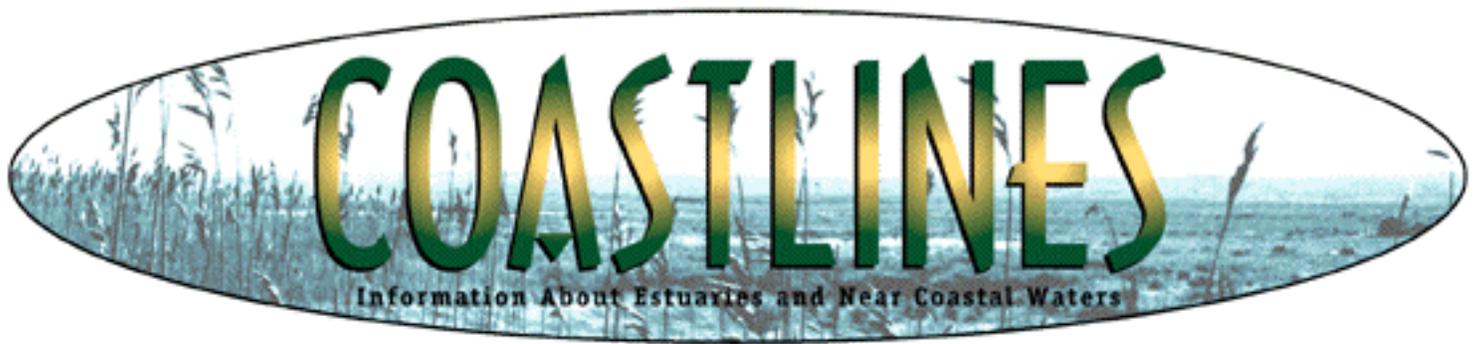
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## **Weather Technology to Measure Rainfall in Watershed Basins**

New weather technology to measure rainfall in watershed basins is now being tested by researchers from NOAA and the North Carolina and South Carolina Sea Grant programs. The new software program utilizes Doppler radar data and satellite imagery to monitor rainfall in watershed basins as small as one square kilometer. Forecasters can use the data to issue more precise and accurate flood and flash flood warnings and identify areas of storm-related concentrations of polluted runoff.

For further information, contact Keli Tarp, National Oceanic and Atmospheric Administration; Phone: (405) 366-0451; E-mail: [Keli.Tarp@noaa.gov](mailto:Keli.Tarp@noaa.gov).

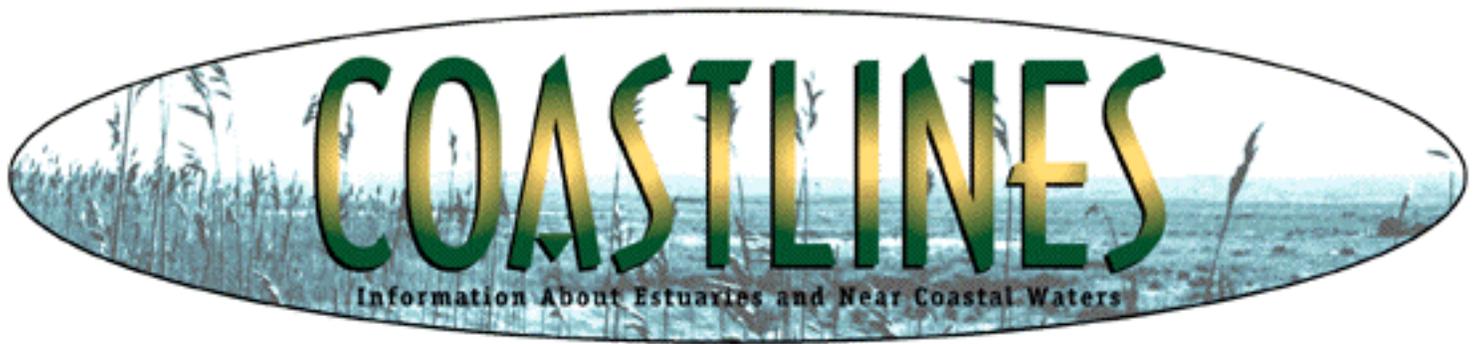
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## **National Estuary Program Habitat Restoration Website**

A new site, entitled Performance Indicators Visualization and Outreach Tool (PIVOT), has been added to the National Estuary Program (NEP) home page. This site provides information on the progress made by NEPs in achieving Environmental Protection Agency's habitat restoration goals. Recently, the 28 estuaries in the NEP restored over 400,000 acres of coastal habitat. The site describes the problem of habitat loss and degradation, and what the NEP is doing to address the problem. The site visually depicts, in maps and reports, the location and type of coastal habitat being protected and restored. The interactive graphic shows how human activities impact the health of estuaries and includes photographs of different types of estuarine habitats. The site was developed in partnership with the National Oceanic and Atmospheric Administration's Coastal Services Center.

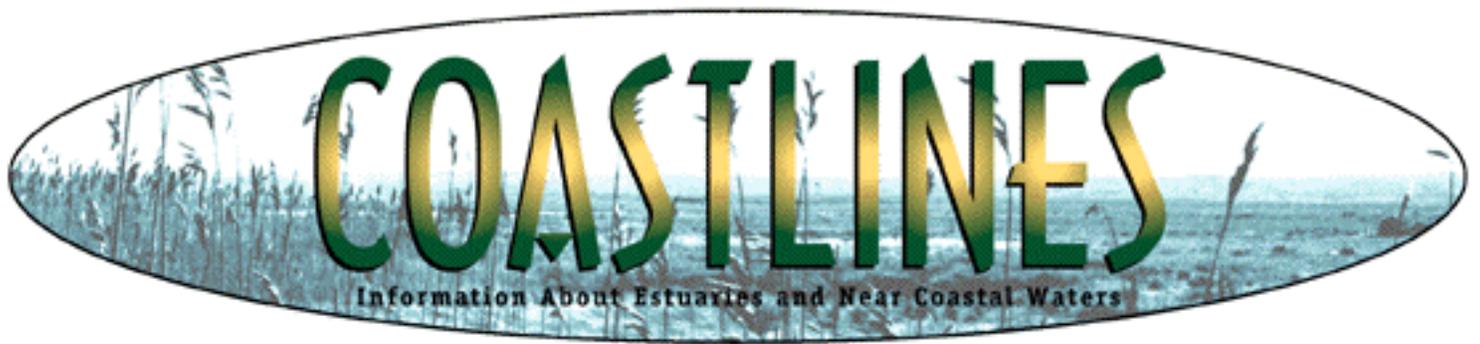
The site can be accessed by clicking on the Coastal Habitat button on the NEP webpage at <http://www.epa.gov/nep/> . 

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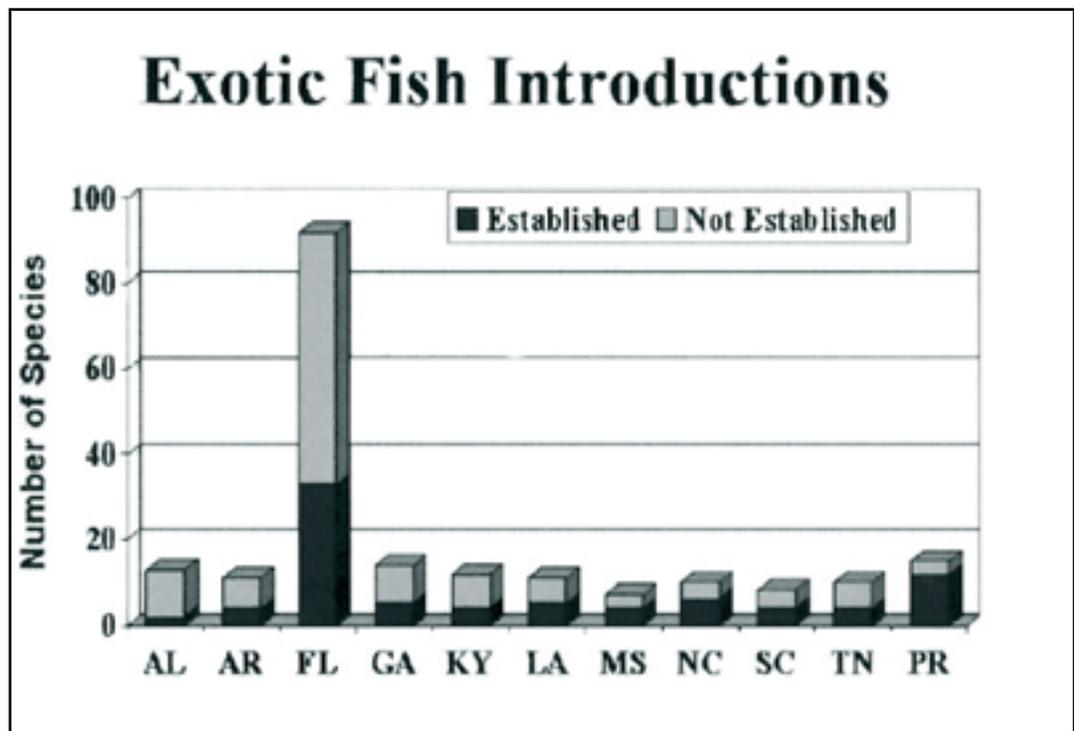
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## **Eyes On The Bay Citizens Help Monitor Tampa Bay**

A new educational campaign launched by the Tampa Bay Estuary Program enlists the aid of boaters, aquarium owners and others in preventing the introduction of potentially harmful invasive species. Besides providing information on ecologically friendly practices that reduce the risk of invasion, "Eyes On The Bay" asks citizens who use the bay frequently to be on the lookout for unfamiliar crabs, mussels and other marine life they encounter.

As global trade and travel accelerate, plants, animals and even microbes are "hitchhiking" around the globe at an unprecedented pace, causing extensive environmental and economic damage. Tampa Bay is not immune to these ecological trespassers, as proven by the recent discovery of a mussel native to Asia in intake pipes of area power plants.

Since it was first observed in 1999, the Asian green mussel has spread rapidly to Sarasota and as far south as Charlotte Harbor. In Tampa Bay, it is found primarily on hard surfaces such as bridge and dock pilings. Only weeks after volunteers constructed a small oyster reef in April, 2001, to help halt erosion of an important bird rookery in Tampa Bay, green mussels began colonizing parts of the structure.



Scientists believe the green mussel arrived in Tampa Bay in

ballast water released by a ship upon entering port in Tampa. Bay managers still don't know exactly what, if any, impact the green mussel is having on native shellfish and habitats. But they do agree that, once established, invasives are nearly impossible to eliminate – and their presence nearly always signals trouble for native plants and animals.

The harmful impacts of non-native plants, such as Brazilian pepper and cogon grass, are well-documented in Tampa Bay, and substantial resources have been devoted to combating these interlopers. But little is known about invasive animals, such as crabs, mussels or fish, in the bay watershed.

A key component of the "Eyes On The Bay" project is a first-ever scientific survey of invasive species in Tampa Bay. The survey, which includes an extensive literature review and field sampling to assess the extent of existing invasive animals, started this fall and will be completed this winter by a team of researchers from the University of Florida and the U.S. Geological Survey (see sidebar).

Although ballast water is a major avenue for the transport of non-native marine animals from one waterway to another, "Eyes On The Bay" seeks to show citizens that they have a key role to play in keeping invaders at bay. Tropical fish may escape from fish farms to canals or streams leading to the bay, residents may release animals from home aquariums without understanding the potential consequences of their actions, and recreational boaters may take their boats from one waterway to another without properly cleaning off the hull and propeller, which can transport tiny organisms and marine plants to Tampa Bay from other areas or states. Non-native plants and animals are also intentionally imported for many reasons, including food cultivation.

Through signs, radio announcements, and TBEP's website "Eyes On The Bay" will present simple precautions citizens can take to make sure they aren't contributing to the "alien invasion," while enlisting them in efforts to monitor and detect potential new trespassers. The data citizens provide will be mapped and used as an early detection tool in identifying the arrival of new species, and hopefully halting the

spread of their progress to other areas of the bay.

"Eyes On The Bay" is being financed by grants from US EPA – which recognizes invasive species as an emerging critical issue for estuaries like Tampa Bay.

For further information, contact Nanette Holland, Tampa Bay Outreach Coordinator, Tampa Bay Estuary Program, MS I-1/NEP, 100 8th Ave. S.E., St. Petersburg, FL 33701; Phone: (727) 893-2765; Fax: (727) 893-2767; E-mail: [nanette@tbep.org](mailto:nanette@tbep.org) or visit the website at [www.tbep.org](http://www.tbep.org). [EXIT disclaimer >](#)

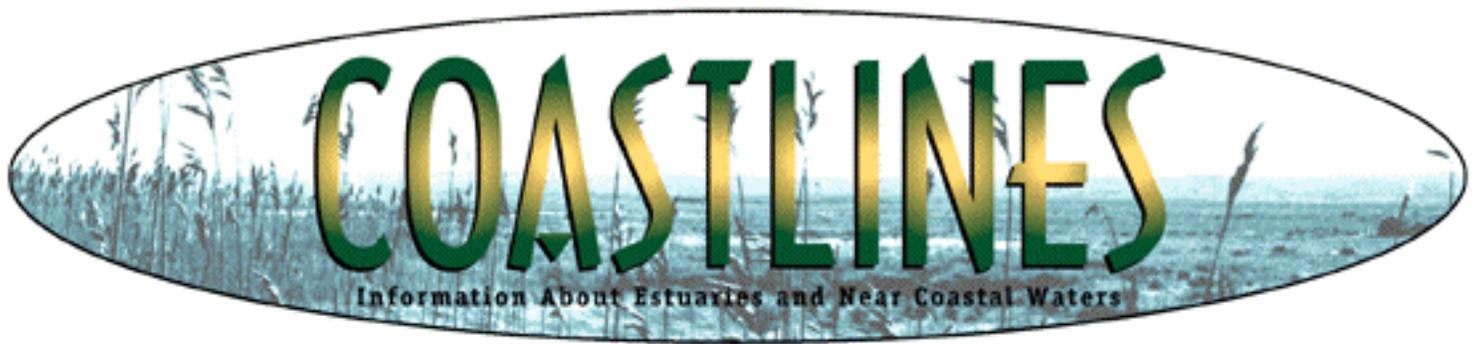
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## **Rapid Assessment of Invasive Species**

So you want to find out the extent of invasive species in your estuary? While each location may dictate different methods and funding may limit the assessment, developing a protocol is a necessary first step to determine the extent of invasive species. An assessment can be in-depth (long-term) or rapid (snapshot). In Tampa Bay, University of Florida and USGS researchers have designed a rapid assessment of marine and estuarine nonindigenous fish, invertebrates, plants, and macroalgae. The rapid assessment technique is not meant to be definitive or exhaustive, but rather, to be an indicator of topics which require further research or immediate management decisions.

The rapid assessment includes a literature search and field surveys. The literature search provides a bibliography of the literature pertaining to the biota of Tampa Bay. From this research, a list of nonindigenous and those of unknown origins is compiled. Representative sampling sites are chosen that reflect the diverse habitats found in Tampa Bay, some sites focus on those likely to be invaded. Three replicate samples will be taken at each site. Species will be identified to the lowest taxonomic level and recorded as either absent or present, along with an index of abundance—rare, common, abundant or dominant. Unknown taxa will be sent to experts and preserved samples of abundant species will be provided for future identification.

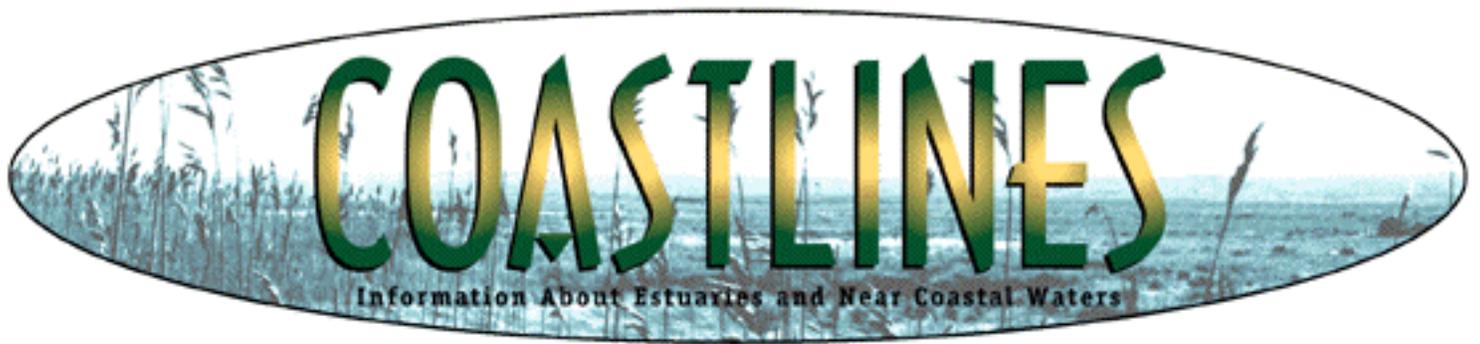
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## **EPA Sets Standards for New Industrial Facilities to Prevent Fish Kills from Cooling Water**

On November 9, 2001, EPA Administrator Christie Whitman signed the first of three scheduled regulations designed to reduce adverse environmental impacts, especially impacts on fish and shellfish, from cooling water intake processes at industrial facilities and power plants. The final regulation will govern the design, capacity, and construction of new structures at an estimated 121 new manufacturing and electric generating plants over the next 20 years.

Manufacturing and electric generating facilities often withdraw water from bays, rivers, and lakes to remove excess heat from the manufacturing processes and electric generation. The cooling water intake process can damage fish and sea life when the intake structures are not properly designed and constructed.

The new regulations are required by the Clean Water Act and must be implemented over the next three years. The first regulation is technology-based, although it is flexible: specific technologies are not required but facilities can innovate and adapt based on local circumstances. Compliance is expected to cost less than \$47 million annually to the industries, with no impact on the nation's energy supply.

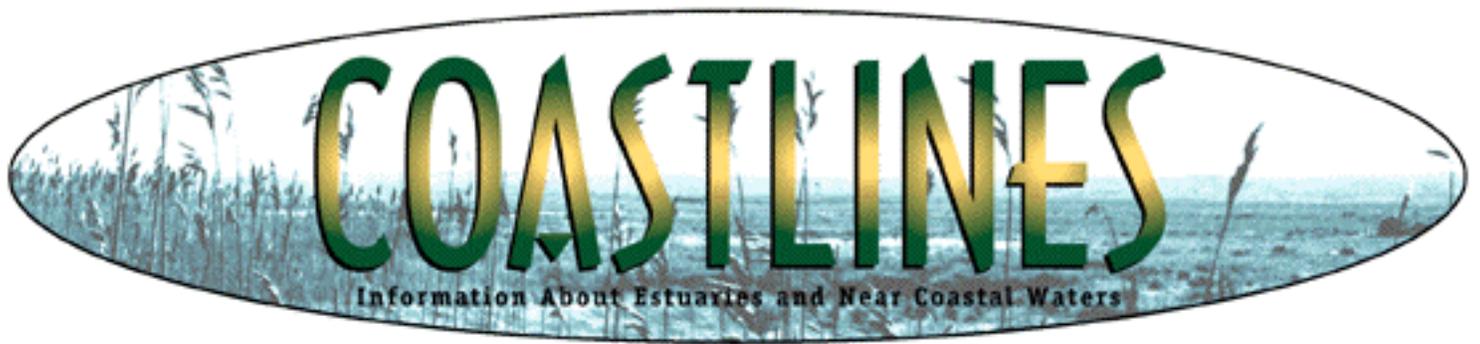
For further information, visit [www.epa.gov/waterscience/316b/](http://www.epa.gov/waterscience/316b/)

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## **Air Pollution Impacts Santa Monica Bay**

### **Introduction**

The Los Angeles metropolitan area is renowned for having some of the worst air quality in the nation. While many sources of pollution that impact Santa Monica Bay are well characterized, aerial deposition has been virtually unmonitored, until recently. The Santa Monica Bay Restoration Project (SMBRP) conducted a study to measure air deposition of trace metals to the bay with grant support from US EPA's Great Waters Program and the Los Angeles County Department of Public Works and in-kind contributions from the Southern California Coastal Water Research Project (SCCWRP) and University of California, Los Angeles (UCLA).

The objectives of the Santa Monica Bay aerial deposition study were threefold:

- 1) Establish the total annual pollutant load of trace metals from direct aerial deposition to both Santa Monica Bay and the bay watershed;
- 2) Assess how large the load is compared to other sources, and
- 3) Determine how the load varies in time and space.

### **Data Collection**

During 1998 and 1999, scientists from UCLA and SCCWRP collaborated to collect and analyze pollutant concentration data in the atmosphere above the bay and its watershed. The study focused on the trace metals chromium, copper, lead, nickel, and zinc. A concurrent study of air toxins by the South

Coast Air Quality Management District (AQMD) provided additional data that greatly enhanced the geographic coverage of the study, adding an additional 24 stations throughout the South Coast Air Basin to the study.

A computer model was used to plot the estimated pollutant distribution of deposition rates at different locations under varying weather conditions. The model indicates that Santa Monica’s watershed has some of the highest atmospheric concentrations of zinc in the air basin.

Researchers also measured contaminant concentrations in the sea-surface microlayer (the very thin, upper surface layer of the ocean) at eight locations in the Bay to study the spatial pattern of deposition in the adjacent water. When the zinc concentration in the sea-surface microlayer was compared with the zinc concentration in the "bulk" water, beneath the microlayer, the observed distribution pattern indicates that the farther away from shore, the less zinc falls on the water. This corresponds well with the modeled aerial zinc concentrations in the watershed and embayment.

## Results

Results of the study found aerial deposition to be a significant contributor of trace metals to the overall pollutant load of the bay, particularly for lead (99%), chromium (50%), and zinc (43%). For the five metals studied, the contribution of atmospheric pollution to the total metal loading varies from 13% to 99% (Table 1). These percentages presume that aerial deposition on the watershed reaches the bay as stormwater runoff during the wet season. Measured metal loadings from stormwater runoff support this presumption.

**Table 1: Comparison of atmospheric and non-atmospheric trace metal inputs to Santa Monica Bay (million tons/year)**

	<b>Atmospheric Input</b>	<b>Non-Atmospheric Input</b>	<b>Percent Atmospheric</b>
Chromium	0.77	0.76	50%
Copper	5.1	16.0	24%
Lead	4.2	0.02	99%
Nickel	0.79	5.24	13%
Zinc	17.7	23.6	43%

Results also show that chronic, daily, dry deposition of metals on Santa Monica Bay and its watershed far exceeds the amount deposited during rain events or during Santa Ana conditions, when large volumes of polluted air move from inland areas out to sea. This is contrary to what is commonly observed along the East Coast, but these results are expected in the Los Angeles basin due the region’s relatively low rainfall and the infrequency of Santa Ana events.

The study also showed that the majority of metals deposited by dry deposition on Santa Monica Bay and

its watershed originate as relatively large (bigger than 10 microns) aerosols from local area sources. Early evidence points to off-highway vehicles (such as construction equipment) and small businesses as the principal sources in the Santa Monica Bay watershed. The predominance of larger aerosols also means that most deposition occurs relatively close to the emission source. For example, while 75% of zinc deposition originated from sources within the bay watershed, only 4.5% of zinc deposition is from sources outside of the watershed.

## Conclusions and Next Steps

The results of the study have several implications for nonpoint source management in the Santa Monica Bay watershed, and in other coastal watersheds exposed to urban air pollution:

- Atmospheric deposition, primarily chronic, daily, dry deposition, must be considered as a significant nonpoint source of metals in establishing TMDLs (total maximum daily loads) for Santa Monica Bay and water bodies in the bay's watersheds
- Reductions of nonpoint source inputs may require a coupling between air quality and water quality regulatory actions and policies. For metals, the most important sources of emission to the atmosphere seem to be non-permitted area sources (e.g., small businesses and off-highway vehicles such as construction equipment) which may be relatively difficult to regulate

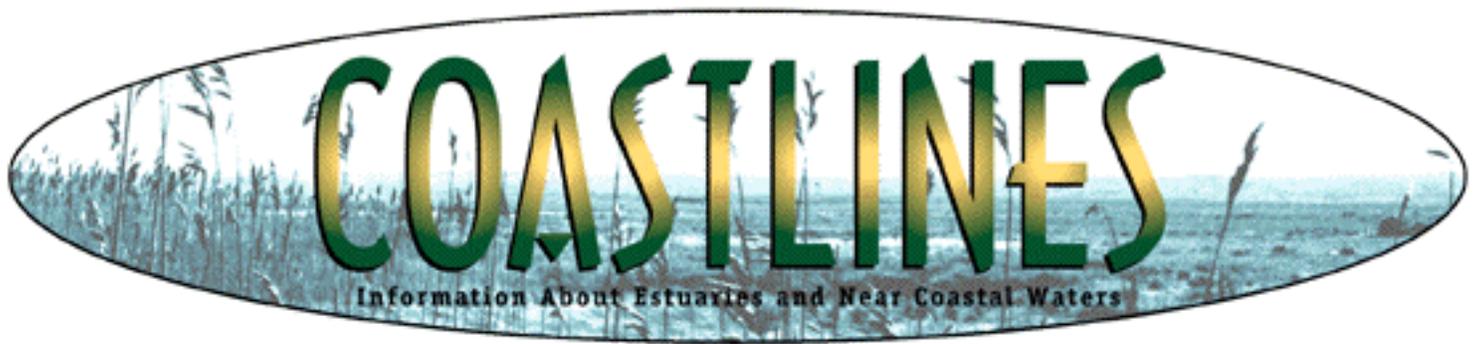
A second phase of the study is ongoing, led by SMBRP and its partners and designed to:

- Pinpoint the sources of aerial deposition in the Santa Monica Bay watershed;
- Study the deposition of other pollutants of concern, such as nutrients, pesticides, mercury, and
- Determine how aerial pollution is deposited into urban runoff and the processes governing deposition.

For further information, contact Guangyu Wang, Staff Scientist, Santa Monica Bay Restoration Program; Phone: (213) 576-6639; E-mail: [gwang@rb4.swrcb.ca.gov](mailto:gwang@rb4.swrcb.ca.gov). Or visit the website:

<http://www.smbay.org/10.htm>. [EXIT disclaimer ►](#)

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## **Atmospheric Deposition Handbook Now Available!**

The atmospheric deposition of toxics and nitrogen is an increasingly important challenge in managing water resources. These pollutants can adversely affect both human health and the environment. For example, atmospheric deposition is a major contributor of mercury pollution in U.S. waters and the most frequently listed reason for fish consumption advisories. As of December 1999, 41 states had issued fish advisories for mercury. Additionally, atmospheric deposition of nitrogen contributes to eutrophication in a significant number of coastal watersheds. Roughly 10–40% of the nitrogen that reaches East and Gulf Coast estuaries is transported and deposited via the atmosphere.

A new technical handbook, entitled *Frequently Asked Questions about Atmospheric Deposition: A Handbook for Watershed Managers* (EPA-453/R-01-009, September 2001) is now available from the EPA. The handbook answers basic questions about air deposition and sources, how its significance can be assessed through existing information, monitoring and modeling, and how the information can be used in a management strategy.

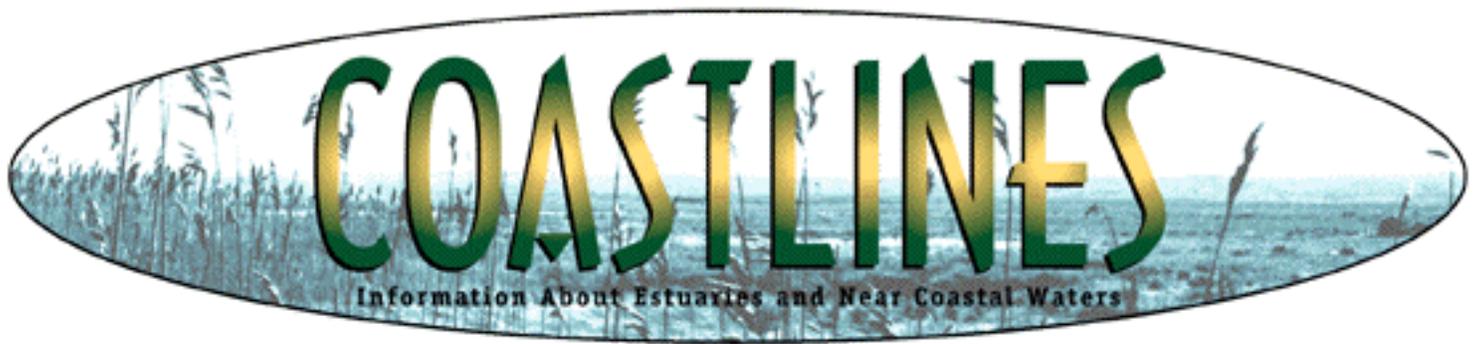
The handbook is available on the web at <http://www.epa.gov/oar/oaqps/gr8water/> and <http://www.epa.gov/owow/oceans/airdep/>. For further information, contact Gail Lacy, EPA Office of Air and Radiation; Phone: (919) 541-5261; E-mail: [lacy.gail@epa.gov](mailto:lacy.gail@epa.gov) or Debora Martin, EPA Office of Water; Phone: (202) 260-2729; E-mail: [martin.debora@epa.gov](mailto:martin.debora@epa.gov).

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## **Environmental Indicators: Measuring the Health of the Delaware Estuary**

The Delaware Estuary is 134 miles long, stretching from the fall line between Trenton, New Jersey, and Morrisville, Pennsylvania, in the north, to the point where the Delaware Estuary enters the Atlantic Ocean between Cape May Point, New Jersey, and Cape Henlopen, Delaware. In 1996, the Delaware Estuary Program (DELEP) finalized a Comprehensive Conservation Management Plan (CCMP) to protect the Delaware Estuary that recommended 77 Action Items. In an effort to begin assessing the overall health of the Delaware Estuary and evaluating the progress towards the goals outlined in the CCMP, the DELEP established an initial suite of nine environmental indicators in 2000.

Indicators are tools that are used to assess progress toward a particular goal or objective. The environmental indicators for the Estuary are helping to measure progress toward enhancing and preserving the diverse ecosystem of the Delaware Estuary and maintaining a balance among the Estuary's many uses.

The first suite of Delaware Estuary Environmental Indicators was published in a report that was produced through the cooperative effort of numerous federal, state, local and nonprofit agencies. The indicators in the report were developed from data that were readily available and included analyzing the changes over time in:

- Farmland acreage (1982 – 1992);
- Population of adult shad (1975 – 2000);
- Population vs. developed land (1970 – 1990 and 1990 – 2020);

- Water use efficiency and potable water withdrawals (1990 – 1996);
- Acres of public parkland (1990 –1999);
- Dissolved oxygen levels in the estuary (1967 –1997);
- Shellfish resource population (1990 – 1998); and
- Suitability of estuary waters for swimming (1990 – 1997).

In addition, baseline data on contaminated sediments in the estuary, benthic toxicity, and organic contaminants toxicity were established for future use in developing environmental indicators. The report examined observed trends in each of these indicators, the importance of these indicators, economic, environmental and social impacts, and knowledge gaps.

Although the individual indicators range from land use to water quality, many of them are related. For example, the survival of American shad is closely tied to dissolved oxygen. An increase in the number of shad, a migratory fish, suggests that water quality and habitat in the Delaware Estuary have improved. In the past, pollution in the heavily industrialized section of the Delaware River resulted in low dissolved oxygen levels, thus blocking the passage of shad during their migration. However, recently improved wastewater treatment and an increase in the public consciousness about protecting water quality have resulted in much higher oxygen levels and improvements in fish passage.

The indicators provide a way to review changes over time, their potential trends, and provide managers with information valuable for reaching future goals. For instance, the areas used for harvesting shellfish have expanded, suggesting improved water quality in those areas. People living in the region are using less water due in part to conservation efforts, even though the population is increasing. On the other hand, the Delaware River continues to have significant water quality issues, such as toxic contaminants, in the water column and sediments.

Since the publication of the initial suite of indicators, DELEP has assembled a group of experts to begin the task of developing a more comprehensive list of measurable goals. Once established, these measurable goals will lead to updated and/or additional indicators to assess the environmental health of the estuary. The draft goals were distributed and reviewed by a larger audience of stakeholders directly affiliated with the Estuary Program. In early 2002, an Indicators Workshop will be held to bring together natural resource managers, academia, and the scientific community to discuss the proposed measurable goals, additional parameters that should be measured, and develop corresponding environmental indicators.

The task of developing measurable goals, environmental indicators and management strategies is a challenging one, but will result in invaluable planning and program management tools. These tools will allow the program, resource managers, government officials, and the public to better understand the challenges facing the Delaware Estuary and to more effectively and focus resources and efforts towards meeting those challenges. In the end, this process will provide a clear path towards achieving a healthy and sustainable ecosystem.

For further information, contact Forsyth Kineon, DELEP Program Director; Phone: (609) 883-9500, extension 215. To obtain a copy of DELEP's Environmental Indicators Report, contact Kathy Klein,

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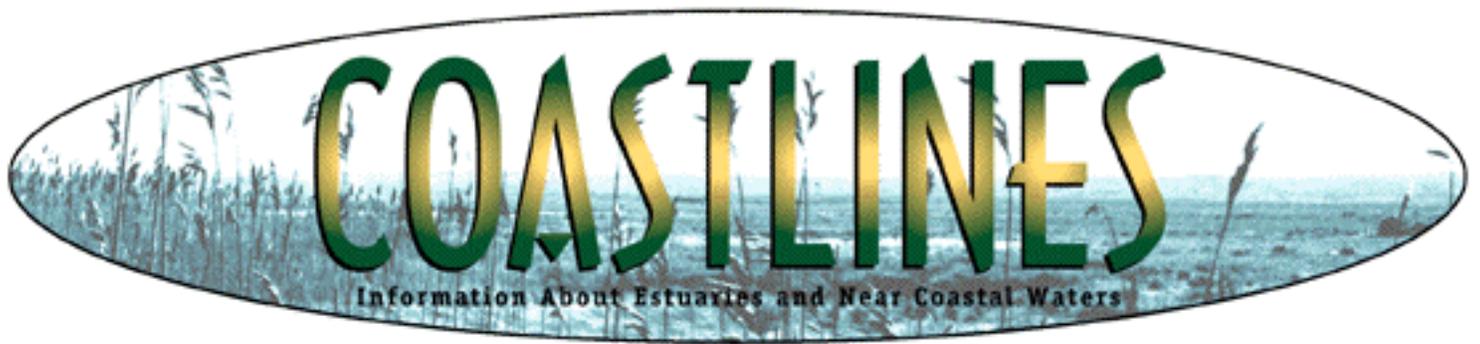
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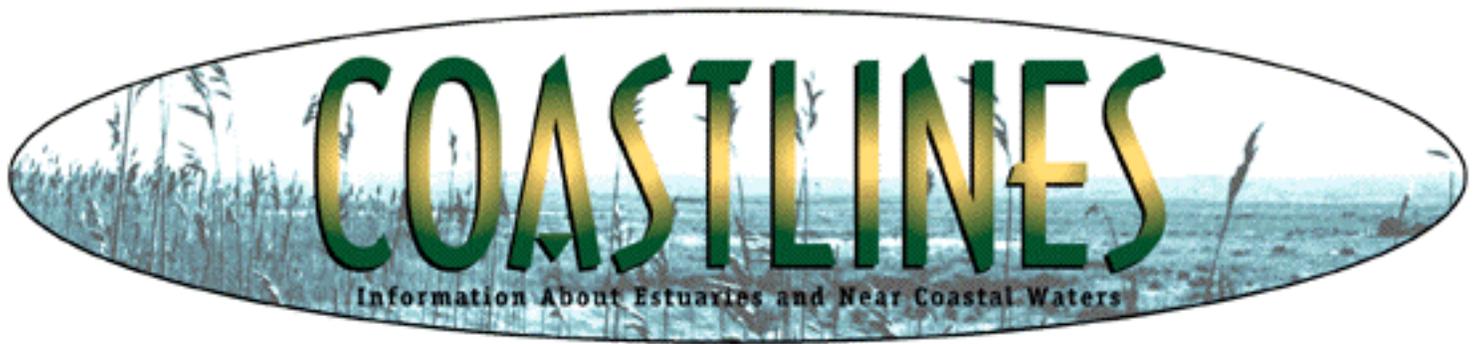
## **Stormwater Strategies CD Available**

Laden with heavy metals, oil, nutrients, organic matter, organic contaminants, and sediment, polluted stormwater runoff poses a major threat to streams, rivers and lakes. To assist communities in implementing better stormwater controls, the Natural Resources Defense Council (NRDC) recently released a CD-ROM version of its report, "Stormwater Strategies: Community Responses to Runoff Pollution." The new CD includes updated case studies on stormwater management issues, website links to stormwater leaders across the nation, and electronic navigational tools to help find information of particular interest to your watershed.

For further information on the Stormwater Strategies CD, visit the Natural Resources Defense Council website at [http:// www.nrdc.org/publications/](http://www.nrdc.org/publications/). [EXIT disclaimer ►](#)

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## **Draft Strategy on Restoring America's Estuaries Available**

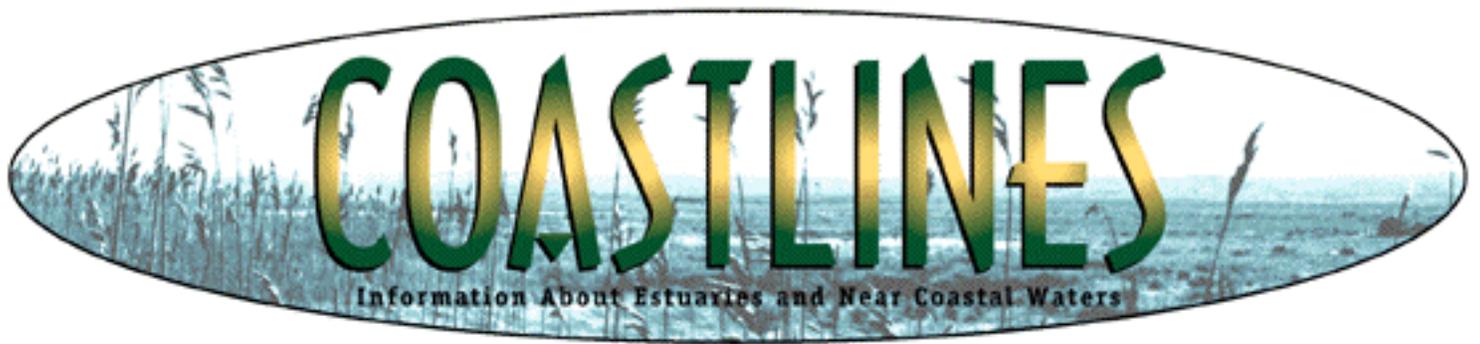
The Restore America's Estuaries program, an alliance of 11 regional, coastal-community based environmental organizations, promotes partnerships between state and federal agencies, non-profit organizations, and scientists to develop a National Strategy to Restore Coastal Habitat: Restoring America's Estuaries. Its goal is to restore natural function to one million acres of estuary habitat by 2010. A draft Strategy is currently available and provides a comprehensive approach to maximize the benefits of habitat restoration projects and to encourage coordination of federal and non-federal activities relating to the restoration of coastal habitat.

For further information, contact Steve Emmet-Mattox, E-mail: [semmettmattox@mindspring.com](mailto:semmettmattox@mindspring.com) or to learn more about the Restore America's Estuaries program visit the website at [www.estuaries.org](http://www.estuaries.org)

To review the draft visit <http://restoration.nos.noaa.gov/>. [EXIT disclaimer >](#)

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## **EPA Announces Role in the Prevention of Discharges of Ship Ballast Water**

The introduction of non-native and potentially nuisance aquatic species to coastal estuaries through the discharge of ballast water from ships traveling from international ports is a significant and well-documented problem in the U.S. These organisms can include fish, harmful algae, jellyfish and pathogenic bacteria. While it is currently recommended that vessels exchange their ballast water with mid-ocean water to limit the release of these organisms, the efficiency of these exchanges is not enough to completely free ballast water of potentially invasive species. At this time, the greatest barrier to effectively controlling aquatic nuisance species (ANS) from ballast water discharges is the lack of commercially available technical solutions. The EPA expects that in the future, new technical developments will make current ballast water exchange methods obsolete.

### **The Report**

On January 13, 1999, US EPA received a petition which requested that discharges of ship ballast water be regulated under the National Pollutant Discharge Elimination System (NPDES), a program that requires permits for the discharge of pollutants into the nation's waters. In response to the petition, EPA's Office of Water investigated mechanisms available under the Clean Water Act and other relevant statutes and programs to control ANS in ballast water discharges.

EPA published the results of the investigation in a draft report, *Aquatic Nuisance Species in Ballast Water Discharges: Issues and Options*. The report explores non-regulatory as well as regulatory actions that EPA could take to prevent these ANS introductions. The comment period for the draft ended on

January 13, 2002. EPA will prepare a final report once public comments have been considered.

## **Recommended EPA Actions in the Draft Report**

The draft report suggests that EPA can best combat ANS introductions from ballast water discharges by taking an active role in a number of areas.

### **1) EPA should promote the development of effective ballast water treatment technologies.**

The EPA intends to actively promote research, outreach, and technology development by establishing the prevention of ANS introductions as a research priority through its Environmental Technology Verification, Small Business Innovative Research, and Green Ships and Green Ports programs. EPA will provide technical assistance to ANS research projects initiated or funded by other organizations. EPA will support the U.S. Coast Guard's efforts to evaluate the effectiveness of its regulations and to revise them, if necessary, to enhance their effectiveness in preventing ANS introductions, including the development of domestic ballast water standards and encouraging the development and adoption of new technologies. In addition, EPA will continue to participate in working towards an international ballast water agreement, including the development of standards.

### **2) EPA should work to prevent species introductions.**

To do this, EPA will encourage public participation and education/outreach and support the U.S. Coast Guard to maximize compliance with the National Invasive Species Act (NISA) regulations by:

- Providing technical assistance, coordination, and advocacy support to U.S. Coast Guard outreach, education, and research projects; and
- Participating actively on the ANS Task Force, its regional Panels, and its Ballast Water Committees.

In cooperation with other Federal agencies, EPA will engage the regulated community in a government-shipper partnership that:

- Formally recognizes the efforts of shipping interests, which commit to real, significant actions that reduce the risk of ANS transfer;
- Provides technical assistance, coordination, and where appropriate, financial support to shippers' projects designed to address ANS; and
- Where appropriate, provides regulatory flexibility for ANS prevention projects.

In addition, EPA will encourage national consistency and coordination with state and local governments'

efforts to control ANS invasion from ballast water. EPA intends to develop an Invasive Species Management Plan to identify appropriate EPA-specific activities to implement the Invasive Species Council's National Invasive Species Management Plan. Lastly, EPA intends to use its authority in reviewing NEPA documents and other documentation, to promote the adequate consideration of the effects of ANS in Federal actions, which involve ballast water.

EPA will defer consideration of the application of National Pollutant Discharge Elimination System (NPDES) permits to ballast water discharges pending the above actions. The effectiveness of other programs, including the level of compliance with the U.S. Coast Guard's program under NISA, will be a factor in EPA's future consideration of this issue.

An electronic copy of the entire draft report can be viewed or downloaded from EPA's Internet web site at [www.epa.gov/owow/invasive\\_species/petition.html](http://www.epa.gov/owow/invasive_species/petition.html). For further information, contact John Heisler, EPA Marine Pollution Control Branch, Phone: (202) 260-8632; or E-mail: [heisler.john@epa.gov](mailto:heisler.john@epa.gov).

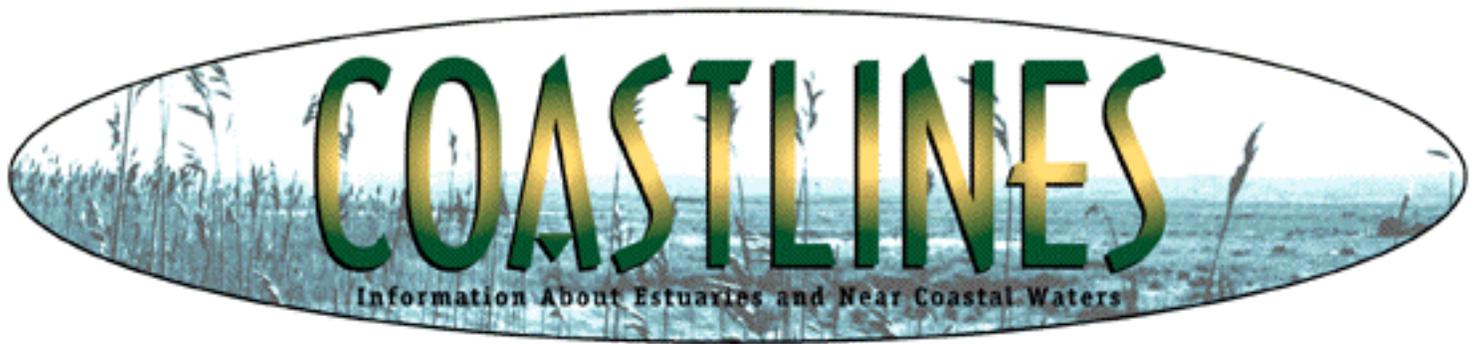
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## **Shoreland Management Website**

The Minnesota Shoreland Management Resource Guide website is now online at [www.shorelandmanagement.org](http://www.shorelandmanagement.org). Designed for people who make the everyday decisions that impact lakes and rivers, the website provides a wealth of shoreland and lake management information. The site, collaboratively developed by the University of Minnesota Sea Grant Program and a multi-disciplinary steering committee, recently made its debut and has already won a national competition, earning a gold award from the Association of Natural Resources Extension Professionals.

The Shoreland Guide website provides information on shoreland management, including fact sheets, scientific and technical literature, out-of-print publications and new materials. It also profiles citizen lake restoration projects and supports an interactive state map that helps users identify people to contact concerning questions. The site includes a glossary defining technical terms, agencies, and acronyms often found in shoreland publications.

A compact disk of the shoreland site is also available for \$4. To obtain a copy, contact Minnesota Sea Grant; Phone: (218) 726-8106 or E-mail: [seagr@d.umn.edu](mailto:seagr@d.umn.edu). For further information, contact Marie Zhuikov, Communications Coordinator, University of Minnesota Sea Grant Program; Phone: (218) 726-810; E-mail: [mzhuikov@d.umn.edu](mailto:mzhuikov@d.umn.edu).

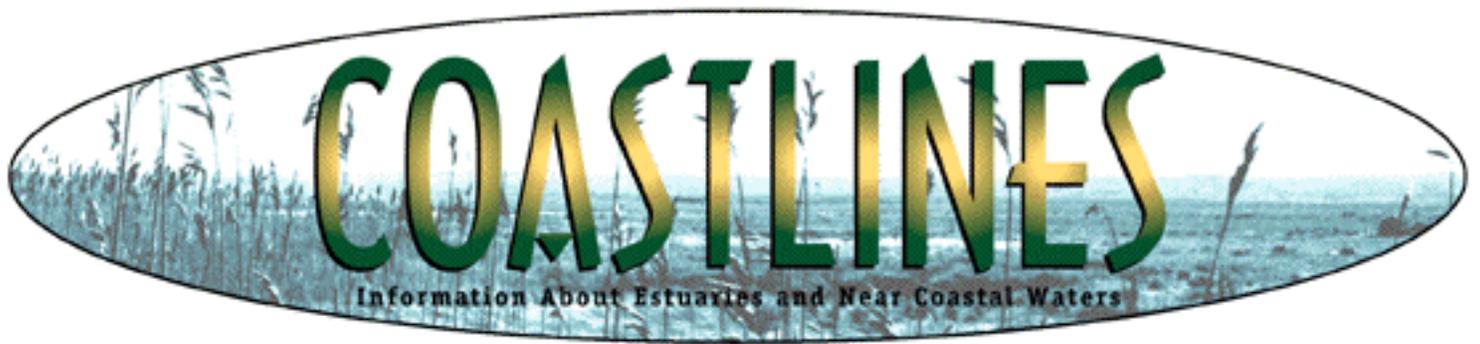
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## **Sierra Club Lawsuit Prompts Nationwide Debate**

Nearly seven million tourists visit the sandy coves, volcanic cliffs, and colorful reefs of Hawaii each year. In fact, tourism is Hawaii's Number One industry, generating a third of the state's gross product and a third of its jobs. In 1999, tourists spent over \$10 billion on vacations in the Aloha state. In 1998, the Hawaii Legislature set up the Hawaii Tourism Authority to steer tourism policy, funding the authority with about \$60 million a year from hotel room taxes.

In the autumn of 1999, the Hawaii Tourism Authority (HTA) awarded a three-year, \$114 million contract to the nonprofit Hawaii Visitors and Convention Bureau to promote Hawaii throughout the world as a vacation and business destination. The following January, in an unprecedented move, the Sierra Club sued the HTA to halt the marketing contract until the state can assess the environmental impact of attracting more tourists. The Hawaii Supreme Court heard arguments in November, 2000.

According to the Hawaii chapter of the Sierra Club, increasing visitor arrivals will lead to overcrowded beaches, strained natural resources, clogged roadways and overburdened natural areas. In addition, the effect of adding millions of tourists to the islands' population each year has an as yet unmeasured impact on the island's limited water resources. More tourists means more roads, more traffic, more power plants, greater freshwater and electricity demands, increased development pressure, and more pollution.

Past evidence supports the Sierra Club's claims. Visitors have had an undeniable, harmful impact on the natural environment at Hanauma Bay on the island of Oahu, as well as at other locations in the island chain. Snorkelers inadvertently damage sensitive corals, smokers leave cigarette butts on the beach, and the oils in tanning lotions and sunscreens create a visible sheen on the water's surface. While Hanauma

Bay is recovering thanks to a ban on fish feeding, smoking, and tour bus drop-offs, the rest of Hawaii's shoreline is constantly under development pressure; Waikiki, once a pristine paradise, has become overcrowded with traffic, people, road tar and concrete.

The Sierra Club's court filing claims that although the economic benefits that may be derived from the expenditure of these state funds have been established, the environmental, ecological and social adverse impacts caused by an increased number of visitors have not been addressed. An environmental impact statement should assess how many more tourists Hawaii can handle and how best to mitigate the impacts of more visitors.

Using a state law, HRS Chapter 343-1, that requires government agencies to conduct an environmental impact study (EIS) before spending state money, the Sierra Club argued that the law applies to the HTA and the marketing contract it awarded the Hawaii Visitors and Convention Bureau. HTA officials maintain that the law cited by the Sierra Club was intended only for major, state-funded capital improvement projects, such as roads and bridges, not for government services.



But some legal experts say the law leaves room for disagreement, because it includes any actions that propose the use of state or county funds, except for certain listed exceptions. While tourism marketing is not currently a listed exception to the law, there is a bill advancing in the Hawaii Legislature that would explicitly exempt the tourism authority from the environmental review requirements cited in the lawsuit.

The lawsuit has struck a sour note with the tourism industry and its supporters in state government because it could potentially hurt the recovery of Hawaii's economy from a precipitous decline in tourism revenues during the recent Asian economic downturn.

Because this case has a number of national implications, several mainland industry groups, including the National Tour Association, the American Hotel and Motel Association, the Travel Industry Association of America and the Western States Tourism Policy Council, have formed a coalition opposing the lawsuit. They are concerned that if Hawaii loses this lawsuit, states may be prevented from promoting tourism attractions, such as the beaches of Lake Tahoe or the lands around Death Valley.

Others who oppose this lawsuit worry this case could encourage a broader interpretation of the National Environmental Policy Act (NEPA), which requires environmental assessments for all federally-funded projects and governs public lands, such as national parks and forests. If NEPA applies to marketing plans that would attract tourists, a successful Sierra Club suit would set a precedent on how marketing dollars could be spent. Tourist attractions across the country would need environmental assessments to determine the impacts of visitors on each site.

So far, the Hawaii Supreme Court has not handed down any decision on the lawsuit, and there is no timetable for a verdict. In the meantime, the lawsuit continues to generate passionate discussion about the conflict between tourism and conservation.

For further information, check the website of the Sierra Club's Hawaii chapter at [www.hi.sierraclub.org/hta/assess.htm](http://www.hi.sierraclub.org/hta/assess.htm). [EXIT disclaimer ►](#) This article was compiled from information in numerous news items published on this subject.

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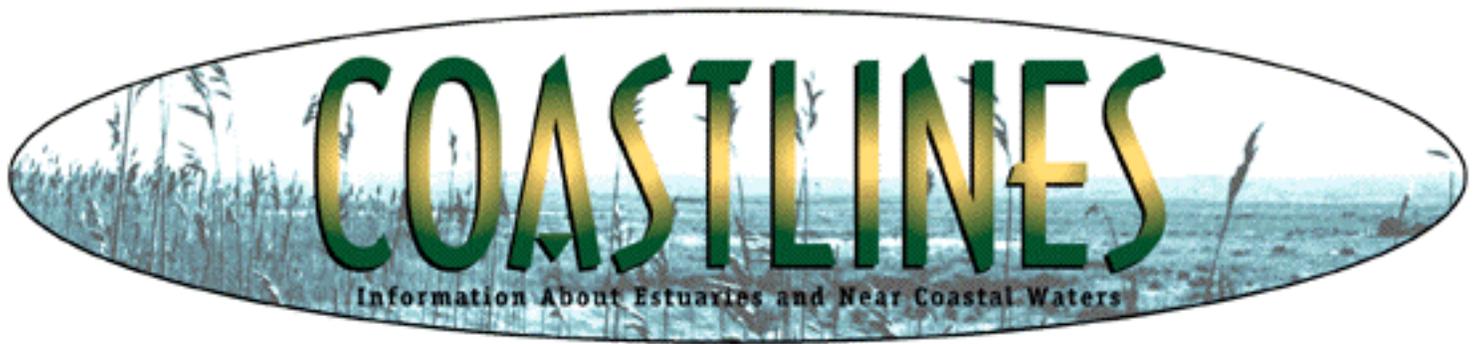
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## **Interested in Water Law?**

Vermont Law School is offering the following courses during Summer Session 2002:

- Ocean and Coastal Law with Tim Eichenberg of The Ocean Conservancy and Don Baur of Perkins Coie (June 17-June 27). This course will consider the natural components of estuarine, coastal, and marine ecosystems and some of the conservation issues confronting them.
- Fisheries and the Oceans with Peter Van Tuyn of Trustees for Alaska (July 22-August 1). This course will explain in detail how laws can operate to protect the marine environment and how federal managers have applied these laws to manage fisheries.
- Clean Water Act with Randolph Hill of the US EPA's Water Law Office (June 17-June 27). This course will examine in depth the key provisions of the Clean Water Act, including: water quality standards, technology-based requirements, effluent limitations, permitting, enforcement, and resolution of interstate disputes.

For information on these and the 27 other environmental law courses offered during Vermont Law School's Summer Session 2002, please contact us at (800) 227-1395 x2201, E-mail:

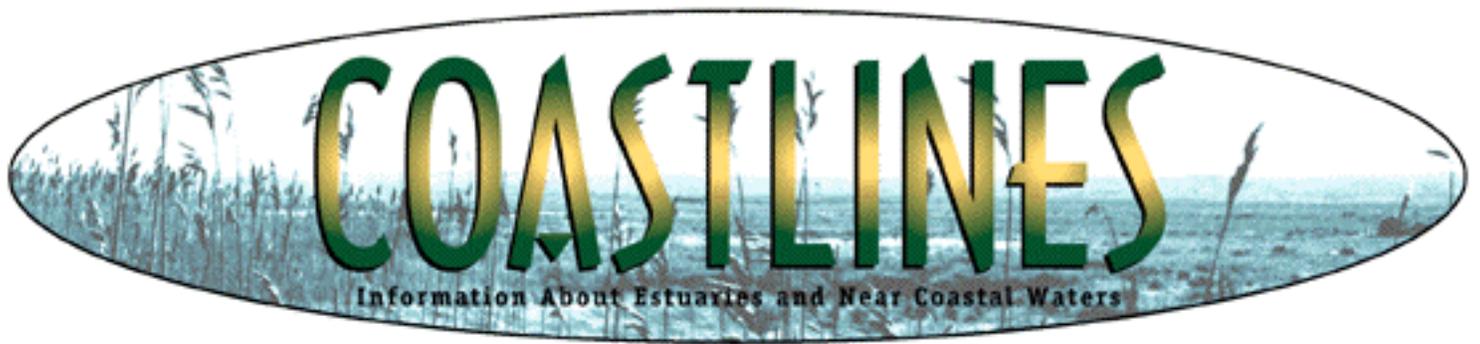
[elcinfo@vermontlaw.edu](mailto:elcinfo@vermontlaw.edu) or visit the website: [www.vermontlaw.edu](http://www.vermontlaw.edu). [EXIT disclaimer ►](#)

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United States  
Environmental Protection Agency

Office of Water  
(4504F)

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January 2002



## Galveston Bay Estuary Program

### Seafood Consumption Safety Program for Public Health Protection

#### Introduction

Galveston Bay is a premier Texas resource, providing important natural habitats for many native and migrant species. But throughout history Galveston Bay has also been a critical resource for humans for food supply, transportation, oil and gas production, and recreation. The surrounding watershed uses includes urban development, petroleum and petrochemical production, and agricultural uses. Galveston Bay shares many problems with other estuaries of a similar stature, chief among them the increasing demands placed on resources because of an expanding population and its associated development. Over half of the state's population lives in the watershed to Galveston Bay.

Historically, seafood testing in Galveston Bay has been underfunded, lacking in continuity, and performed using different methodologies by various organizations, resulting in incompatible data, uncertainty about the status of seafood and negative perceptions about the safety of Galveston Bay seafood. Clearly, a bay-wide assessment was needed. While the Galveston Bay Estuary Program (GBEP) could not fully fund a bay-wide assessment, it initiated, through an innovative stakeholder-led process, a coordinated effort to assess the Lower Galveston Bay and the Christmas Bay Complex portions of the Galveston Bay Estuary.

The Seafood Consumption Safety Program established a multi-agency, multi-discipline task force to advise on the study. The program called for the collection and analysis of high quality fish and crab data from a portion of Galveston Bay and the development of a strong public outreach program. The stakeholder-led approach allowed the Texas Department of Health (TDH) to develop and standardize a statewide method for assessing seafood consumption safety that could be applied to other portions of the bay. The Lower Galveston/Christmas Bay project expanded into a bay-wide assessment funded with additional help from US EPA and the Texas Natural Resource Conservation Commission. The final, more complete assessment produced a definitive "full-scan" bay-wide risk assessment of fish and blue crabs throughout Galveston Bay in order to answer the public's question: "Is the seafood from Galveston Bay safe to eat?"



## 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.*

## Background

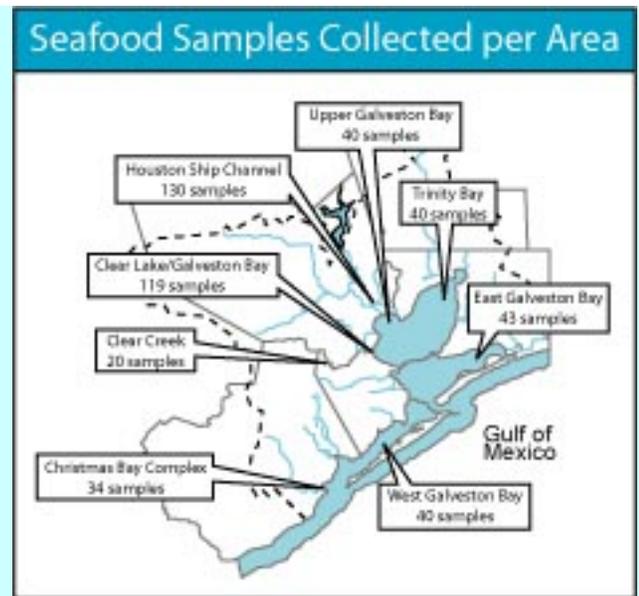
Galveston Bay covers 600 square miles of water surface and averages six to twelve feet in depth. Its watershed covers an area of 39,337 square miles, incorporating the Houston/Galveston area and the Dallas/Ft. Worth metroplex. Half the population of the state of Texas lives in the watershed and has a potential impact on the bay. The lower watershed, which is the study area for the GBEP, is defined as the 4,238 square mile area draining to the bay, downstream of two major impoundments: Lake Houston on the San Jacinto River and Lake Livingston on the Trinity River. The growing city of Houston, with its associated urban communities, occupies the western side of the bay, while the eastern side remains largely agricultural and undeveloped. More than three million people live in the five coastal counties bordering the Galveston Bay system. Twenty percent of that population lives within two miles of the bay or its tidal tributaries.

Galveston Bay is home to the Port of Houston, the 2nd largest port in the U.S. Additionally, the Houston-Gulf Coast Region accounts for almost half of the nation's basic petrochemicals manufacturing capacity and over one-third of the nation's petroleum refining. In addition, the bay is the final recipient of treated wastewater from more than 1,400 industrial and municipal point source discharges, amounting to more than 60% of the wastewater (by volume) discharged in Texas. It also receives non point source pollutants in stormwater runoff generated by agricultural, urban, suburban and rural land users of the bay.

At the same time, the bay area is rich in resources -- 3/4 of the bird species in North America spend some time in Galveston Bay; some ten thousand recreational boats are registered in the Galveston Bay area; 3/4 of the fish harvested in the Gulf are dependent on estuaries like Galveston Bay for mating and spawning; 1/3 of Texas commercial fishing income; and over half the recreational fishing expenditures are related to Galveston Bay. Without a doubt, the bay and the tributaries that feed into it are a rich resource both economically and environmentally.

Commercial and recreational fishing on Galveston Bay generates nearly one billion dollars per year in revenues, making the bay Texas' largest estuarine source of seafood. For every pound of finfish caught commercially in Galveston Bay, more than six pounds of finfish are caught by recreational anglers. For the nearly 300,000 licensed recreational anglers, Galveston Bay supports some two million hours of sport fishing annually. The economic benefits associated with sport fishing were estimated at \$364 million in 1986. Given the usage of Galveston Bay for recreational fishing and the intense industrial and human pressures on the area, questions arise regarding the safety of seafood harvested from Galveston Bay.

The Galveston Bay Estuary Program, formerly the Galveston Bay National Estuary Program, was established in 1989 to develop a Comprehensive Conservation Management Plan (CCMP) for the Galveston Bay ecosystem. The CCMP for the Galveston Bay area is called The Galveston Bay Plan (the Plan). The principal function of the Plan is the pooling of resources--funding and expertise--for more efficient resource management. The Plan was developed in three phases over a five year period: Identification and Agreement of Priority Problems; Scientific Characterization of those problems; and Development of Solutions. The Plan outlines a series of goals and links a set of specific initiatives to the identified problems in Galveston Bay. Public Health Protection is addressed in the Plan and the development of a seafood consumption safety program is identified as an action item. The seafood safety consumption program was devised as the result of agencies and stakeholders working together to implement The Galveston Bay Plan.



## Project Overview

To develop a seafood consumption safety program, the Galveston Bay Estuary Program provided the Texas Department of Health (TDH), Seafood Safety Division with a grant to evaluate potential health risks associated with consumption of fish and crabs taken from lower Galveston Bay. GBEP provided the forum for cross-jurisdictional participation and input and established a Seafood Safety Task Force composed of federal, state, and local stakeholders. This task force provided the technical guidance and allowed for the innovative use of input from local and commercial fishermen in the determination of sampling sites that are popularly fished

Initially, the TDH collected and analyzed a total of 164 fish and crab samples from the Lower Galveston Bay and Christmas Bay Complex at a cost of \$170,000. The original GBEP funded project provided the TDH with the ammunition and broad support needed to seek additional funding to enlarge the effort. The project was expanded for the entire bay and collected a total of 562 samples at a cost of \$600,000. The tissue samples were analyzed for metals, volatile and semi-volatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), chlorinated dioxins and furans.

## The Seafood Safety Task Force

Coastal Conservation Association	Commercial Fishing Representative
Texas Cooperative Extension--Galveston County	Galveston Bay Information Center, Texas A&M Galveston
Gulf Coast Waste Authority	Galveston Bay Estuary Program
US Environmental Protection Agency Region 6	Texas Natural Resource Conservation Commission
Texas Parks and Wildlife Department	Reliant Energy
Texas A&M Sea Grant College Program	US Fish and Wildlife Service

## Project Results

Results of the comprehensive multi-year study of seafood from Galveston Bay and adjacent waters showed that fish and crabs from areas of the bay where most recreational fishing occurs are safe for unlimited consumption. Fish and crab species from areas of Galveston Bay, south of the Houston Ship Channel, can be eaten without restrictions. This safe area covers the vast majority of Galveston Bay including the areas where most recreational fishing occurs. The study results also prompted, though not unexpectedly, TDH to expand on a 1990 advisory that limited consumption of catfish and crabs from the upper part of the Houston Ship Channel and the southern part of the San Jacinto River.

TDH now recommends limited consumption of all fish and crabs from those two areas. Due to elevated levels of chlorinated pesticides, PCBs and dioxins, TDH advised that adults eat no more than one eight-ounce serving per month of any species of fish or crabs from portions of the Houston Ship Channel. Frequent and long-term consumption of fish with elevated levels of chlorinated pesticides, dioxins and PCBs (polychlorinated biphenyls) may cause reproductive defects, cancer, or liver damage. Children and women who are pregnant, nursing or who may become pregnant should not eat any fish or crabs from these waters. TDH lifted a 1993 consumption advisory on all fish and crabs from Clear Creek, which flows into Clear Lake, part of the Galveston Bay complex. The latest TDH study found no harmful levels of dichloroethane and trichloroethane, chemicals that prompted the 1993 advisory. Frequent and long-term consumption of fish with elevated levels of dichloroethane and trichloroethane may cause cancer. The study did not include oysters, which are continuously monitored in another TDH seafood safety program, or shrimp, which are not considered at this time a source of harmful chemicals.

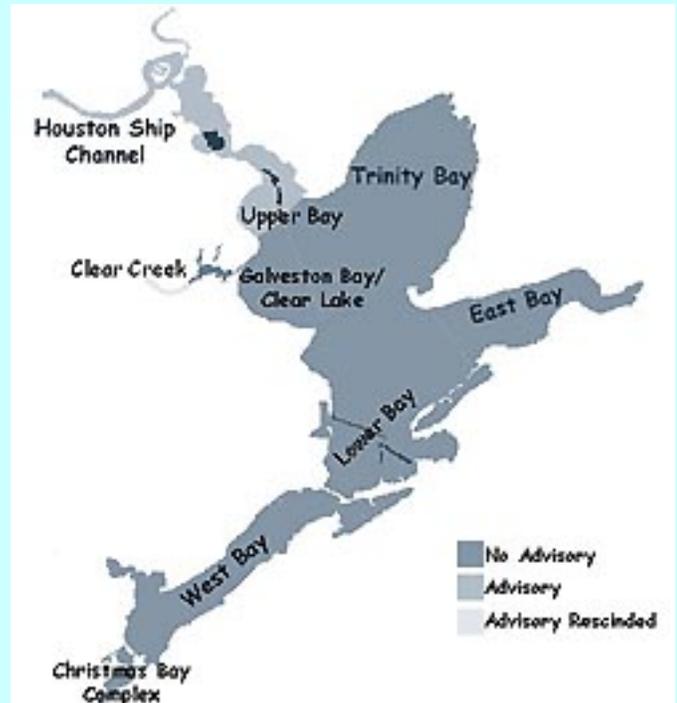
## Project Accomplishments

Public education on the results of the program focused on the development of a Seafood Safety web page on the GBEP Website, inclusion in publications, such as State of the Bay 2nd Edition: A Characterization of the Galveston Bay Ecosystem, and providing results at public events, like the annual "Bay Day." The Seafood Safety Task Force continues to meet and develop new avenues for disseminating the results of the project.

The Galveston Bay Estuary Program continues to learn and realize the value of maintaining commitments and interest from a large and diverse body of stakeholders. In this instance, the stakeholders led the process, by bringing different organizations together to generate new ideas, methods and share resources, which ultimately allowed the project to expand and attain success.

The Galveston Bay Seafood Safety Program accomplished the goal of developing the first comprehensive bay-wide assessment of the safety of seafood and helped to maintain the economic status of Galveston Bay seafood. In addition, the study provides a useful baseline, with a standardized methodology, for allowing comparison with future studies.

Recommendations for the continuance of the seafood safety program have been made and efforts are underway towards implementing future routine seafood monitoring in Galveston Bay. The quality of the data, areal extent of coverage, and technical input from stakeholders made it possible for the Galveston Bay Estuary Program to answer the public's question: Is the seafood from Galveston Bay safe to eat?



**For further information, contact:**

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*Galveston Bay*



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## Previous Publications in the Demonstration Projects Series

<b>Report Title</b>	<b>National Estuary Program</b>	<b>Date</b>	<b>Publication #</b>
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
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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
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