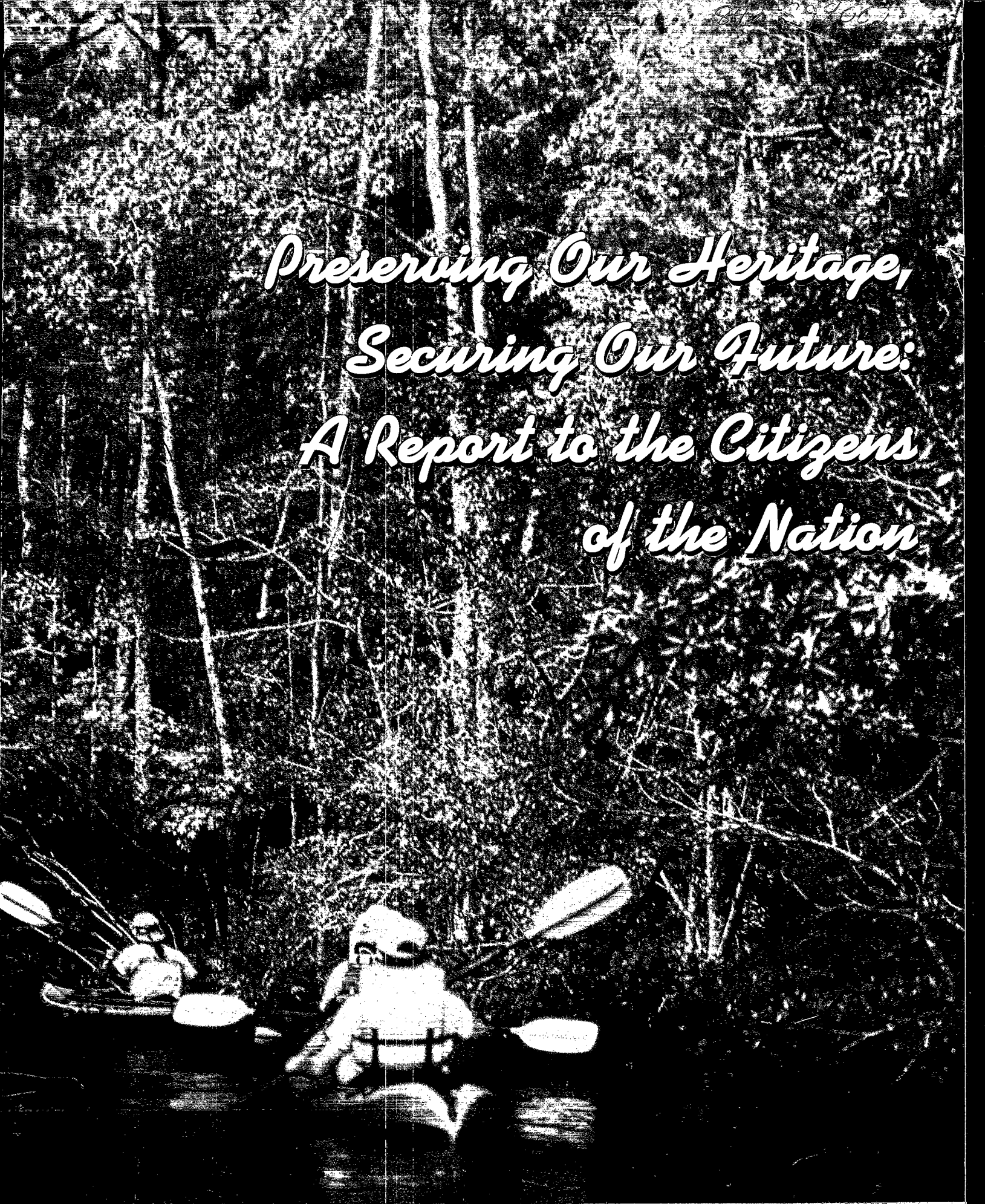
Preserving Our Heritage, Securing Our Future: A Report to the Citizens of the Nation



ANEP

ASSOCIATION OF NATIONAL ESTUARY PROGRAMS

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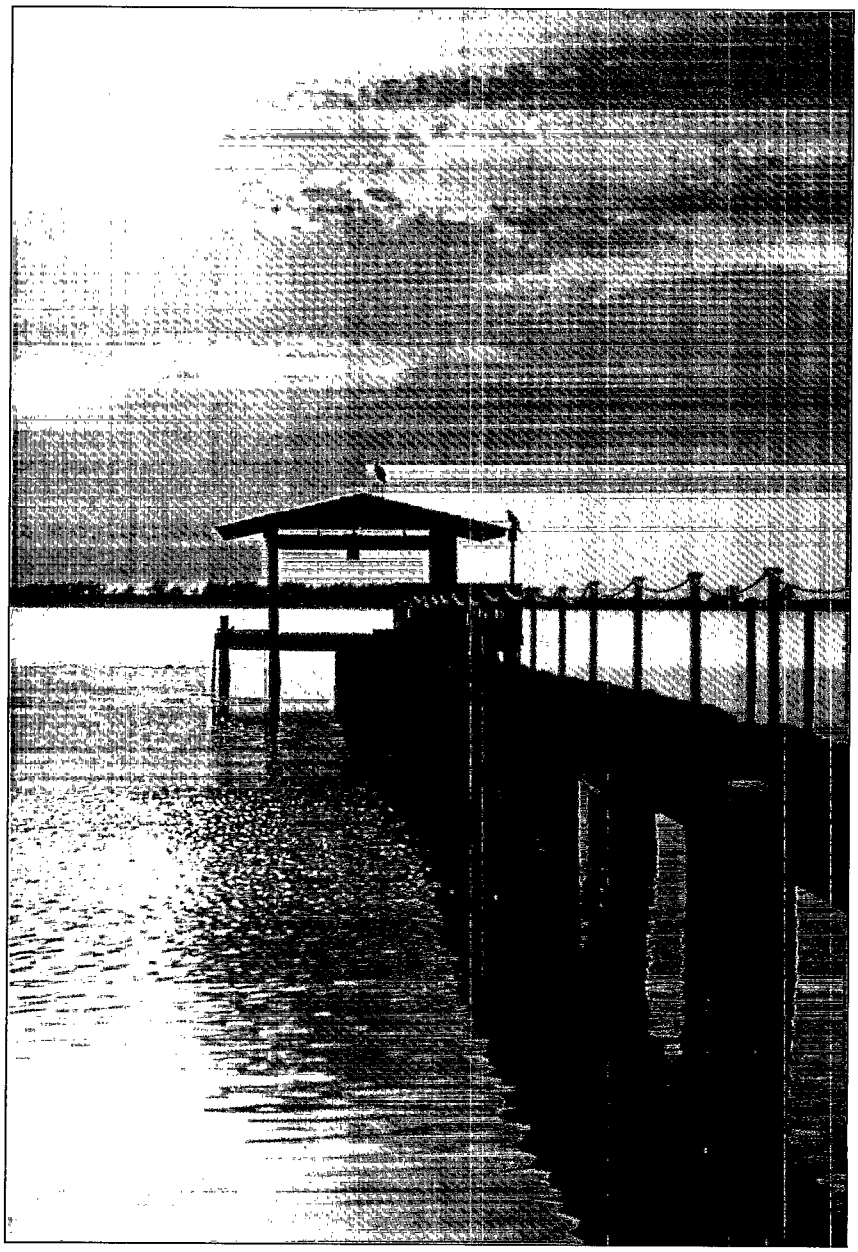
Estuary - A semi-enclosed body of water, open to the ocean and diluted by fresh water

Watershed - The land area surrounding an estuary which collects and conveys fresh water to the estuary



South Florida sunrise along the Indian River Lagoon

Front cover, kayakers paddling in *Albemarle-Pamlico Sounds, North Carolina.*

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Association of National Estuary Programs,
Washington, D.C.

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Back cover, Sarasota Bay NEP.

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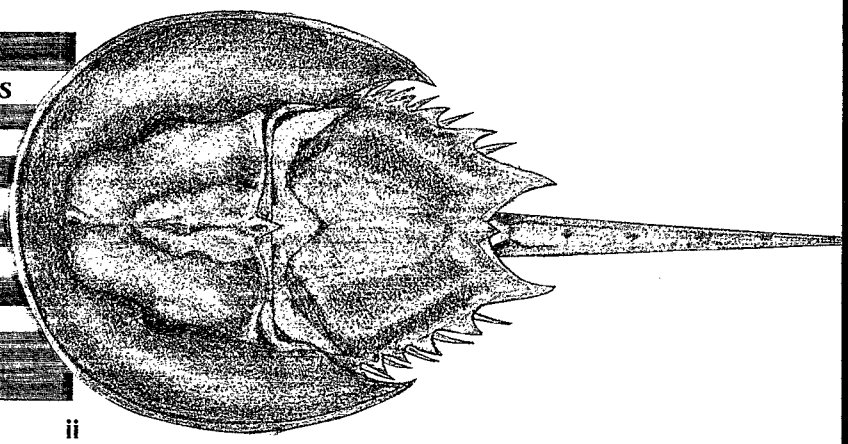


Market Survey Reveals Americans Expect To Find Coasts Under Stress

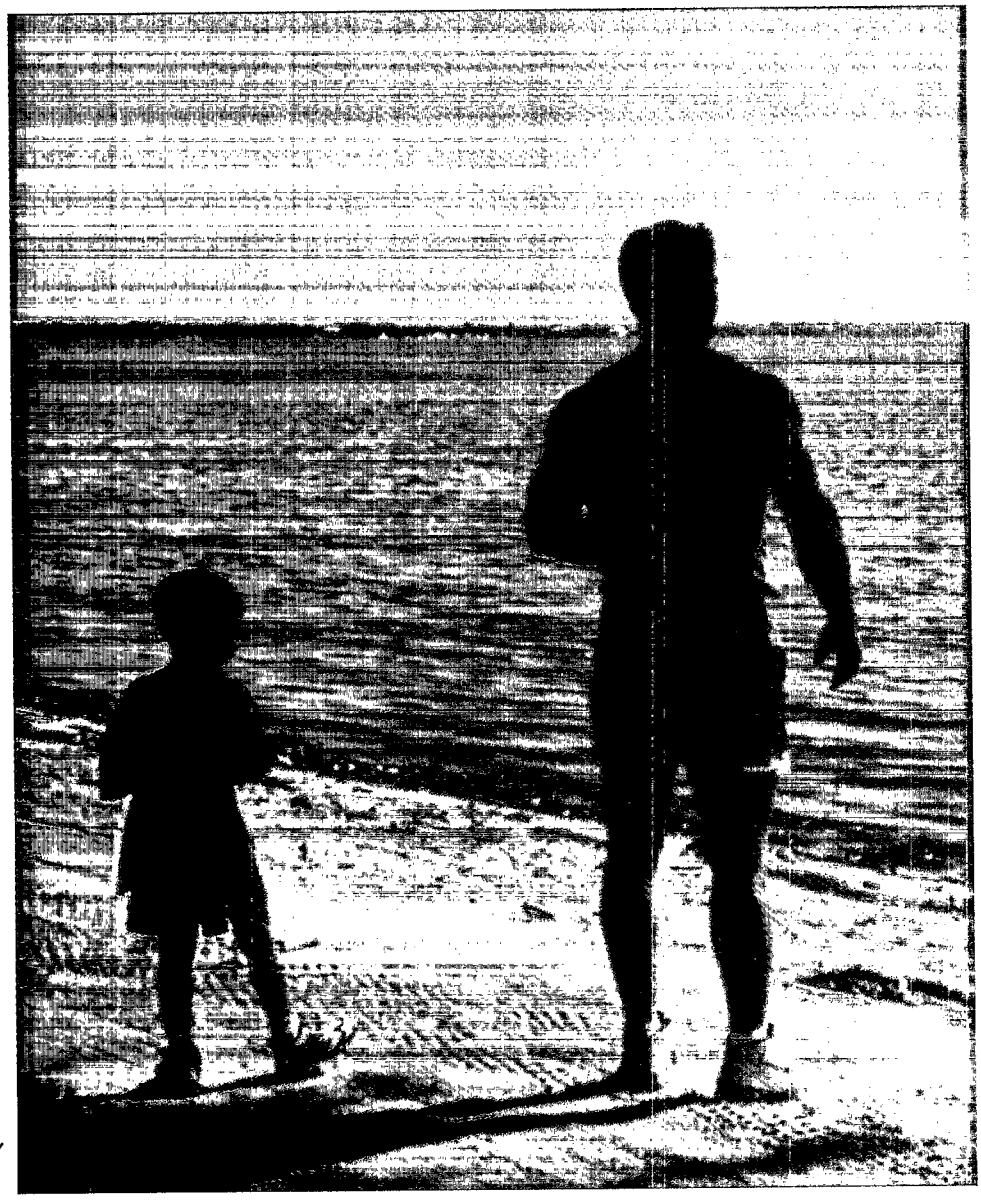
For millions of Americans, summertime means visits to the coast. The average American spends about 10 vacation days at the coast each year, and over half the U.S. population lives there. Yet this popularity can spell trouble.

As part of a nationwide effort to raise Americans' understanding of the stress on the coast, a national market research firm, Market Facts' TELENATION, donated survey services to find out what Americans think about coastal issues.

The random survey found significant concern about overbuilding, erosion, water pollution, overcrowded beaches and marine debris.

For example, 83 percent of respondents say they see overbuilding along the coast as a problem. Comparing conditions to 10 years ago, 56 percent of respondents said they see more trash; 47 percent see more dead fish washed up on beaches; 53 percent say the waters are dirtier, and 64 percent say they see more erosion.

Still, the survey indicates that Americans seem unaware of an individual's impact on the coast.



A father and son stroll along one of Florida's sandy beaches near Sarasota Bay.

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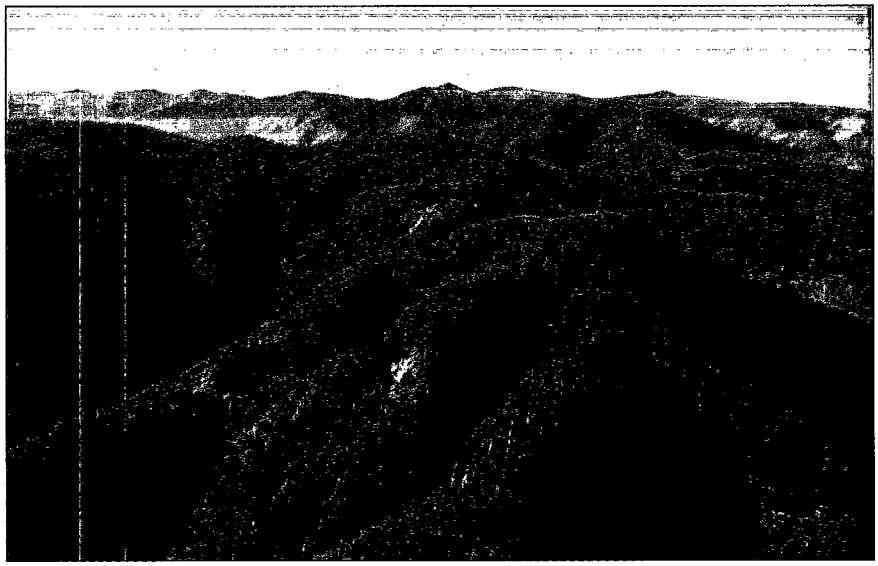
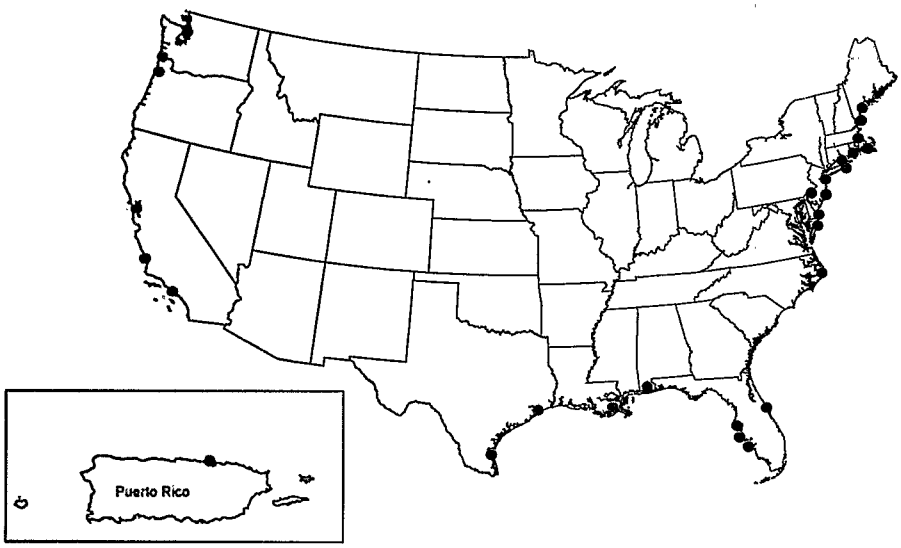
An aerial view of the Tillamook Bay Estuary watershed in Oregon



Estuaries of the National Estuary Program

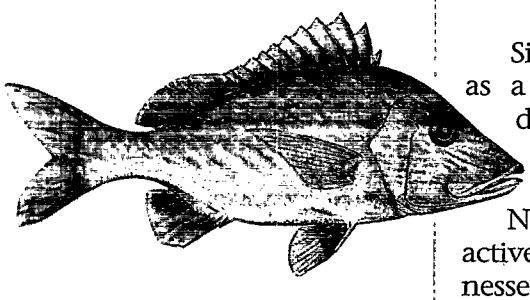


NEP locations, for more detail see inside back cover.

The National Estuary Program was established by Congress in 1987 to recognize and protect "estuaries of national significance."

tered by the U.S. Environmental Protection Agency (EPA), which provides seed money to local communities to develop and implement comprehensive management plans for their estuaries.

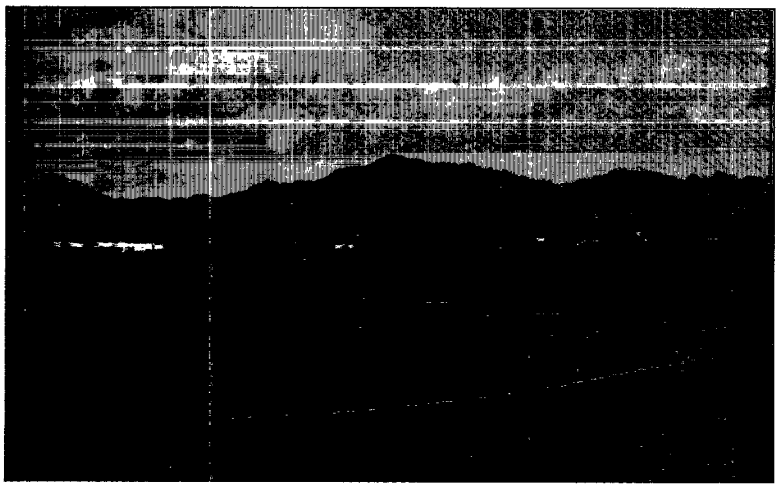
Today, the NEP encompasses 28 selected estuaries, located in every coastal region of the country (see map at above left.) Many of the estuaries participating in the Program are in good health, but need additional protection if they are to remain so. Others are suffering the consequences of rapid growth and development, and require a helping hand to repair damage to habitats, fisheries or water quality. All are cornerstones of their community's economic and environmental well-being – as well as its cultural identity.



Since its inception, the NEP has served as a catalyst for bringing people with diverse interests together to address the threats facing America's estuarine ecosystems. In fact, one of the NEP's greatest strengths has been the active involvement of citizens and businesses who have a substantial investment in the health and sustainability of local waterways. This report highlights our accomplishments as we look back on a decade of success – and ahead to the challenges that remain.

The Sanibel-Captiva Conservation Foundation and the Charlotte Harbor National Estuary Program's Citizen's Advisory Committee tour the Venus Lake restoration project on Sanibel Island, Florida.

Tillamook Bay watershed in Oregon

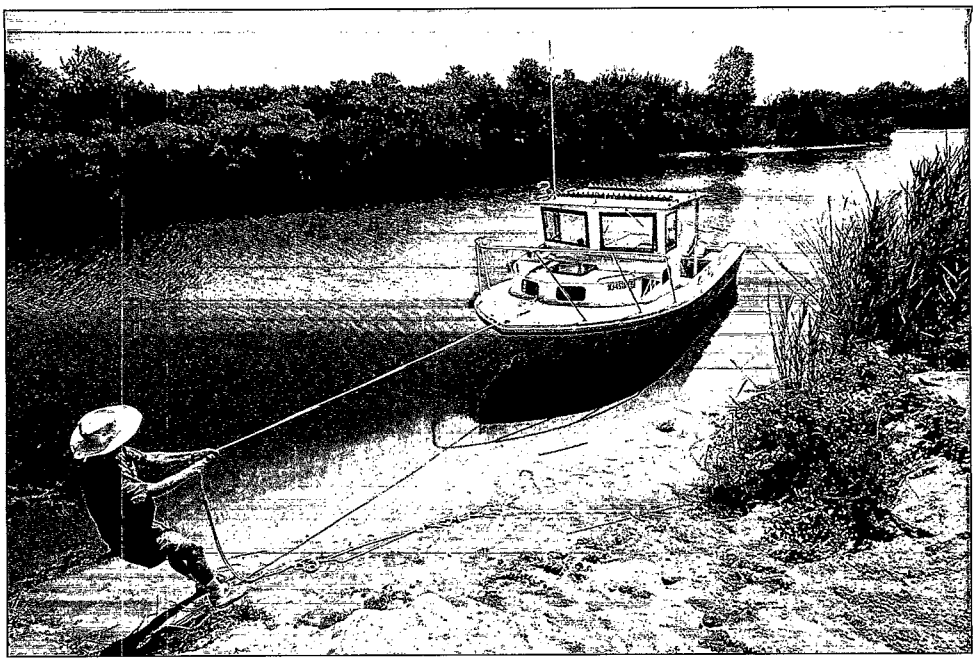


What is an estuary?

Estuaries are places where fresh and salt water mix. Whether they are called bays, estuaries, harbors, sounds or lagoons, these fertile junctions of sea and stream are among the most productive areas on earth. As many as 80 percent of the fish that we catch for food or fun depend on estuaries for all or part of their lives. This is why estuaries are often called the "cradles of the sea."

Many of the nation's most celebrated water bodies are estuaries: Chesapeake Bay, San Francisco Bay, Puget Sound and Long Island Sound, for example. Although each estuary is unique, they all share common characteristics such as constant mixing of salt and fresh water by tides and winds, as well as common problems such as excessive nutrient pollution and loss of natural habitats.

There is more to an estuary than you might think just by looking at a shaded area on a map. n fact, estuaries encompass broad ecosystems that usually extend many miles beyond the open waters of a bay or lagoon to encompass surrounding wetlands, rivers and streams. Anything that happens on land within this sprawling watershed has a direct impact on the estuary itself.



A boater hauls his boat onshore along Herring Point in New York-New Jersey Harbor, NJ.

As many as 80 percent of the fish we catch for food or fun depend on estuaries for all or part of their lives.

What's an estuary worth?

It's impossible to put a dollar figure on all the benefits an estuary provides. However, some of the economic impacts derived from estuaries have been well documented.

For example, estimates developed by the National Estuary Program indicate that commercial and recreational fishing contribute about $4.3 billion to the nation's economy each year, while the marine industries supported by these activities add another $3 billion annually.

Tourism and recreation associated with estuaries participating in the NEP generate an estimated annual economic impact of $16.3 billion. For many communities, estuaries are the focal point of tourist-related

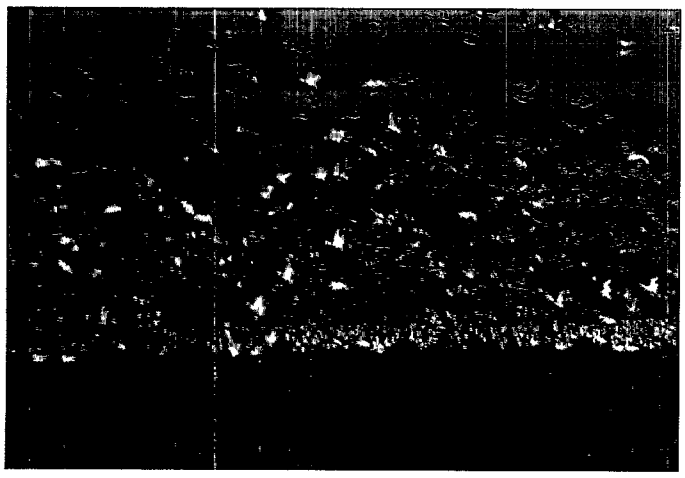
Commercial and recreational fishing contribute $4.3 billion to the nation's economy each year. Tourism and recreation generate an estimated annual economic impact of $16.3 billion.

North Carolina fisherman with companion in Albemarle-Pamlico Sounds

Port of Houston, Texas, a major port in the Galveston Bay watershed area

A recreational angler raises a red drum in Galveston Bay, Texas.

Waterfowl use the Barataria-Terrebonne estuarine system in Louisiana as a resting and feeding stop in route to wintering grounds.



activities. In the Albemarle-Pamlico Sounds of North Carolina, for example, 10 percent of the local workforce is employed in tourism-related businesses. Tourists visiting Southwest Florida's scenic Charlotte Harbor spend more than $1 billion every year.

Ports established in estuaries contribute billions of dollars to local economies and employ hundreds of thousands of people. More than $40 billion worth of goods passed through ports in Puget Sound last year, while the Port of Tampa in Tampa Bay directly or indirectly provides jobs for 5,000 people and consistently ranks among the top 10 in the nation in trade activity.

Other benefits bestowed by estuaries are less tangible, but are equally important. Estuaries are critical habitats for a magnificent array of fish, birds and other creatures; they provide unparalleled recreational opportunities for people; and the wetlands that border estuaries serve as natural filters for pollutants and buffers against punishing storms. Consider these facts:

- More than 45 percent of the nation's surface waters are contained in estuarine systems, making these areas an important source of drinking water for many Americans. In fact, two-thirds of the residents of California obtain their drinking water from freshwater rivers, streams and marshes associated with the San Francisco Bay-Delta Estuary;

- The Lower Columbia River Estuary is the most valuable spawning and nursery area for salmon in the continental United States;

- The Buzzards Bay Estuary in Massachusetts provides critical nesting habitat for 98 percent of North America's endangered roseate terns;

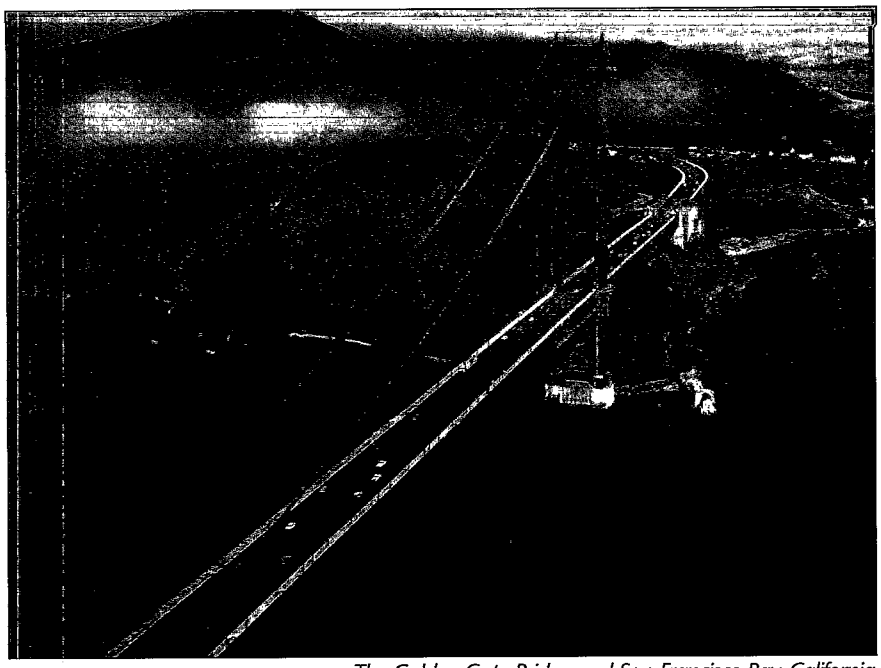
- Mangrove islands in Tampa Bay in Florida are among the nation's most important waterbird nurseries, annually hosting as many as 40,000 nesting pairs of 25 different species.

- Fish, oysters, crabs and crawfish are so abundant in the Barataria-Terrebonne estuarine complex in Louisiana that it is known as the "nation's fish market."

In summary, our nation's estuaries, like anything else that cannot be replaced, are priceless.

Gateways to a new nation

Estuaries have played a central, if often unheralded, role in the history of the United States. The first colonists in the New World settled along the fertile shores of estuaries, joining Native Americans who long before had set down roots on these waterways.



The Golden Gate Bridge and San Francisco Bay, California

From our earliest beginnings, Americans have always flocked to the coast, dredging the fertile wetlands for farmlands, clearing vast forests of cypress, oak, redwood and pine for timber products, harvesting oysters, clams, shrimp and fish, and hunting beaver, otter and other animals that sustained a thriving fur trade. Only in recent decades have we come to realize that the bounty provided by our estuaries is not endless.

The Statue of Liberty greeted immigrants as they sailed through one of the nation's gateways, the New York-New Jersey Harbor, New Jersey.

But our fascination with the coast has not waned, and the waterward migration continues. Today, most Americans live within 50 miles of the coast, and thousands of newcomers arrive every day. Ironically, these beautiful places are imperiled by their own popularity, since more people and development often mean more pollution, habitat destruction and pressure on fish and wildlife populations.

Today, most Americans live within 50 miles of the coast, and thousands of newcomers arrive every day.

Many coastal communities now recognize the necessity for "smart growth," a concept promoted and supported by the National Estuary Program. This new approach acknowledges that a strong economy and a healthy environment go hand in hand. The NEP also recognizes that environmental protection is most successful when those directly affected by the health of an ecosystem – local citizens, local officials and other stakeholders – have a strong voice in decisions about their estuary's future.

The NEP approach: promoting partnerships for progress

Because estuaries are by definition dynamic, evolving

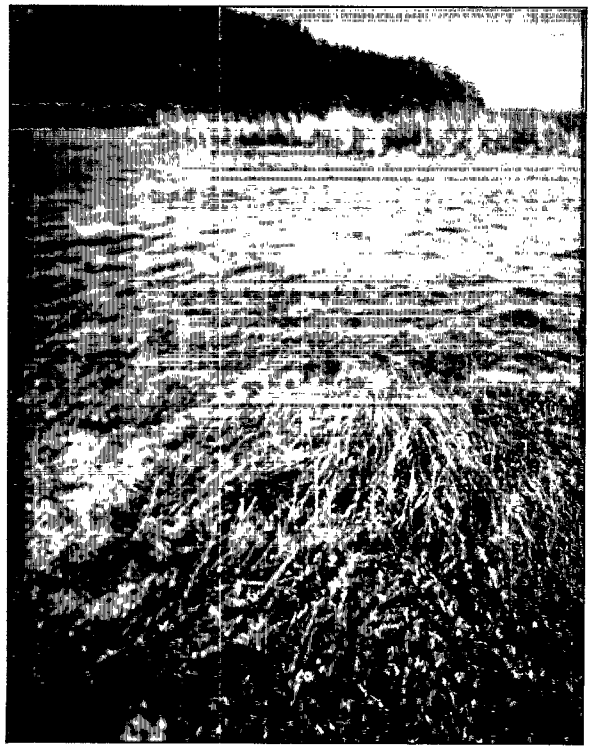
Farmland water project in San Francisco Bay watershed

automobiles; and poorly operating septic tank systems or municipal wastewater systems.

Bacterial contamination that can cause public health problems may be caused by animal feedlots, leaky wastewater and stormwater systems, boaters who do not properly dispose of on-board waste, and malfunctioning septic tank systems. Pollutants like heavy metals and other toxic contaminants have many sources such as automobiles, industrial facilities, oil spills, and the mishandling of hazardous materials during production or transport.

All of these pollutants – excess nutrients, bacteria, heavy metals, and toxics – can degrade water quality and make the water unsafe for human contact or drinking. Poor water quality also affects the birds, fish, and other animals that live in and near the water. Water quality problems can make oysters and scallops unsafe to eat, cause massive fish kills, or create deformities and lesions in birds, fish, and other creatures.

Seagrass meadow in the Indian River Lagoon, Florida. Surface water runoff is promoting the loss of this important habitat.

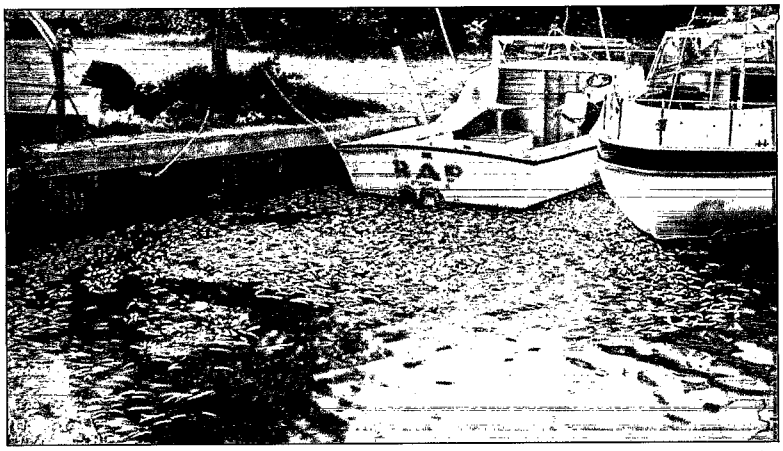


Maintaining a minimum level of water quality is therefore an important issue for both people and wildlife. When water quality is degraded, drinking water supplies, commercial fisheries, human health, and fish and wildlife can be damaged.

Examples of water quality degradation

- The Petaluma River, a tributary to San Francisco Bay, has experienced seasonal algal blooms, low oxygen levels and fish kills resulting from municipal waste discharges.
- Low dissolved oxygen levels are problematic in Corpus Christi and Galveston bays in Texas and in Mobile Bay, Alabama. Low oxygen levels are especially prevalent where wastewater discharges and surface runoff occur to areas that are poorly flushed or have little circulation.
- In 1990, nitrogen loads to Sarasota Bay, Florida were estimated to be three times greater than pre-development levels.
- Pollution from surface runoff has been implicated in nearly thirty percent reduction in seagrass coverage that

occurred in the Indian River Lagoon, Florida between 1970 and 1990. If no action is taken it is estimated that pollution from surface runoff will increase by more than thirty percent by the year 2010 due to increasing human population.



Low dissolved oxygen levels have resulted in fish kills in the Indian River Lagoon, Florida.

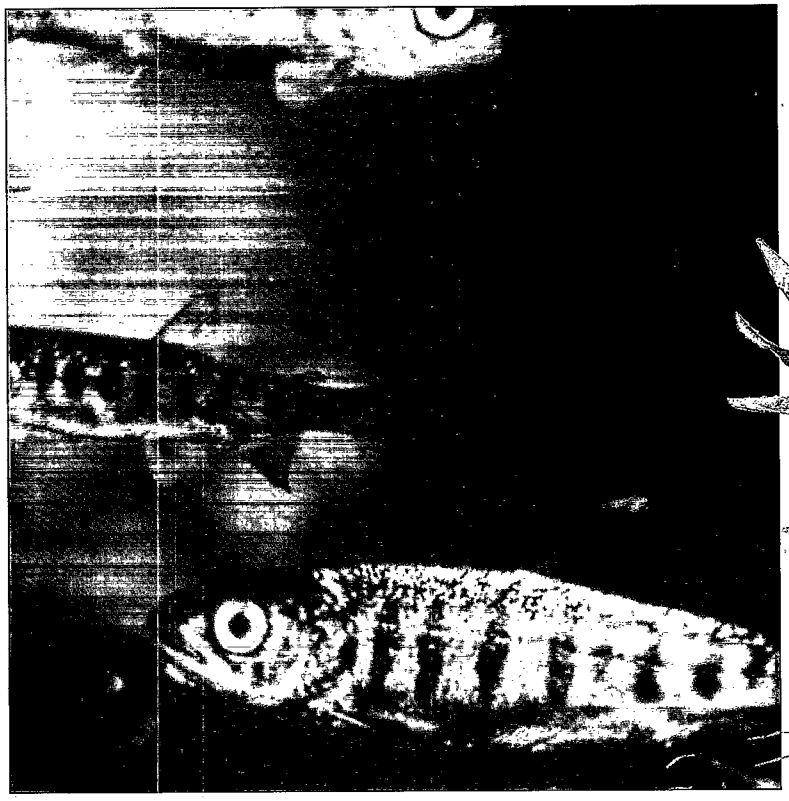
- Runoff from the land contributes more than fifty percent of nitrogen loadings to Marylands' Coastal Bays. Fifty percent of these loadings come from agricultural feeding operations (primarily poultry) which make up less than one percent of the watershed.

- A citizen-based water quality sampling effort in Buzzards Bay, Massachusetts reports that nine of the Bays' 30 embayments experience poor water quality (primarily from over enrichment of nutrients) during the summer months. Another eight embayments are in transition from good to poor water quality. At least fifty percent of all the embayments have shown a slight to moderate decline in water quality during four years of monitoring.

- From mid-July through September each year, up to half of Long Island Sound in New York experiences dissolved oxygen levels insufficient to support healthy populations of marine life. Nitrogen loads are more than twice those estimated during pre-colonial times with 57 percent of nitrogen entering the Sound each year attributable to human activities.

Fish & wildlife habitat loss

Coho salmon smolt in Tillamook Bay, Oregon



Every animal requires places to feed, raise young and hide from predators. Most species require different habitats at different stages of their lives and the ability to move freely from one habitat to another as their needs dictate. For fish, manatee, wading birds, and other water-dependent animals, runoff from farms and cities can alter aquatic habitats and eliminate food sources. Conversion of wetlands, swamps, and other coastal areas to dryer lands for agriculture, residential communities, and roads is a chief cause of habitat loss.

For terrestrial animals, the destruction or conversion of their usual places to hide, feed,

Manatee in Tampa Bay, Florida

nest, and sleep decreases the number of animals that survive and reproduce. Pressures from harvesting of animals, such as overfishing, can remove so many fish from an area that not enough mature adult fish remain to spawn a new generation to replace the ones that were lost.

Also, the accidental or intentional introduction of plant and animal species from other locations can upset the delicate natural balance of reproduction and population control. Introduced plant species typically do not provide the same food sources and shelter for local wildlife that they receive from native plants. Exotic interlopers often out-compete native species and drive native species out of the area. If no local predators exist to control the spread of exotic species of plants and animals, they can spread into vast areas and become difficult to control or to remove.

Examples of fish and wildlife habitat loss

Twenty-three of the 28 National Estuary Programs have identified habitat loss and damage as a high priority management issue. Listed below are some specific examples of habitat loss and the pressures that are facing fish and wildlife populations:

Development along the shores of the Indian River Lagoon, Florida

- In the Indian River Lagoon, Florida, the amount of land devoted to urban uses increased by 895 percent between 1940 and 1987. The amount of land dedicated to agricultural uses increased by 352 percent during the same time period.

- The amount of finfish harvested from Peconic Estuary, New York, has dropped from 2.9 million pounds in 1980 to less than 340,000 pounds in 1989 – an 88 percent decrease.

- In Charlotte Harbor, Florida, important pine flatwood habitats

have been reduced to less than half their former range. These upland areas that are dominated by pine trees, wax myrtle, and saw palmetto plants are critical habitat for animals such as deer, pileated woodpeckers, gopher tortoises, and sandhill cranes.

- In the Maryland Coastal Bays region, oyster beds have shrunk from more than 2,000 acres to approximately 200 acres, while fish populations are shifting to less desirable species tolerant of polluted waters, especially in the northern bays.

- Santa Monica Bay, California, provides habitat for at least 5,000 plants and animals. However, residential development, pollution and over-harvesting are whittling away the numbers and diversity of plants and animal species in the area.

- Coastal areas around Massachusetts Bay, including wetlands, are steadily damaged or depleted by development. Eelgrass meadows in some Cape Cod embayments are being replaced by undesirable macroalgal communities. Declines in populations of fish that spawn in freshwater are attributed to the construction of dams and other structures that restrict access to upstream nursery areas.

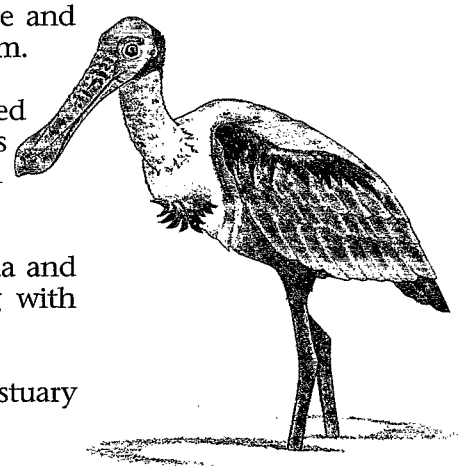
Agriculture can contribute to freshwater discharges collected from irrigation and storms.

- Between 1780 and 1980, nearly half of all North Carolina's wetland areas were destroyed. These losses are placing a severe strain on the many rare and endangered plants and animals of the Albemarle-Pamlico Sounds system.

- Between one and three million bushels of oysters were harvested yearly in the Delaware Estuary at the turn of the century. Viruses and diseases associated with pollution decimated oyster stocks in the 1950's, and today the oyster harvest is almost zero.

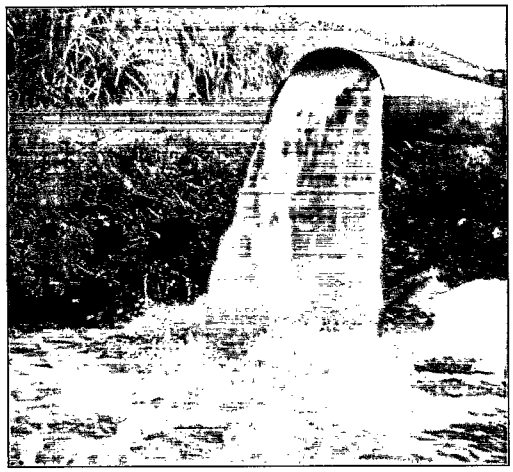
- Since 1950, about half of the natural shoreline of Tampa Bay, Florida and nearly 40 percent of its seagrass beds have been destroyed, along with significant portions of upland habitat.

- About 90 percent of the historic wetland acreage in San Francisco Estuary area has been converted to farmland, urban areas, or other uses.



Agriculture often uses and discharges significant amounts of fresh water to estuaries.

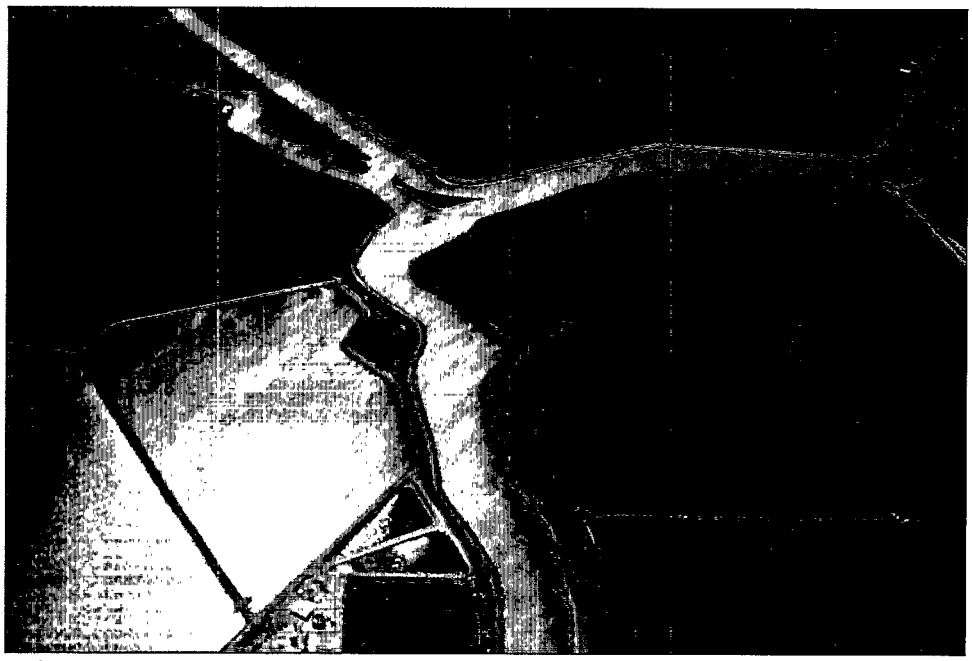
Alterations in freshwater flows



The dynamic and productive habitats associated with estuaries have evolved due to the naturally occurring and highly variable changes in freshwater flows from the land to coastal waters. These systems have evolved gradually and over extended periods of time. When humans undertake activities which rapidly and permanently change the amount and timing of freshwater flowing to estuaries, it can have devastating effects.

Some ways in which humans alter freshwater flows include:

- Constructing dams, reservoirs and flood control structures that divert surface and groundwaters thereby preventing water from



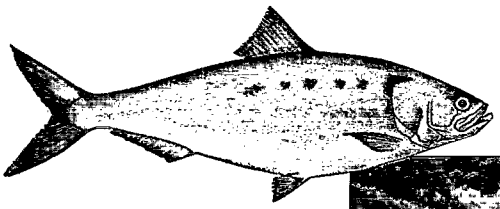
Delta Canal, San Francisco Bay watershed

reaching the estuary in historical quantities, and

- Ditching, draining, paving and clearing wetlands, forests and other natural areas for urban and agricultural development that increases the amount of freshwater reaching estuaries beyond the amounts they can tolerate.

Examples of alteration of natural flow regimes

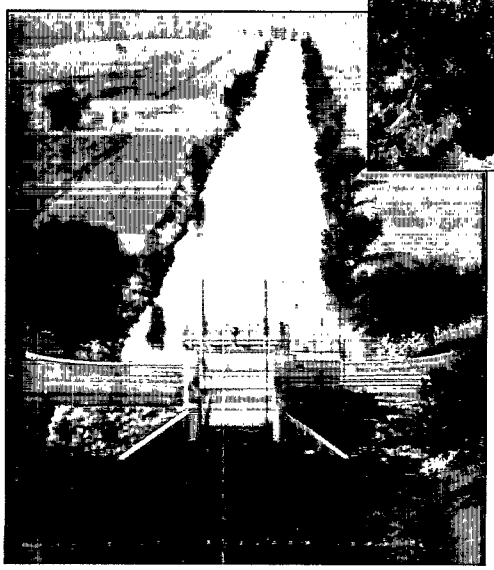
Eleven of the National Estuary Programs have identified human-caused changes in the timing and amount of freshwater flowing to the system – resulting in either too much or too little freshwater – as a highly significant issue.



- Forty percent of the total miles of streams in North Carolina's coastal counties have been modified to some extent.

To right, a naturally meandering river

Below, canals like this one carry excessive freshwater and agricultural runoff to estuaries.



- In recent years, more than half the San Francisco Estuary's natural river flows have been diverted for agricultural, municipal and industrial uses. Millions of fish eggs, larvae, and young are sucked into the powerful intake pumps of the water supply project.

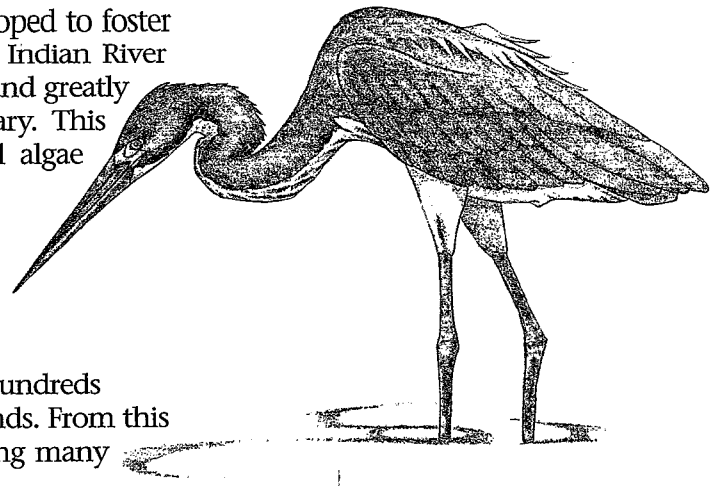
- During the 20th century, 23 reservoirs have been constructed within the Delaware River Basin.

- Damming of four major rivers for flood control and water supply development, along with hydrologic modifications in the watersheds of numerous tidal creeks, has significantly reduced the amount of productive, low-salinity habitat in the Tampa Bay ecosystem in Florida.

- Both of the creeks entering Morro Bay, California, are heavily siphoned for municipal and agricultural uses, sparking contentious water rights battles between competing interest groups that have long divided the region.

- Diversions of surface water have caused massive kills of steelhead trout in Oregon and California.

- *Since the turn of the century,* drainage works developed to foster agriculture and urban development within Florida's Indian River Lagoon have doubled the size of the drainage basin and greatly increased the amount of pollutants entering the estuary. This has increased the number and extent of harmful algae blooms and fish kills.



A Case for Ecosystem Management

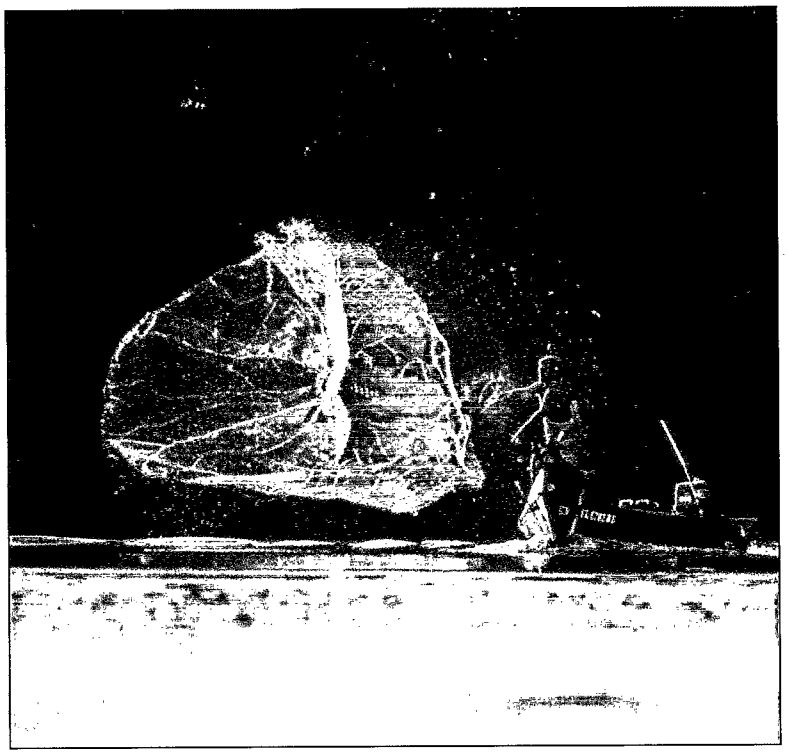
Think of an estuary as a heart served by dozens or even hundreds of arteries and veins in the form of rivers, creeks and wetlands. From this perspective, it is easy to understand how activities occurring many miles away can affect an estuary's health.

Traditional environmental management approaches often viewed an estuary as a series of separate compartments, and parceled responsibility for those compartments to many different organizations. While this philosophy recognized the importance of individual components, it did not address the needs of the overall system – and all too often resulted in inefficient gaps and overlaps in management.

In contrast, the National Estuary Program approach of ecosystem management is akin to looking at the world through a wide-angle rather than a macro lens. It recognizes the critical connection between an estuary and its vast watershed, and assesses the cumulative impacts of human actions on entire natural systems. A key component of ecosystem management is the use of living resources as a meaningful measure of an estuary's health. Instead of measuring progress by rigid laboratory standards alone, success is centered on restoring or improving natural communities and the marine life they support. This broad focus allows estuary managers the flexibility they need to achieve realistic, cost-effective solutions with tangible results.

The National Estuary Program has been a national leader in implementing ecosystem-based management plans that account for the needs of an estuary's individual "threads," while preserving the integrity and diversity of the overall tapestry that defines it.

A commercial fisherman tosses his cast net.



U.S. EPA Administrator Carol Browner lends a hand to Lakewood High School students planting marsh grass in Tampa Bay, Florida.

Taking action for our future

Congress created the National Estuary Program to collect and analyze data needed to assess trends in water quality, and then develop and implement Comprehensive Conservation Management Plans that recommend corrective remedies for identified problems in individual estuaries. The Management Plans that each NEP produces are designed to produce meaningful, measurable results. Community support and involvement are critical components of this process.

The overall goals of the NEP are to protect and improve water quality and enhance the living resources of an estuary. To achieve these goals, the NEP:

Establishes working partnerships among all levels of government and the private sector;

- The Massachusetts Bay Program's interagency approach to shellfish bed restoration seeks to restore and protect 13 oyster, clam, scallop and mussel beds along Massachusetts and Cape Cod bays. The restoration program combines the regulatory and enforcement efforts of the Massachusetts Division of Marine Fisheries and local health boards with the pollution identification, cleanup and public outreach skills of various federal and state agencies and community groups. This coalition also works with area businesses to promote the use of innovative pollution reduction and prevention strategies. What was a widely scattered, inefficient "hit-or-miss" effort is now a systematic, goal-oriented resource management program.

Volunteers pitch in during a community wetland planting day in Sarasota Bay, Florida.

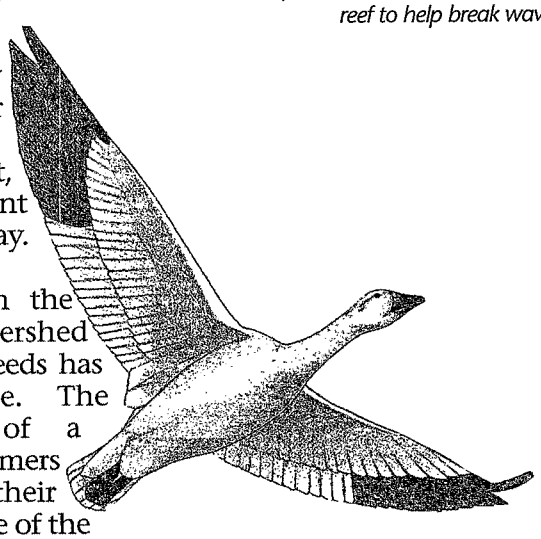
- Groundbreaking research sponsored by the Tampa Bay NEP has identified air pollution as a major source of the bay's nitrogen burden and focused national attention on the strong connection between air and water quality. Many other communities are applying this pioneering work to their estuaries, while Tampa Bay is moving to address the problem through an interlocal agreement that commits local

governments and private industries to reducing their nitrogen contributions to the bay, with support from federal and state regulatory agencies.

Volunteers from the Natural Resources Conservation Service, Americorps and the Galveston Bay National Estuary Program in Texas erect fencing to create an oyster reef to help break wave action on newly planted shore grasses.

Promotes the transfer of scientific information and expertise to Program partners, including agricultural interests, businesses, industries and homeowners.

- The Narragansett Bay Estuary Program, Rhode Island, has enlisted scientific expertise from Brown University, NASA, the U.S. Department of Energy and the private sector to assess the health of the bay. The team is using state-of-the-art satellite and aerial imagery to quantify the overall water quality impacts of the largest fossil fuel power plant in the Northeast, located at Brayton Point on Mount Hope Bay, a part of Narragansett Bay.



- A project that helps farmers in the Delaware Inland Bays watershed determine their crop's nitrogen needs has received increasing acceptance. The project promotes the use of a chlorophyll meter that shows farmers how much nitrogen fertilizer their crops require at any given time. Use of the meter reduces the potential for harmful nitrogen runoff into the bays and saves farmers money. At its debut, Sussex Conservation District personnel demonstrated the device to area growers. All responded positively and several participants plan to purchase meters of their own.

Citizens and scientists conduct water quality testing in Tillamook Bay, Oregon

Enlists public participation in programs to increase community awareness of pollution problems and remedies;

- Paterson Creek Pals, a volunteer stewardship group in Tillamook Bay, Oregon, has monitored water quality and conducted restoration projects in Paterson Creek since the summer of 1995. With a small grant from the Tillamook Bay NEP, the Pals already have planted more than 2,000 trees to create shady havens for fish; collected monthly baseline water quality data; monitored insect and fish populations; sponsored annual

State and local officials in the Albemarle-Pamlico Sounds Estuary Program address the public about estuary issues in North Carolina.

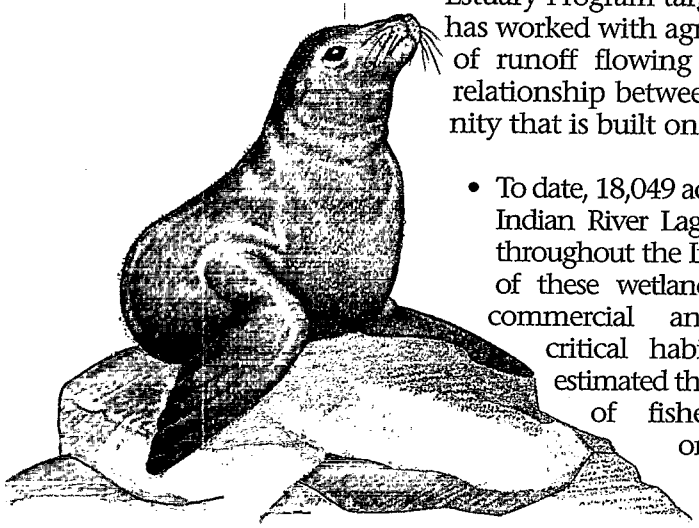
community creek cleanups; and provided educational brochures and library poster updates to the community.

- The Albemarle-Pamlico Estuarine Study Program, North Carolina, promotes nature-based tourism and education to facilitate environmentally sound economic development. The Program helped initiate the non-profit Partnership for the Sounds in 1993. The Partnership, overseen by a Board of Directors comprised of local governments, community groups and business interests, promotes eco-cultural tourism, environmental stewardship and education as key components of sustainable growth in the Albemarle-Pamlico area.

Encourages basin-wide or ecosystem planning to control pollution and manage living resources.

- The Wetlands Ecosystem Goals Project is a collaborative effort spearheaded by the San Francisco Estuary Program, California, to identify the types, locations and specific acreages of wetlands needed to sustain healthy fish and wildlife communities in the San Francisco Bay watershed. The Project, which involves representatives of various public agencies and public interest groups concerned with wetland protection have developed goals and recommendations for effective planning and design of restoration projects.

- Because so much of the Corpus Christi Bay, Texas, watershed is used for agricultural purposes, partners working with the Corpus Christi Bay National Estuary Program targeted agricultural runoff as a priority issue. The Program has worked with agricultural interests to investigate the quality and quantity of runoff flowing into the watershed. This effort is creating a strong relationship between resource agencies and the entire agricultural community that is built on trust and cooperation.



- To date, 18,049 acres of impounded salt marshes have been reconnected to the Indian River Lagoon, Florida. The total acreage targeted for reconnection throughout the Indian River Lagoon basin is 27,000 acres. The reconnection of these wetland areas has resulted in increased habitat for important commercial and recreational fish species and has improved critical habitat for migratory and wading birds. It has been estimated that each acre of reconnected impoundment results in $10,000 of fishery production and that each dollar expended on marsh reconnections provides $25 in economic benefit to the Lagoon region.

Develops and implements pollution reduction and prevention programs.

- The amount of nitrogen entering Sarasota Bay, Florida, as a result of human activities has been reduced by an estimated 28-38 percent since 1988. Through implementation of policies set forth by the Sarasota Bay National Estuary Program, the amount of life-sustaining seagrasses has increased 7 percent in that same time, and Sarasota Bay now supports an estimated 38 million more fish, 114 million more crabs and 58 million more shrimp than it did a decade ago. Large-scale wetland restoration projects that are planned, under way or completed will repair more than 400 acres of saltwater wetlands and create a network of artificial reefs in the Sarasota Bay.

- Clark's Cove is located on the western shore of Massachusetts' Buzzards Bay, between the towns of Dartmouth and New Bedford. Raw sewage discharged to the cove from antiquated sewer systems had forced the closure, nearly a century ago, of all of New Bedford's shellfish harvesting beds to protect public health. Work supported by the Buzzards Bay NEP provided for enhanced water quality sampling and analysis that more precisely defined the nature of the contamination and led to development of a shellfish harvest management strategy. Resulting improvements to dry-weather bacteria counts prompted the Massachusetts Division of Marine Fisheries to reopen Clark's Cove to conditional shellfish harvesting after 91 years of closure.

The National Estuary Program is unique in its emphasis on solving problems at the watershed level and its focus on local decision-making. Each Program is governed by a management conference composed of stakeholders with a vested interest in the future health of their estuary.

The NEP process identifies the most critical problems within the estuarine system and the responsibility that federal, state and local entities have for addressing those problems. This approach allows local communities to target their efforts more effectively and efficiently within the constraints of dwindling government funds and competing community needs. Only when the Program has produced a Management Plan that is fully supported by the local citizenry is that Plan submitted to the state's Governor and the EPA for approval.

The NEP is not a "command and control" program in which the federal government imposes costly and complex regulations that local communities can ill afford and which often do not achieve their desired result. It is a consensus-building process that takes into account the needs, wishes and limitations of local citizens whose livelihoods and lifestyles depend upon healthy, sustainable natural resources.

A great blue heron searches for food in Albemarle-Pamlico Sounds, NC.

The following pages contain summaries of the status and corrective actions happening within each of the national estuary programs. Turn to your program

Barataria Terrebonne National Estuary Program

Fast Facts

4.2 million-acre system between the Mississippi and Atchafalaya Rivers in Louisiana.

No where else in the world is disappearing as quickly.

A half-acre of coastal wetland turns to open water every 15 minutes.

Supports a commercial harvest of over 600 million pounds of fish and shellfish each year.

Sustains the oldest French-speaking culture in the nation.

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Status Update & Next Steps

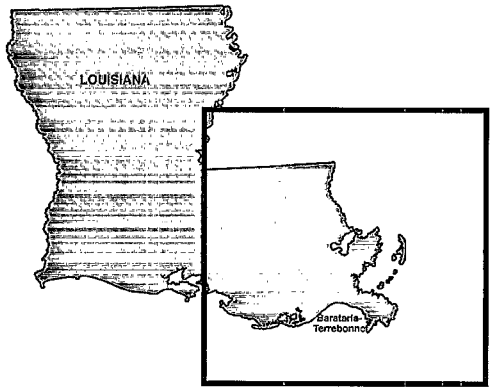
Barataria-Terrebonne is facing a serious crisis with a land loss rate of 21 square miles every year. The area's natural plumbing has been altered in many ways:

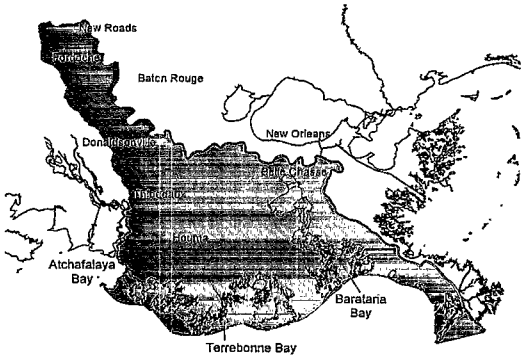
- by river levees along the Mississippi and Atchafalaya Rivers;
- by extensive dredging of straight canals, many of which are deeper than natural water bodies;
- by breaching of natural ridges;
- by laying of pipelines; and
- by impoundments created by levees, dikes, roadbeds, and embankments,

making hydrologic modification the "linchpin" issue. This priority problem directly impacts other identified problems of sediment and habitat loss, and water quality issues of nutrient-enrichment, pathogen contamination and toxic substances.

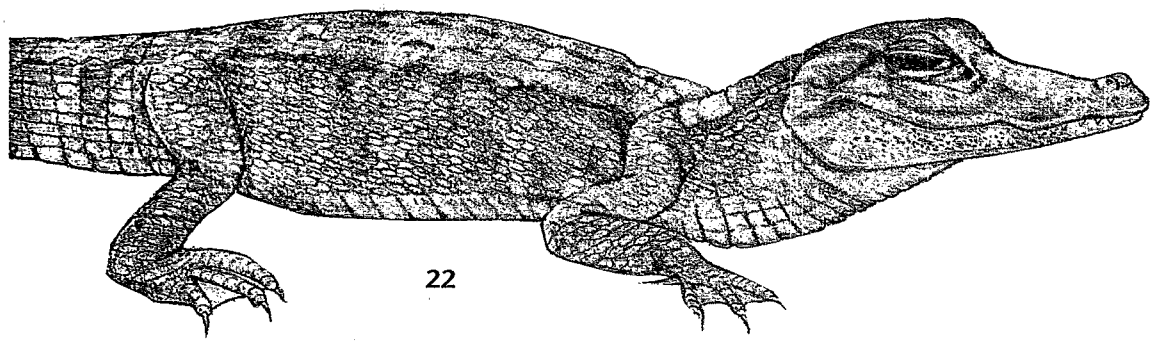
Barataria-Terrebonne Program's nationally-recognized, award-winning management plan addresses methods to re-establish the natural flow of water and improve water quality. In addition, the Program has partnered with the Gulf of Mexico Program to demonstrate shellfish restoration strategies.

For more information about the Barataria-Terrebonne Estuaries Program call 800-259-0869/(504) 447-0868, write P.O. Box 2663, Thibodaux LA 70310, or email us at btep-smk @nich-nsunet.nich.edu.





Barataria-Terrebonne watershed. Courtesy of USEPA.



Barnegat Bay Estuary Program

Fast Facts

Consists of Barnegat Bay and Little Egg Harbor in southern NJ.

660 square mile watershed located largely in Ocean County.

Total year round population in county is 466,500 but can double in summer. Fastest growing county in state.

Tourism brings in an estimated $1.65 billion annually.

Supports a $2.7 million commercial fishery and playground for tens of thousands of recreational boaters and anglers.

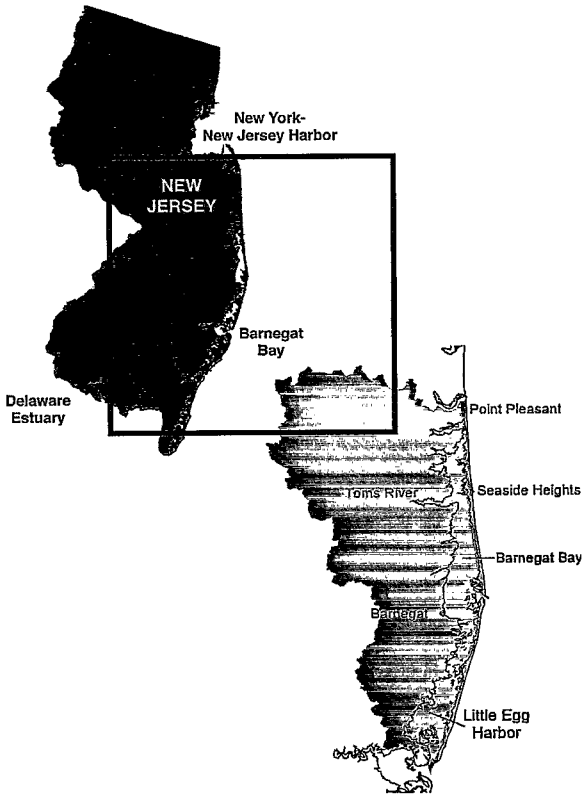
Status Update & Next Steps

The primary environmental concern is nonpoint source pollution, particularly pathogens, nutrients, and sediments. The potential impact of these pollutants is significant as the residence time for water moving through the bay is 50 days.

Activities include a Nonpoint Source Pollution Partnership to coordinate demonstration projects, the NJ Clean Vessel Program which has identified the Bay as a priority area for the installation of marine sewage pumpouts, and progress on a No Discharge Zone application for portions of the estuary.

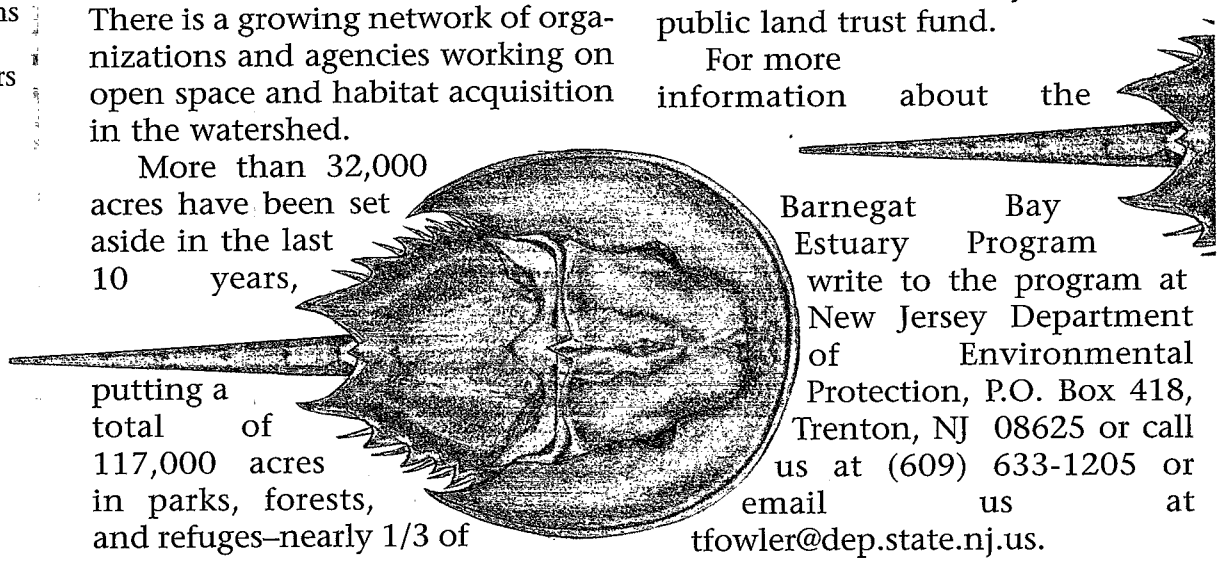
Habitat loss and alteration is also an environmental concern because of land development. There is a growing network of organizations and agencies working on open space and habitat acquisition in the watershed.

More than 32,000 acres have been set aside in the last 10 years, putting a total of 117,000 acres in parks, forests, and refuges–nearly 1/3 of the county. A recent citizen initiative increased property taxes to add about $3.8 million a year to the public land trust fund.



Barnegat Bay watershed. Courtesy of USEPA.

For more information about the Barnegat Bay Estuary Program write to the program at New Jersey Department of Environmental Protection, P.O. Box 418, Trenton, NJ 08625 or call us at (609) 633-1205 or email us at tfowler@dep.state.nj.us.



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Buzzards Bay Program

Fast Facts

Bordered by southeast Massachusetts, Elizabeth Islands and Cape Cod.

Watershed includes 236,000 people, 40% in the city of New Bedford.

Produces nearly 40% of world's cranberry harvest.

Combined quahog, bay scallop, soft shell clam, and oyster harvest valued at $6 million (1994).

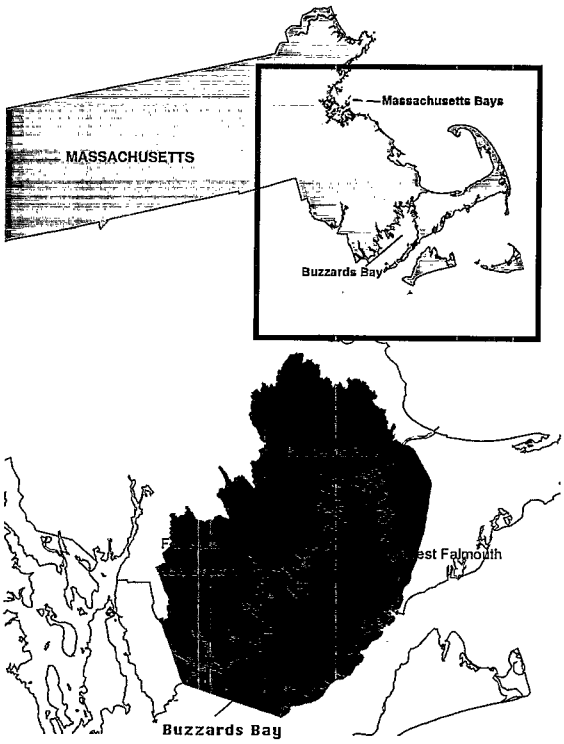
Nearly 20,000 marine vessels pass through Cape Cod Canal annually, with some 10,000 vessels anchoring in the Bay throughout summer.

Status Update & Next Steps

Buzzards Bay has avoided many of the Baywide water quality problems that plague other more urbanized watersheds on the eastern seaboard.

Nevertheless, current land use practices and a growing population have degraded natural resources, particularly the 32 small embayments and harbors. The limited flushing capacity of these areas further intensifies the decline of valuable resources such as eelgrass, a valuable shellfish habitat.

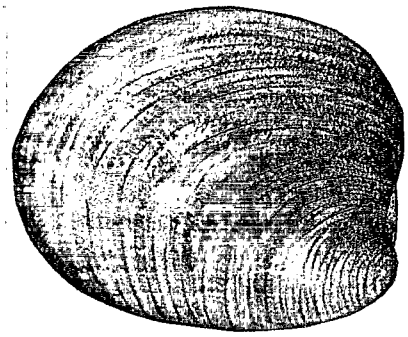
The major threats are excessive nutrient loadings from polluted stormwater runoff and groundwater and bacterial contamination from improper sewage disposal and stormwater runoff. One result of these problems is the closure of shellfish beds, which has a significant negative impact on the local economy.

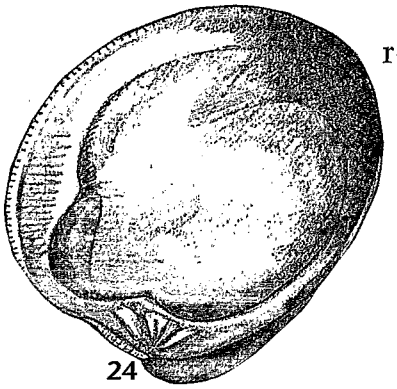


Buzzards Bay watershed. Courtesy of USEPA.

The vast majority of actions in the plan are directed at local governments, a reflection of the fact that this level of government in Massachusetts has the greatest authority for dealing with nonpoint source impacts.

For more information regarding the Buzzards Bay Project, call (508) 291-3625, write 2870 Cranberry Hwy., East Wareham, MA 02538 or visit or email us at tracy.warncke @state.ma.us.





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Casco Bay Estuary Project

Fast Facts

Watershed is 985 square miles and includes 41 municipalities.

Only 3% of Maine's land mass, but 25% of state's population.

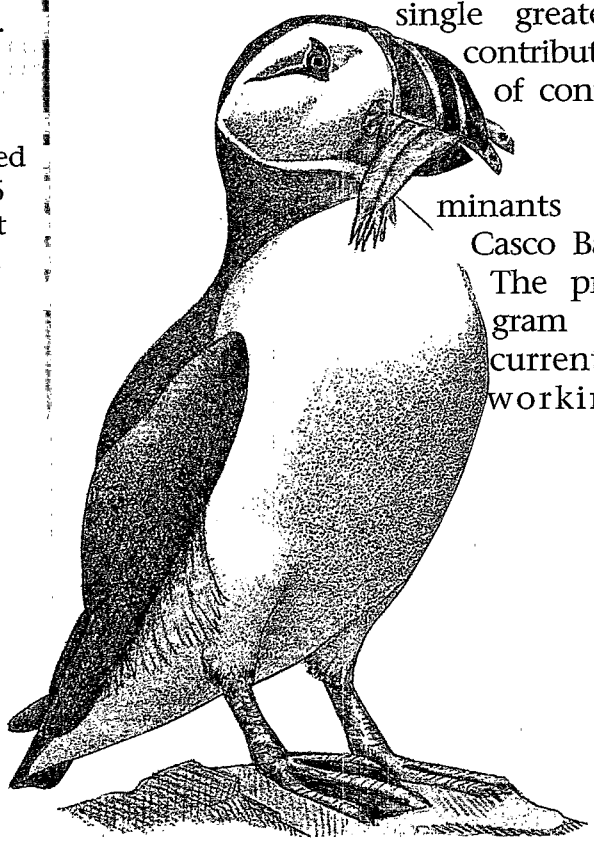
Tourism-related expenditures exceed $250 million per year.

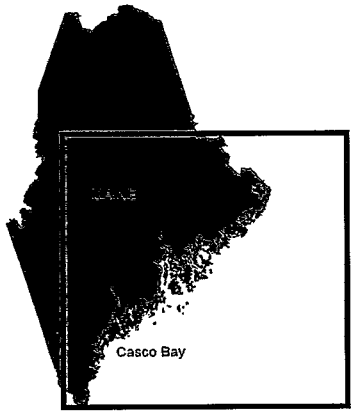
Soft shell clams provide estimated income of $4.66 million to about 270 commercial diggers (1994).

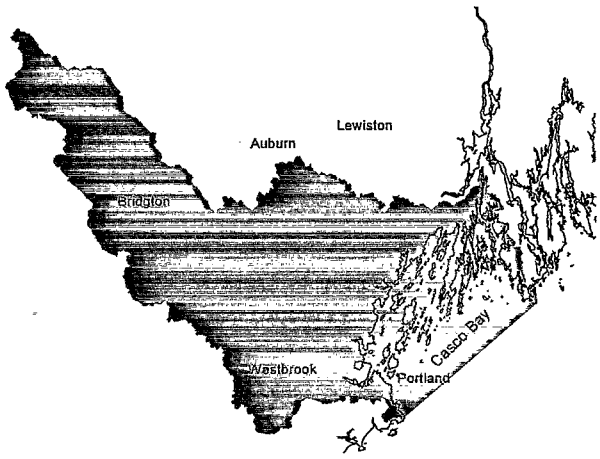
Status Update & Next Steps

The program is focusing on the most significant problems facing the Bay today: toxic pollution, habitat disruption and loss, nutrient enrichment, and pathogen contamination.

These problems are the result of development, stormwater runoff, combined sewer overflows, failing septic systems and discharges from boats, or existing sediment contamination. Storm-water runoff is thought to be the single greatest contributor of contaminants to Casco Bay. The program is currently working to implement recommendations that aim to reopen clam flats in the Bay, address the combined sewer overflows of the City of Portland, and educate the public about pollution prevention from homes and boats.







Casco Bay watershed. Courtesy of USEPA.

For more information about the program call (207) 780-4820, write Casco Bay Estuary Project, University of Southern Maine, Room 408, Law School Building, P.O. Box 9300, Portland, ME 04104 or email us at kgroves@usm.main.edu.

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Charlotte Harbor National Estuary Program

Fast Facts

One of the largest Florida watersheds, covering 4,400 square miles.

Includes 18 cities and several important basins: Lemon Bay, Myakka River, Peace River, tidal Caloosahatchee, Estero Bay and Charlotte Harbor proper.

The area supports a wide variety of economic uses such as tourism, ranching, citrus, phosphate mining, vegetable crops, residential development and urban areas.

Current population of 1.1 million (1997) expected to grow to 1.65 million by 2020.

World famous for tarpon and snook fisheries.

ANEP

Association of National Estuary Programs

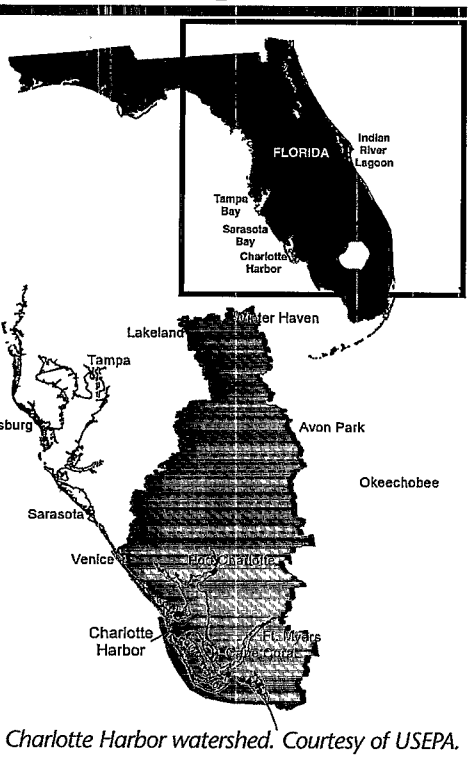
Status Update & Next Steps

The Charlotte Harbor National Estuary Program is developing a Comprehensive Conservation and Management Plan to address the following local issues:

- **Hydrologic Alterations**
  Adverse changes to amounts, locations, and timing of freshwater flows, the hydrologic function of floodplain systems, and natural river flows.

- **Water Quality Degradation**
  Including but not limited to pollution from agricultural and urban runoff, point source discharges, septic tank system loadings, atmospheric deposition, and groundwater.

- **Fish and Wildlife Habitat Loss**
  Degradation and elimination of headwater streams and other habitats caused by development, conversion of natural shorelines, cumulative impacts of docks and boats, and invasion of exotic species. The development of the management plan has included a thorough review of existing scientific information, compiling a directory of public and private monitoring programs, assessing the programs and agencies that manage resources, and holding a public and technical conference.

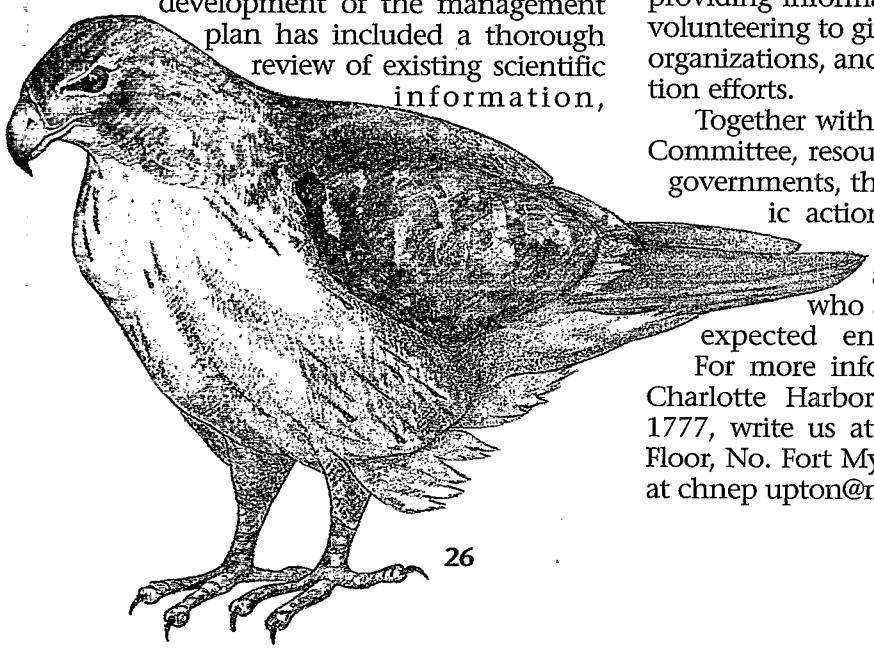


Charlotte Harbor watershed. Courtesy of USEPA.

The Citizen's Advisory Committee has been active in setting resource objectives, providing information about local issues, volunteering to give presentations to civic organizations, and targeting public education efforts.

Together with the Technical Advisory Committee, resource managers, and local governments, the plan will detail specific actions to be implemented, the cost of these actions, the partners who are responsible, and the expected environmental benefits.

For more information regarding the Charlotte Harbor NEP, call (941) 995-1777, write us at 4980 Bayline Dr., 4th Floor, No. Fort Myers, FL 33917, or email at chnep upton@mindspring.com.



Corpus Christi Bay National Estuary Program

Fast Facts

Includes 3 of 7 estuaries in Texas: Aransas, Corpus Christi, and upper Laguna Madre.

12 county region known as the Coastal Bend is more than 11,500 square miles; over 22,500 square miles in drainage basin.

Population of nearly 600,000 projected to double within 35 years.

Nation's 6th largest port and 3rd largest petrochemical complex.

More than 490 species of birds and 234 species of fish.

Bay-related economic activities provided over $4.1 billion in sales, $2.3 billion in value-added, and generated more than 53,000 jobs for local residents (1995).

ANEP

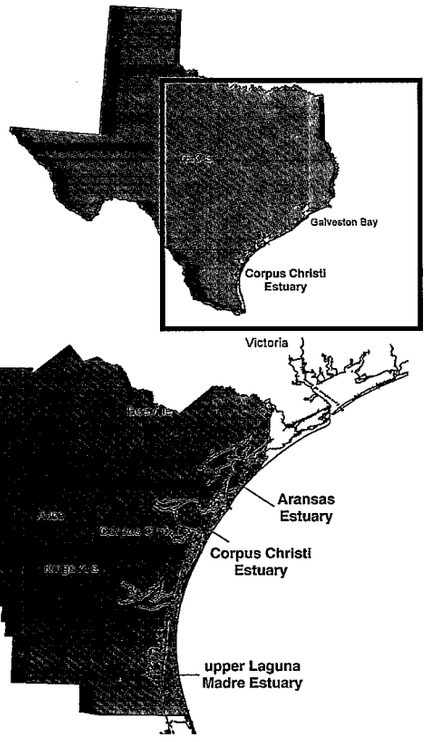
Association of National Estuary Programs

Status Update & Next Steps

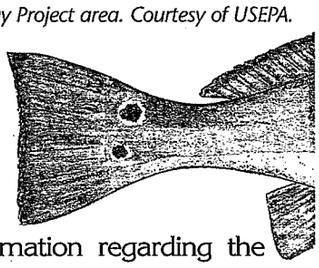
Seven priority issues are being addressed: altered freshwater inflows, condition of living resources, loss of wetlands and other estuarine habitats, degradation of water quality, altered estuarine circulation, bay debris, and public health issues.

Using a collaborative, consensus-building process, the program is working toward:

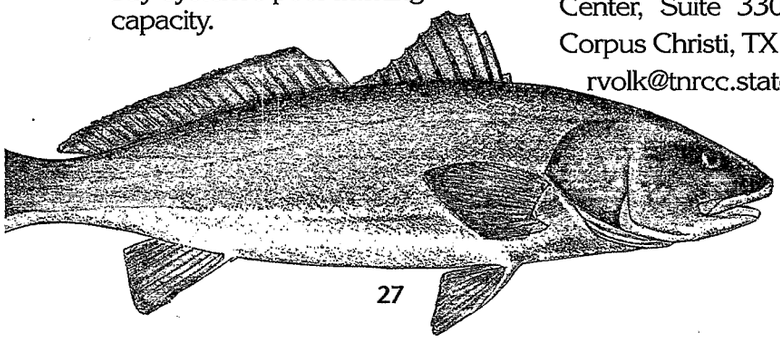
- a politically acceptable strategy to achieve the freshwater inflow needs of the estuaries;
- completion of a long-term (20 to 50 year) dredged material placement plan that incorporates beneficial use concepts to the maximum extent possible;
- habitat conservation and management at the regional, landscape scale; and
- completion and acceptance of a "total loadings" plan for the bay system that will reconcile projected regional population growth and the bay system's poor flushing capacity.



Corpus Christi Bay Project area. Courtesy of USEPA.



For more information regarding the Corpus Christi Bay NEP, call (512) 980-3420, write us at Natural Resources Center, Suite 3300, 6300 Ocean Dr., Corpus Christi, TX 78412, or email us at rvolk@tnrcc.state.tx.us.



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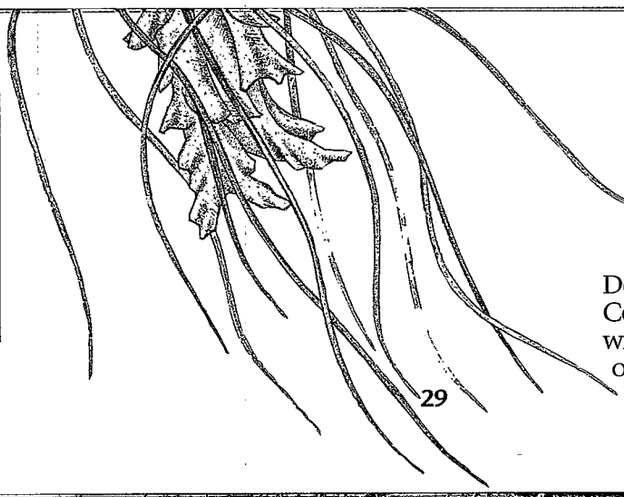

- The Farmland Preservation Demonstration Project has resulted in the preservation of almost 3,400 acres of land within 11 farms. If all pending requests are approved, over 4,500 acres of farmland and woodland will be preserved within the watershed.

For more information regarding the Delaware Inland Bays Program, call the Center for Inland Bays at (302) 645-7325, write us at P.O. Box 297, Nassau, DE 19969 or email at brichards@udel.edu.

ANEP

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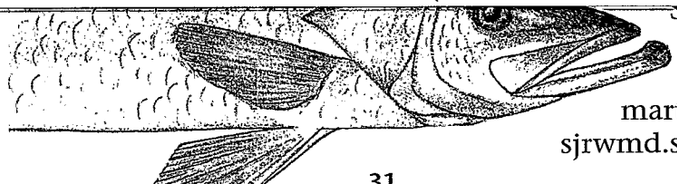


South Harbor City, Suite 107, Melbourne FL 32901 or email us at martin_smithson@district.sjrwmd.state.fl.us

Delaware Estuary Program

Fast Facts

Status Update & Next Steps

Galveston Bay Estuary Program

Long Island Sound Study

Fast Facts

15 million people within 50 miles of its shores, and projected to grow another 4.1% by 2010.

Estimated annual value of boating, sportfishing, swimming, commercial fishing, and intrinsic is $5.5 billion (1990).

Receives more than 1 billion gallons per day of treated effluent.

Status Update & Next Steps

In 1994, the States of New York and Connecticut and USEPA approved a plan to restore the ecosystem and improve the water quality-dependent uses so important to the regional economy.

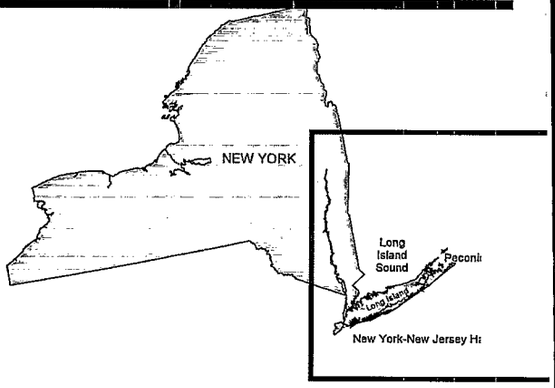
Environmental Goals:

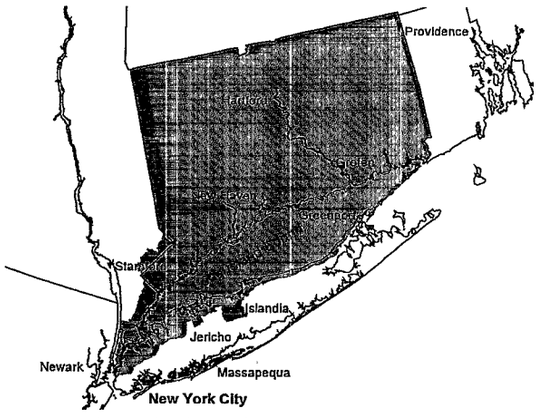
1. Reduce the load of nitrogen by 58.5% within 15 years.

2. Restore 2,000 acres of coastal habitat and 100 river miles used by migratory fish over the next 10 years.

Low dissolved oxygen (hypoxia) is the most significant problem in the Sound, and a phased approach is being used to reduce levels of nitrogen which will result in improved oxygen levels. Having capped nitrogen loads from certain point sources and implemented low-cost improvements at sewage treatment plants, nitrogen loads are now 5,000 tons per year below peak levels.

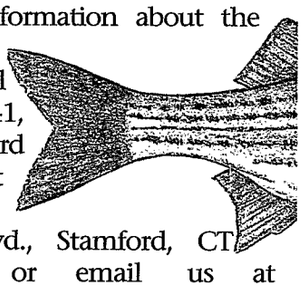
The Habitat Restoration Initiative will complement nitrogen reduction efforts, as healthy habitats help filter nitrogen and other pollutants. Through a partnership of local, state, and federal organizations and agencies, more than 450 degraded sites have been identified and prioritized. Restoration work has been funded at 8 of these sites.

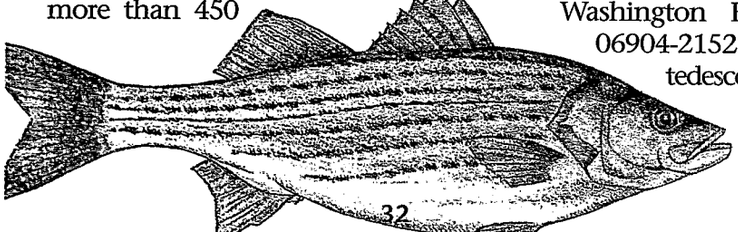




Long Island Sound watershed. Courtesy of USEPA.

For more information about the Long Island Sound Study call (203) 977-1541, write us at Stanford Government Center, 888 Washington Blvd., Stamford, CT 06904-2152 or email us at tedesco.mark@epamail.epa.gov.





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Lower Columbia River Estuary Program

Fast Facts

146 river miles from Astoria to Bonneville Dam and up the Willamette River to Willamette Falls.

Tributaries drain 15,100 square miles.

Home to 2 million people, with 600,000 more expected by 2015.

5 major deep water ports, contributing $28 billion annually to economy.

27 major dams and generating facilities.

Historically produced largest chinook salmon run in world. Now 67 species are endangered and 76 are at risk.

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Status Update & Next Steps

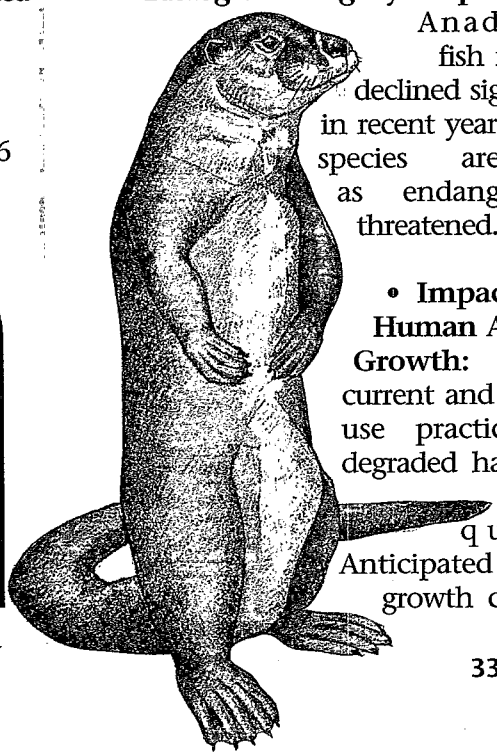
Seven priority issues have been identified including:

- **Toxic Contaminants in Sediments and Fish Tissue:** Levels of PCBs, DDE, and dioxin may be linked to reproductive failure in bald eagles, mink, and river otter.

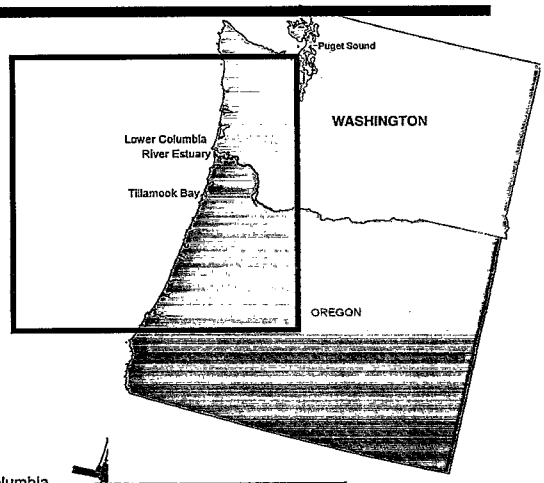
- **Habitat Loss and Modification:** Dams, dikes, maintenance dredging, and land use practices over the last 100 years have significantly altered the estuary.

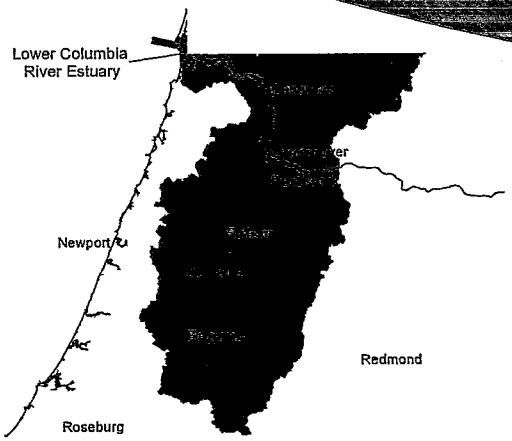
- **Conventional Pollutants:** Point and nonpoint source pollution have changed Ph, temperature, and dissolved oxygen levels.

- **Biological Integrity of Species:** Anadromous fish runs have declined significantly in recent years. Several species are listed as endangered or threatened.



- **Impacts of Human Activity & Growth:** Certain current and past land use practices have degraded habitat and water quality. Anticipated future growth could lead to further degradation.





Lower Columbia River estuary watershed. Courtesy of USEPA.

- **Public Awareness & Stewardship:** There is a continual need to connect people to the river. Greater awareness will lead to stronger protection of the river.

- **Institutional Constraints:** Currently, many agencies and levels of government are involved in managing and protecting the estuary; coordination of these efforts is important.

For more information regarding the Lower Columbia River Estuary Program, call (503) 229-6066, write us at 811 SW Sixth Avenue, Portland, OR 97204 or email us at lcrep@deq.state.or.us.

Maryland Coastal Bays Program

Fast Facts

Shallow coastal lagoons located behind Fenwick (Ocean City) and Assateague Islands including Isle of Wight and Assawoman bays in the north, and Chincoteague, Newport, and Sinepuxent bays in the south.

Watershed of 175 square miles within Worcester County.

Population of 21,781 swells to over 300,000 in summer; expected to double within 30 years.

19 animal species and 89 plant species currently on state's rare, threatened, or endangered list.

Important wintering, staging, and breeding habitats for more than 360 bird species.

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Status Update & Next Steps

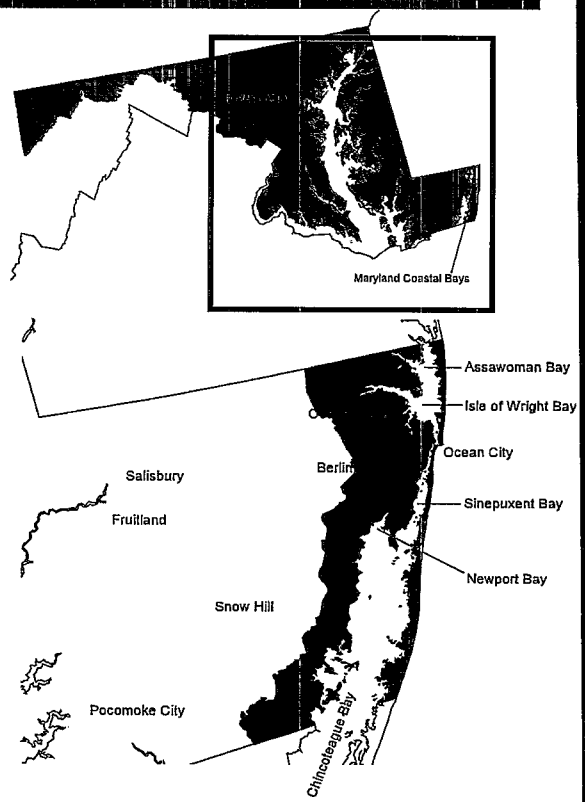
The northern bays, major tributaries, and artificial canals are degraded while the southern bays are in relatively good health. Eutrophication is the single greatest environmental problem.

Loss of terrestrial and aquatic habitat has contributed to the degradation of the bays and, in some locations, chemical contaminants occur at levels that are likely to cause harm to living resources.

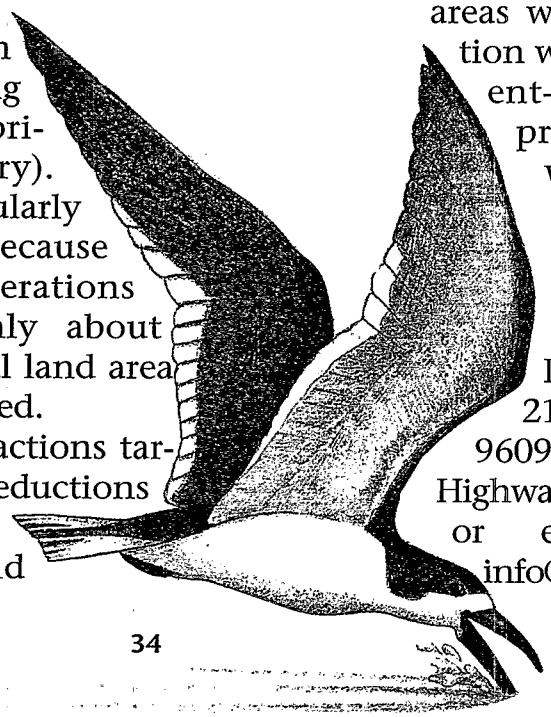
The amount of nutrients entering the coastal bays today is significant.

Approximately one-third of the nutrients come from the wastes produced in animal feeding operations (primarily poultry). This is particularly impressive because these operations constitute only about 1% of the total land area of the watershed.

Corrective actions target nutrient reductions from septics, lawns and farms. Enhancement of riparian areas with natural vegetation will help filter nutrient-rich runoff and provide habitat for wildlife.



Maryland Coastal Bays watershed. Courtesy of USEPA.



For more information regarding the Maryland Coastal Bays Program, call (410) 213-BAYS, write us at 9609 Stephen Decatur Highway, Berlin, MD 21811 or email us at info@mdcoastalbays.org.

Massachusetts Bay National Estuary Program

Fast Facts

Encompasses all coastal waters of Massachusetts Bay from tip of Cape Cod to New Hampshire border, an area of about 1,650 square miles.

Watershed covers more than 6,300 square miles.

Commercial and recreational shellfish harvests contribute $14 million annually in landings alone.

Status Update & Next Steps

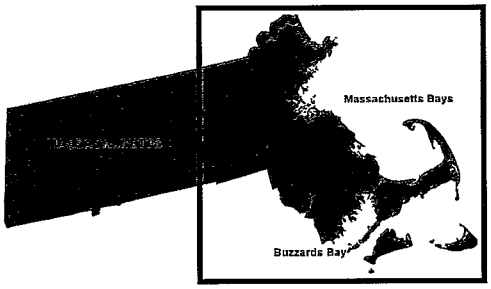
Thousands of acres of shell fish beds are closed, water is unsafe for swimming in many areas, contaminants are found in fish tissues, and some of the harbors have polluted bottom sediments.

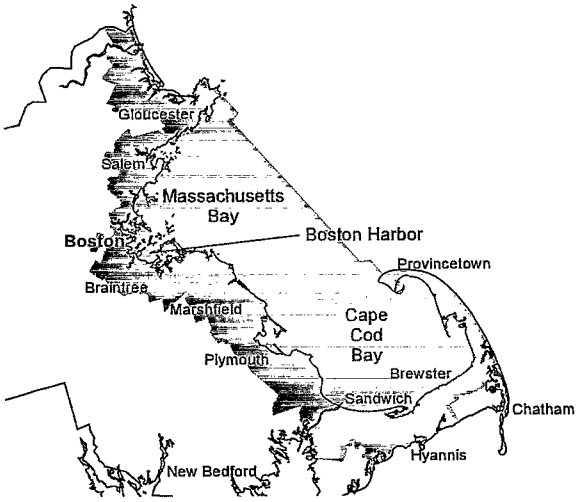
The management plan includes 15 specific Action Plans to not only address the many centuries of human abuse, but also emphasize prevention, in recognition that it costs far more to clean up pollution than prevent it in the first place.

Program studies determined that the most significant sources of nitrogen and PAHs are point source discharges and the atmosphere. Atmospheric sources originate not only from Massachusetts and mid-western states but also from New York City.

More than half of the estimated 13,000 metric tons of oil and grease entering the bays each year is from nonpoint sources of pollution.

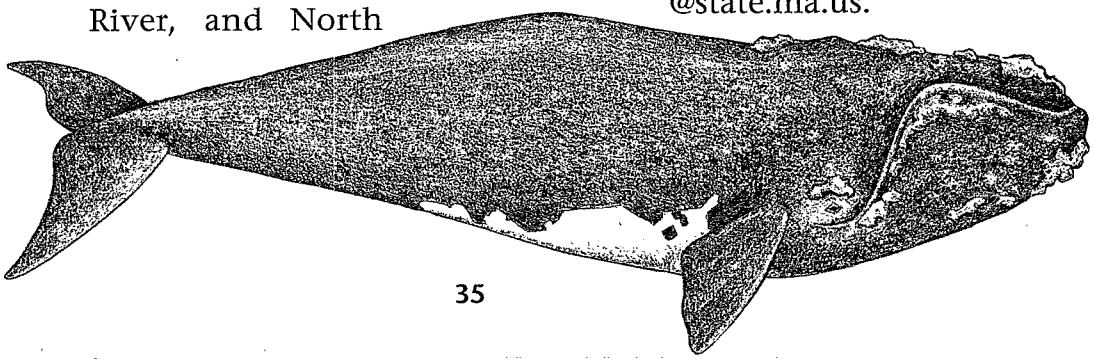
Boston Harbor, the Merrimack River, and North Shore basins contribute the most pollution to the bays. Thirty of the 34 major industrial and municipal outfalls are in these three basins.





Massachusetts Bay watershed. Courtesy of USEPA.

For more information about the Massachusetts Bays NEP write to the program at 100 Cambridge Street, #2103, Boston, MA 02202 or call us at (617) 727-9530, ext. 424 or email us at jan.smith @state.ma.us.



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Mobile Bay National Estuary Program

Fast Facts

Includes most of Mobile and Baldwin Counties, where population increased 27% from 1970 to 1990.

Watershed drains 44,170 square miles.

Nationally significant for minerals, fisheries, forestry products, diverse wildlife, submerged aquatic vegetation, and vegetated wetlands.

Port of Mobile ranked 13th largest in nation in amount of tonnage shipped and 8th in foreign waterborne commerce (1995).

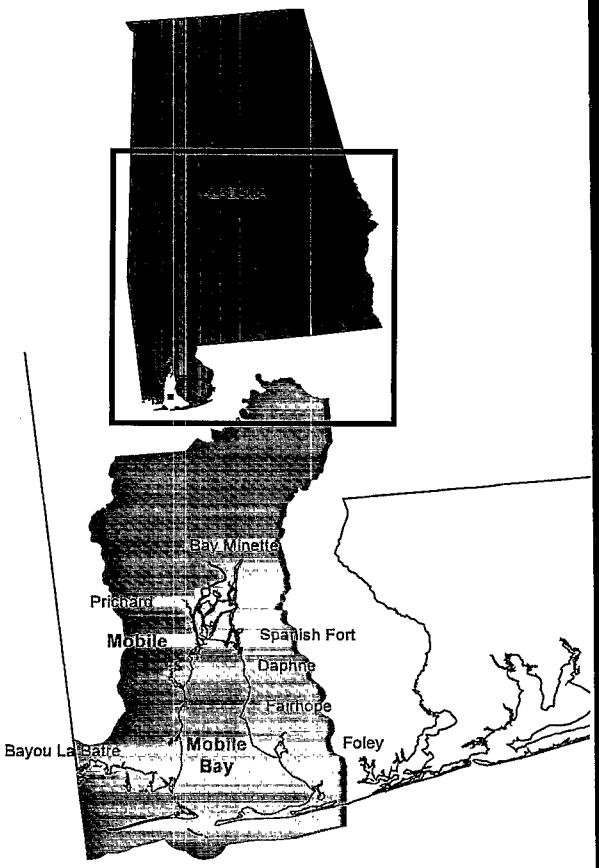
Sportfishing contributes over $260 million annually to local economy, commercial fishing over $300 million and tourism another $415 million (1995).

Status Update & Next Steps

As one of the newest National Estuary Programs, technical and citizen committee members are refining priority issues and developing action plans for human uses, habitat loss, living resources, and water quality.

Some of the program's issues include:

- declines in feeding and breeding bird habitat;
- losses of marshes and submerged aquatic vegetation;
- declines in the quality of coastal wetlands and conversions of wetlands;
- point and nonpoint source pollution;
- physical modifications which have impacted water flow patterns; and
- introduced species.



Mobile Bay watershed. Courtesy of USEPA.

There is concern within the community about introduced species that could be delivered via ship ballast discharges. The program has joined in a cooperative effort with the Coast Guard to check ship bridge logs for compliance with voluntary maritime offshore exchange policies. This analysis will help determine what type of action might be required.

For more information about the Mobile Bay NEP write to the program at 440 Fairhope Avenue, Fairhope, AL 36532 or call us at (334) 990-3565.

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Morro Bay National Estuary Program

Fast Facts

Located entirely within San Luis Obispo County, CA -- includes communities of Morro Bay, Los Osos, and Baywood Park.

48,000-acre watershed.

Supports most significant wetland system on state's south-central coast.

Essential link in Pacific Flyway, supporting one of state's largest waterfowl habitats.

Provides habitat for many endangered and threatened species.

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Status Update & Next Steps

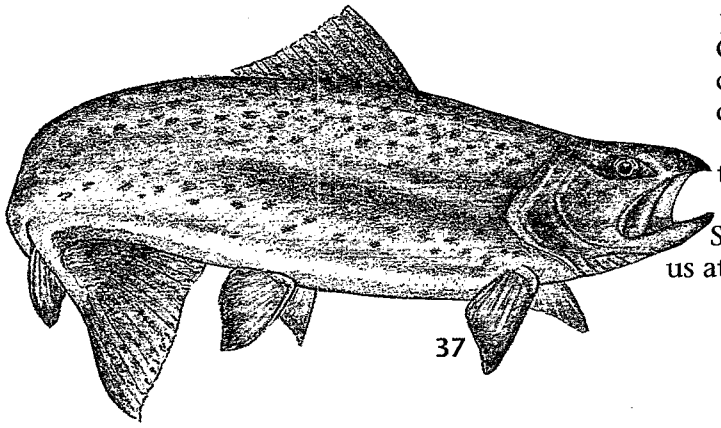
Morro Bay is facing the following priority problems:

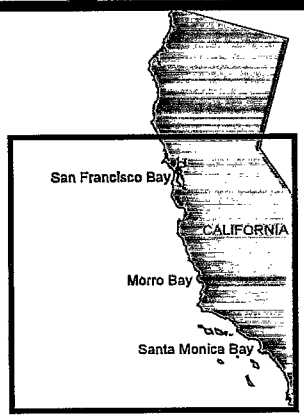
- **Rapid Sedimentation:** The rate of sediment delivery has increased due to changes in land use, changes brought on by wildfire, changes in sediment deposition areas, and reduced circulation .

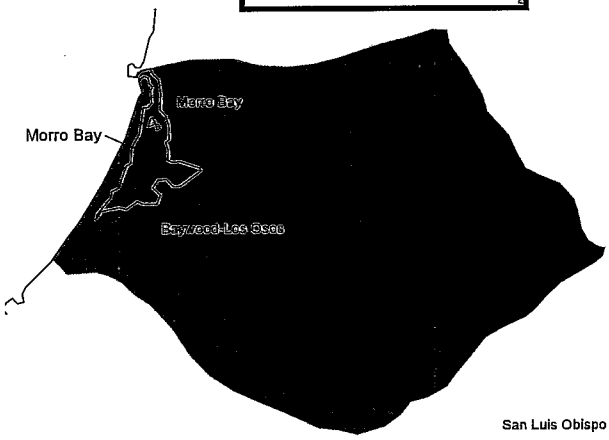
- **Increased Bacterial Concentrations:** Portions of shellfish harvesting lease areas are always restricted, and other areas are closed for several days following storm events.

- **Increased Nutrient Concentrations:** Agricultural land, grazing land, roadside, and lawn runoff are resulting in increased nutrient concentrations. Fertilizers, septic systems, and animal waste are believed to be contributing to this problem.

- **Freshwater Flow Reductions:** Increases in surface and groundwater diversions directly affect the quantity and timing of the flow of creeks into the bay, and the wildlife and botanic values associated with freshwater supply.







Morro Bay watershed. Courtesy of USEPA.

- **Increased Heavy Metal Concentrations:** Inactive mines in the upper watershed are believed to have contributed to high levels of heavy metals found in sediments eroding from these areas. Some mussel samples from the bay have toxic contamination.

- **Habitat Loss:** Development pressures steadily increasing. Greater population density and changing land use threaten water quality and wildlife habitat.

For more information regarding the Morro Bay NEP, call (805) 528-7746, write us at 1400 Third Street, Los Osos, CA 93402, or email us at mjmooney.mbnep@the grid.net.

Narragansett Bay Estuary Program

Fast Facts

One of the most densely populated estuaries in the nation, with almost 2 million people in the watershed.

Watershed is 1,657 square miles and includes the cities of Providence and Newport, RI, and Worcester MA.

Although statewide population has been stable from 1988 to 1997, some coastal towns have experienced 20% growth rates.

Over 100 fish species and 20 shorebird species.

Tourism, the state's 2nd largest industry, contributed $1.7 billion to the economy in 1996.

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Status Update & Next Steps

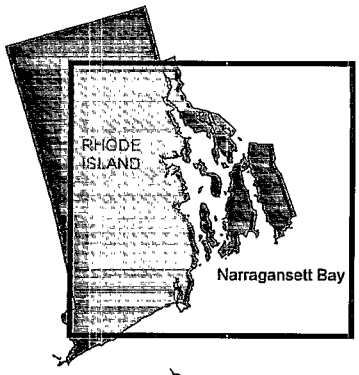
The management plan focuses on conserving and restoring natural resources and protecting and enhancing water quality. Two approaches are being used.

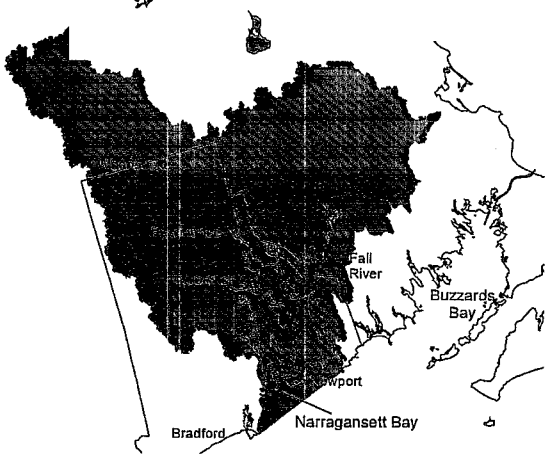
First, bay-wide planning tools and practical, results-oriented projects are being developed that create a basis for informed decisions

The Program is working with coastal municipalities to incorporate new GIS resource mapping data into local planning processes.

Second, watershed-based projects find pollution "hot spots" and develop effective and innovative ways to correct them. This activity is using technical assistance and outreach to communities and citizens to build critical local support for action.

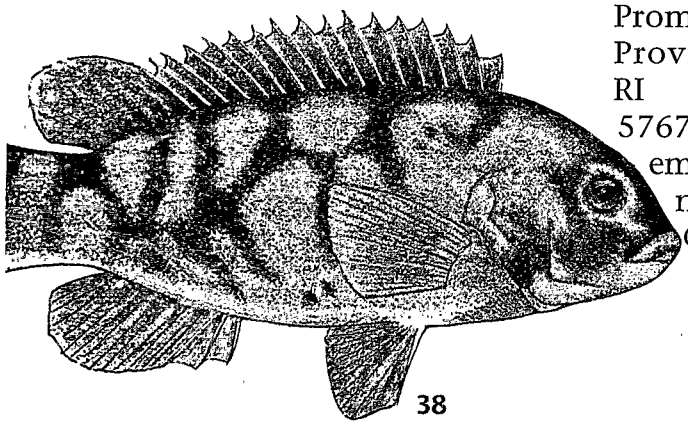
A primary role of the Narragansett Bay Estuary Program is coordination – a critical need because resources for environmental action are becoming increasingly scarce. The program is successfully leveraging state, federal, and local efforts to further common goals.

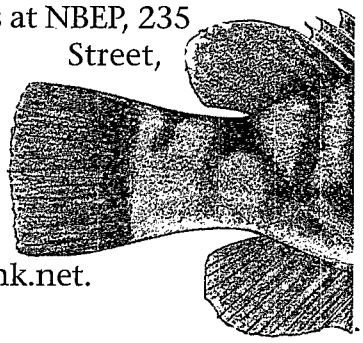




Narragansett Bay watershed. Courtesy of USEPA.

For more information regarding the Narragansett Bay Estuary Program, call (401) 222-4700, ext. 7270, write us at NBEP, 235 Promenade Street, Providence, RI 02908-5767 or email us at narrabay@earthlink.net.





New Hampshire Estuaries Project

Fast Facts

Combined population of the 43 Great Bay and Seacoast watershed communities is over 350,000 (1990) -- projected to grow to over 443,000 by 2015.

Nearly 1 in 5 jobs directly related to travel and tourism - the region's second largest industry.

73% of watershed is forested or open lands.

Recreational shellfishing contributes an estimated $3 million annually to state and local economies.

Recreational saltwater fishermen spent $52 million in 1990.

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Status Update & Next Steps

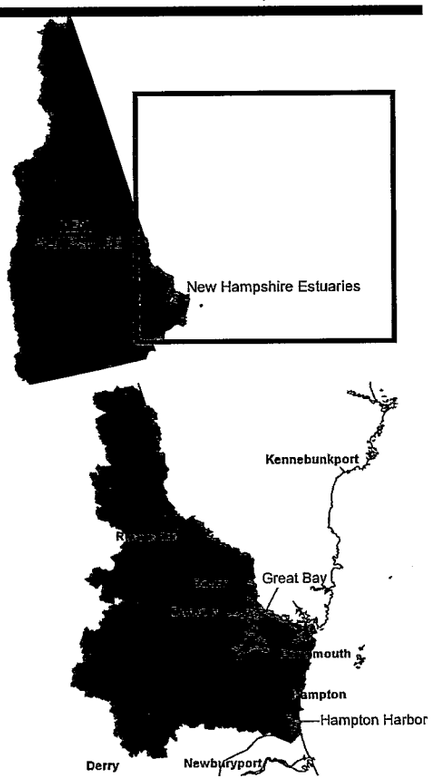
The program is currently refining its list of priority issues.

Most activities are directed at enhancing estuarine water quality through the identification, abatement, and prevention of nonpoint source pollution. Bacterial contamination introduced through stormwater runoff and faulty septic systems are priority management issues.

The decline and management of shellfish resources will be addressed in light of pathogen contamination and habitat degradation.

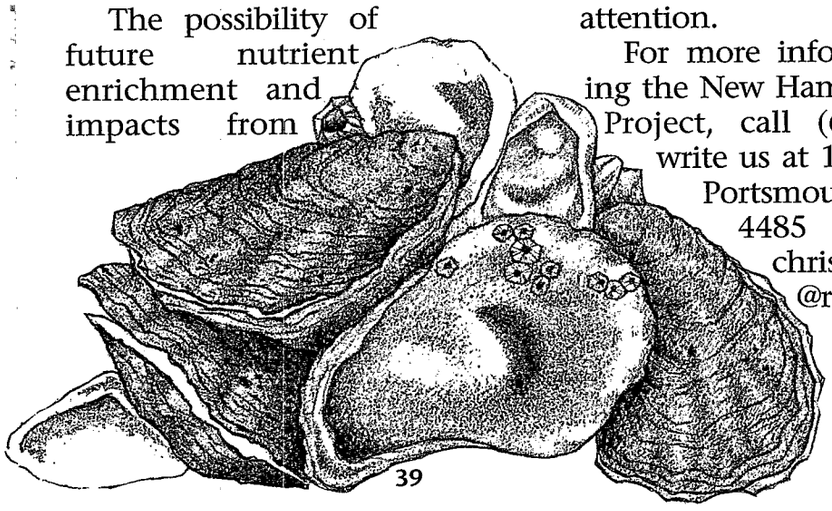
Changes in shoreline/riparian buffers are environmental management issues that impact both water quality and habitat values.

The possibility of future nutrient enrichment and impacts from the resuspension of sediments containing toxic contaminants are also issues drawing management attention.



New Hampshire Estuaries watershed. Courtesy of USEPA.

For more information regarding the New Hampshire Estuaries Project, call (603) 433-7187, write us at 152 Court Street, Portsmouth, NH 03801-4485 or email us at chrisnash @rscs.net.



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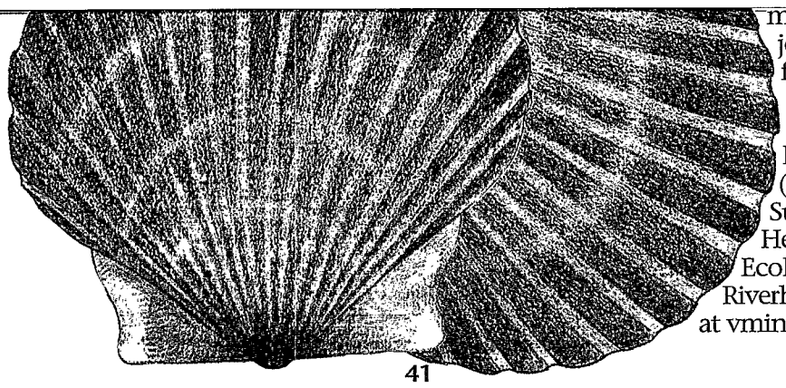


monitoring and action projects, and children's conferences.

For more information on the Peconic Estuary Program, call the (516) 852-2077, write us at Suffolk County Dept. of Health Services, Office of Ecology, County Center, Riverhead, NY 11901 or email at vminei@suffolk.lib.ny.us.

primary challenge of the program is

remaining bay wetlands, and reducing the number of yearly beach closures to zero (through improved stormwater

New York-New Jersey Harbor Estuary Program

Fast Facts

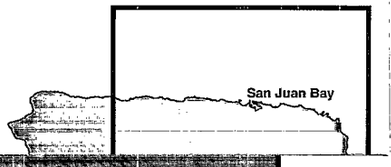
Status Update & Next Steps

San Juan Estuary Program

Fast Facts

Only NEP outside

Status Update & Next Steps



Sarasota Bay National Estuary Program

Fast Facts

The Bay area has pollution control infrastructure presently valued at more than a billion dollars.

The area supports more than 50 water-dependent industries; tourism is number one (more than $820 million annually).

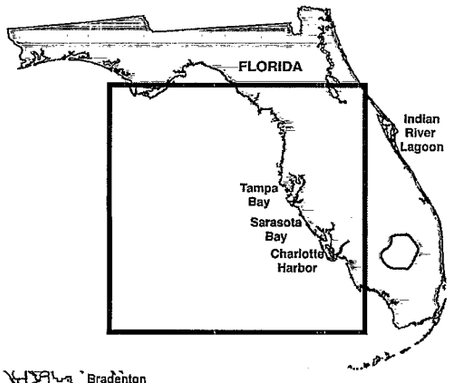
The restoration plan is based on $2.5 million in technical studies and recommends a capital investment of approximately $160 million.

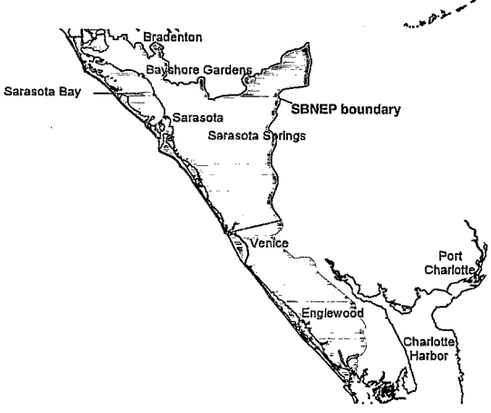
Status Update & Next Steps

Released in November 1995, the comprehensive management plan focuses on improving Bay water quality and productivity.

Community efforts to improve water quality are focusing on controlling nitrogen. Since 1988, it is estimated that nitrogen loading has been reduced by 28%-38% due to improved wastewater treatment, re-use of wastewater and the construction of stormwater control projects. Reduced pollution has in-turn resulted in a 7% increase in seagrasses and an estimated 38 million more fish, 114 million more crabs and 58 million more shrimp than in 1988.

Wetlands restoration and artificial reef creation (for juvenile fish) are also major features of the management plan. Since 1989, more than $8.5 million in wetlands restoration projects (400 acres) are completed or are planned. Nine additional artificial reef sites have been permitted or are in the permitting process; two reefs have been refurbished since 1995.





Sarasota Bay watershed and program boundary. Courtesy of USEPA.

Significant land acquisition efforts to protect bay habitat are underway.

Changes in local landscaping and maintenance practices are also proposed to reduce fertilizer and pesticide runoff. The Florida Yards and Neighborhoods Program is being implemented with twelve model yards created. "The Gulf Coast Heritage Trails"

Tampa Bay Estuary Program

Fast Facts

The largest open-water estuary in Florida, covering almost 400 square miles and draining a 2,200-square-mile watershed.

More than 2 million people, with a 17% increase projected by 2010.

Largest port in Florida, consistently ranking among top 10 ports nationwide in trade activity.

Tampa Bay supports 3 major seaports and a cruise ship industry that contributes more than $10 million annually to the region's economy.

Mangrove islands host over 40,000 pairs of 25 species of birds annually.

Status Update & Next Steps

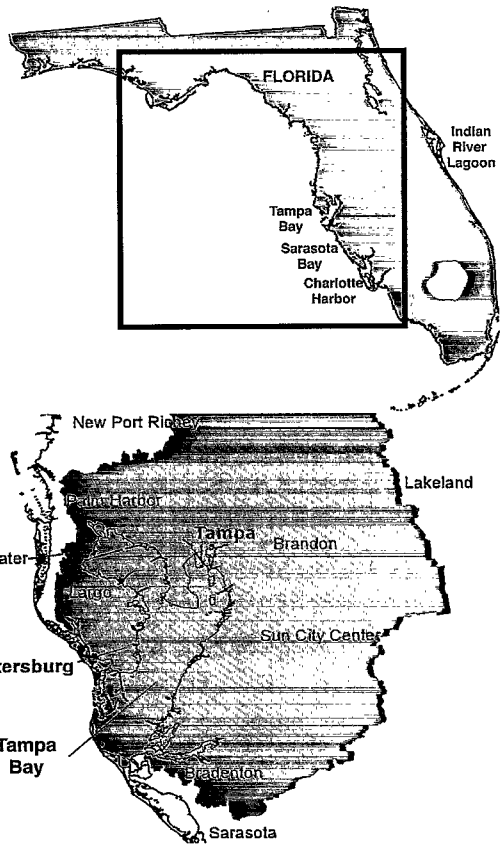
Specific action strategies cover five areas of concern: Water & Sediment Quality; Bay Habitats; Fish & Wildlife; Spill Prevention and Response; and Dredging & Dredged Material Management.

Water & Sediment Quality: Goal is to maintain nitrogen loadings at existing levels, even with future growth, to allow the gradual recovery of 12,350 acres of seagrass. Local governments and industries need to reduce their future nitrogen contributions by about 7% by the year 2010, or about 17 tons per year.

Bay Habitats: Goals include recovering an additional 12,350 acres of seagrass in the bay while preserving the bay's existing 25,600 acres; and "restoring the historic balance" of coastal wetland habitats.

Fish & Wildlife: Goals seek to bolster the number, diversity, and health of the bay's native inhabitants by improving the areas in which they live, feed, and reproduce.

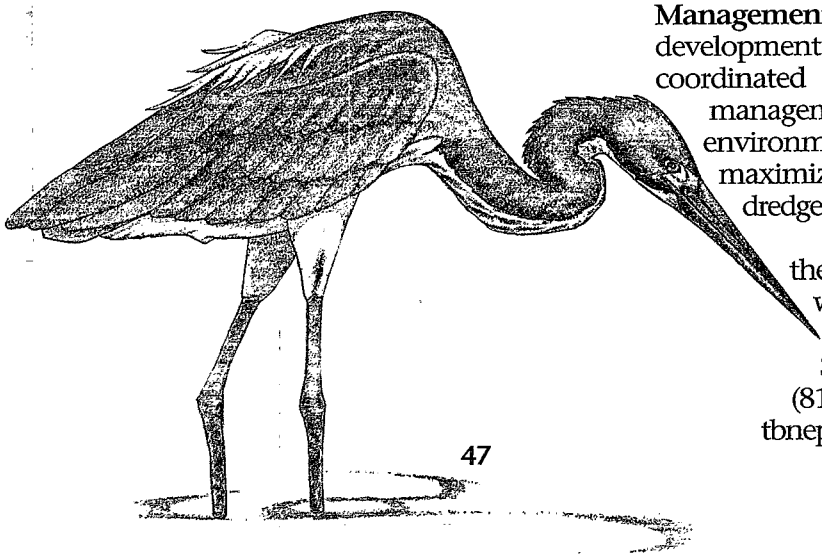
Spill Prevention & Response: Goals include the installation of a state-of-the-art vessel traffic and information system to improve tracking and coordination of ship traffic along the bay's narrow shipping channel.



Tampa Bay watershed. Courtesy of USEPA.

Dredging & Dredged Material Management: Goals focus on the development of a long-range, coordinated dredged material management plan that minimizes environmental impacts and maximizes beneficial uses of the dredged material.

For more information about the Tampa Bay Estuary Program write to the program at M.S. 1-1/NEP, 100 8th Avenue SE, St. Petersburg, FL 33701 or call (813) 893-2765 or email us at tbnep@tampabayrpc.org.



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EPA

U.S. Environmental
Protection Agency