



New York - New Jersey Harbor Estuary Program

April 2003

The Harbor is an **Estuary**, and everyone in the **Watershed** is entrusted with its **Stewardship!**

Estuary: a partially enclosed body of water where freshwater from rivers and streams mixes with saltwater from the ocean

Watershed: the area of land that drains to a common waterway, such as a stream, estuary, lake, wetland, or ocean

Stewardship: the careful and responsible management of something entrusted to one's care

A Steward's Guide to the Estuary



This guide is designed to introduce community groups, environmental organizations, and individuals to the goals of the Harbor Estuary Program, and to present a sampling of stewardship efforts, recent accomplishments, and available resources.

The Harbor Estuary Program brings together government agencies, non-profit organizations, research institutions, scientists, and citizens to protect and restore the natural resources of the estuary. These partners are working together to ensure that future generations will enjoy a healthy harbor ecosystem and a thriving port, with more opportunities for fishing and swimming, better access to the water, and enhanced habitat protection and restoration.

*Planting cord grass
(Spartina alterniflora)
in a salt marsh at
Jamaica Bay
Wildlife Refuge.*

Photo by Don Riepe/
American Littoral
Society

STEWARDSHIP

Who Are the Estuary's Stewards?

Any person or organization that takes action to protect and restore the harbor ecosystem is a steward of the estuary. There are many ways to be involved, and most stewards are engaged in a variety of activities. Three major categories of stewardship are education, advocacy, and hands-on action.

Education, both in schools and in the community, is crucial to protecting the estuary and many stewards focus efforts there. Some groups look at the political side of the equation, advocating for stricter enforcement of regulations, better environmental management, and more money for protection of the region's natural resources. Still others do hands-on work to restore habitat or conduct waterfront cleanups. You don't have to live at the water's edge to be a Harbor Estuary steward. Virtually everything that happens in the watershed affects the waters of the harbor, so land-based restoration and education work is essential.

The following is only a small sampling of stewardship efforts throughout the Harbor Estuary region.

Many non-profits and community groups may not realize that they ARE stewards of the estuary!

Did You Know?

Over 100 species of fish spend at least part of their lives in the Harbor Estuary

One quarter of all nesting herons between Rhode Island and Cape May, NJ make their home in the estuary

There are 770 miles of waterfront in the core Harbor Estuary region

In 2002, the Port of New York & New Jersey handled \$89 billion in cargo, supplying the region's 18 million consumers with everything from cars to coffee

EDUCATION

Educational organizations are inspiring the stewards of tomorrow by teaching young people to recognize the value of local flora and fauna. Many groups offer after school programs, partner with teachers, and lead public education efforts. Interpretive centers like the Alley Pond Environmental Center in Queens, Liberty State Park Interpretive Center in Jersey City, Beczak Environmental Education Center in Yonkers, and the Jamaica Bay Wildlife Refuge introduce children and adults alike to their local natural resources through hands-on education.

New Jersey Project WET (Water Education for Teachers) trains teachers in water education using a customized program focused on the Harbor Estuary. The Bronx River Alliance trains educators in water quality monitoring and



Students monitoring water quality on the Bronx River.

provides outdoor lessons based in science and social studies to be taught at the river. The Wallerstein Collaborative for Urban Environmental Education at NYU trains and supports teachers by providing resources and technical assistance, and by assessing the impact of urban environmental education on teaching and learning.

Public education is often the first step toward creating advocates for the Harbor Estuary region. By raising public awareness of the value and threats to local natural resources, groups like Hackensack Riverkeeper create a support base of informed stewards who come to public hearings and call their elected officials.

A D V O C A C Y

Many stewardship groups are dedicated advocates for the Harbor Estuary. NY/NJ Baykeeper serves as a vital link between community groups and large regional planning and preservation initiatives in the estuary's watershed. Baykeeper helps to directly acquire and restore land with local community groups.

Clean Ocean Action advocates for better management of dredged material and has focused attention on the need to address contaminated sediments throughout the harbor. Large environmental organizations like the Natural Resources Defense Council and Environmental Defense have local offices that promote the protection of the Harbor Estuary. They advocate for stricter enforcement of regulations, litigate, and run action alert networks.

The Working Waterfront Association advocates for an environmentally sustainable mixed-use port. The Association of New Jersey Environmental Commissions (ANJEC), a nonprofit group, advocates for environmental land use planning throughout the state. Some organizations focus on waterfront access issues and the Public Trust Doctrine, which guarantees public access to waterways and waterfronts throughout the region. Groups like the Metropolitan Waterfront Alliance and the Passaic River Coalition work with elected officials, regional planners, and other government agencies to increase public access to the water and develop waterfront plans for the harbor and its tributaries. The Neighborhood Open Space Coalition advocates for more public space in NYC, coordinates walks for health, and runs multiple listserves for groups with similar interests in this area. By helping to create a publicly accessible waterfront, all of these groups enable the public to learn about the Harbor Estuary in the best possible way: by experiencing it.



Early advocacy saved the marsh in Udalls Cove, Queens. Photo by Michael J. Feller/NYC Parks, NRG

H A N D S - O N A C T I O N

Stewards often adopt a local waterbody or watershed and commit themselves to regular cleanup efforts. The Rahway River Association conducts water quality monitoring and tracks the health of local waterbodies. This group and many others coordinate restoration projects in streams, stream buffers, wetlands, lakes, and ponds; and nominate sites to the HEP Habitat priority list.

Other organizations, like the Staten Island Mariners Marsh Conservancy, are closely associated with a park or small parcel of land. Some groups, like the Protectors of Pine Oak Woods, started out that way, and have branched out to larger geographic regions. By coordinating cleanup activities, nature walks, and restoration workshops, groups like these help to foster a strong sense of stewardship in the community.

The Audubon Societies of NJ and NYC conduct birding expeditions and advocate for the preservation of habitat. By getting out in the field and paying attention, local residents can become watchdogs for their local natural resource. While doing restoration and cleanup work, the Jamaica Bay Eco Watchers became aware of the rapidity at which the central marshes in Jamaica Bay were disappearing. The organization began to document the disappearance and raised the issue to government agencies. Subsequently, a blue ribbon panel was formed to study the problem and look for solutions.



Shoreline cleanup on the Hackensack River. Photo by Kathy Urffer/Hackensack Riverkeeper, Inc.

Estuaries are among the most biologically rich ecosystems on Earth.

The amount of fresh water flowing into an estuary varies from season to season and from year to year. This variation, coupled with the daily rise and fall of the tides and movement of salt water up and down-river, creates a unique environment.

More than 80 percent of all fish and shellfish use estuaries as primary habitat or as spawning or nursery grounds.

Harbor water quality is better now than it was 50 years ago.

The National Estuary Program (NEP), established in 1987 by amendments to the Clean Water Act, identifies, restores, and protects nationally significant estuaries of the United States. Unlike traditional regulatory approaches to environmental protection, the NEP targets a broad range of issues and engages local communities in the process. The New York-New Jersey Harbor Estuary became a part of the NEP in 1988.

FOCUS AREAS

In 1996, the HEP completed a Comprehensive Conservation and Management Plan (CCMP) to address some of the estuary's most pressing problems: habitat fragmentation and degradation; inadequate public access; impaired water quality; contaminated sediments; and a large urban population relatively disconnected from the region's valuable estuarine resources. HEP partners have acted to implement the commitments and recommendations of the CCMP through Work Groups focused on specific areas of concern. The focus areas of the CCMP are highlighted in the following pages.



Sampling from the 14th Street pier in Hoboken, NJ during the Harbor Estuary Volunteer Monitoring Workshop. Photo by Joe Hall/EPA

Public Involvement and Education

Foster public awareness and appreciation of the estuary and maximize citizen participation in its protection and restoration.

The health of the estuary and the success of Harbor Estuary Program are strengthened by an informed and active population. The HEP Citizens Advisory Committee serves as a conduit for public involvement and input to the program. In addition, all HEP Work Group meetings are open to the public.

Sample Actions:

In 1999, the HEP established a program office to facilitate implementation of the CCMP and coordinate public education and outreach activities. The HEP Office is staffed by a Program Director (EPA), a Technical Specialist (New Jersey Sea Grant) and an Outreach Coordinator (New York Sea Grant).

As budget money became available in 2001, the HEP Mini-Grant program was reintroduced to fund stewardship efforts. This year, grants will also fund events celebrating National Estuaries Day, September 27, 2003. The HEP Office recently sponsored a two-day Harbor Estuary Volunteer Monitoring Workshop for nonprofits, community groups, and teachers. The office also publishes a quarterly newsletter, *The Tidal Exchange*, and *A Teachers' Guide to Water Education Resources in the NY-NJ Harbor Estuary Region*.

Habitat and Living Resources

Restore and protect ecologically important areas and increase public access to open space without disturbing habitat.

The Harbor Estuary encompasses an amazing diversity of habitats that are home to an abundance of fish, birds, plants, and other organisms. However, habitat loss, fragmentation, and degradation are serious concerns in the estuary. Habitat protection and restoration is one of the most important goals of the Harbor Estuary Program.

Sample Actions:

The HEP Habitat Work Group has developed a list of priority sites for acquisition and restoration in the Harbor Estuary. Community groups and individuals develop habitat restoration and acquisition plans, attend HEP meetings, and nominate sites for inclusion in the work group's list of priority sites.

So far, 16 acquisitions have been completed out of 64 acquisition sites on the list, costing approximately \$60 million and protecting approximately 1,750 acres. Restoration is complete or underway at 30 of the 94 restoration sites, costing roughly \$63 million for approximately 665 total acres. Eight additional restoration sites are in the planning and design stage. The Natural Resources Group of NYC Parks produced a map of the sites and has played an important role in many restoration projects in the region.

Funding to acquire and restore these sites, along with others not on the list, has come from a variety of sources, including the States of NY and NJ, the US Army Corps of Engineers (ACOE), and the Port Authority of NY and NJ (PANYNJ). In addition, ACOE has been funded by Congress to develop a regional habitat plan, known as the Hudson Raritan Estuary Study.

The US Fish and Wildlife Service produced *Significant Habitats and Habitat Complexes of the NY Bight Watershed* assessing the status of habitats and identifying potential threats to their integrity. This report is used to focus on significant ecosystem areas in acquisition and restoration planning.

Public access is also a goal of the CCMP, and HEP partners are working to identify and increase the number of waterfront access points in the harbor region. Various stewardship groups, as well as the NYC Council Waterfront Committee, advocate for improved public access to the waterfront and coordinate activities to bring the public to the water.



NY/NJ Baykeeper and HEP are working together to acquire and preserve sites like this one near Cheesecake Park in NJ. Photo by Greg Remaud/Baykeeper

Habitat:

the specific area or environment in which a particular type of plant or animal lives. Typical estuary habitats include beaches, mudflats, wetlands, bottom sediments, and the water itself.

Estuary Dwellers:

The wetlands at the edges of the Harbor Estuary are key stopover points for birds migrating along the Atlantic Flyway.

The estuary is home to striped bass, white perch and tomcod. Fluke, sea bass, and bluefish are summer visitors as well. Winter inhabitants include herring, sculpin, and hake. The estuary is also home to blue claw and fiddler crabs, terrapins, and a multitude of benthic (bottom dwelling) invertebrates like the clam worm (*Nereis* species of *Polychaeta*).

ROLES OF HEP PARTNER AGENCIES

Federal Agencies

US Environmental Protection Agency (EPA)

Responsible for implementing federal laws designed to protect air, water and land. Through the federal Clean Water Act the EPA was given responsibility for creating the National Estuary Program.

National Oceanic and Atmospheric Administration (NOAA)

Looks for opportunities to restore fishery related habitats, researches essential fish habitats, and is responsible for species management. Has a response team to assess damages from spills. Provides recommendations to federal, state, and local agencies.

US Department of the Interior - National Park Service (NPS)

Manages lands including the Gateway National Recreation Area in New York and New Jersey.

US Department of the Interior - Fish and Wildlife Service (FWS)

Conserves, protects and enhances fish, wildlife, plants and their habitats.

US Army Corps of Engineers (ACOE)

Maintains navigable channels in the Port of NY and NJ. Responsible for dredged material management, flood control, wetlands permitting, the Floatables Action Plan and Drift Removal Program, and a variety of restoration projects.

State Agencies

NJ Department of Environmental Protection (NJDEP)

Acts through regulation, enforcement, inspection, planning, research, permitting and education to control air, land and water pollution and protect habitat throughout the state.

Toxics

Reduce toxic inputs to eliminate adverse ecological and human impacts.

Toxic contamination is a critical problem in the Harbor Estuary. High levels of chemicals, such as PCBs and dioxin, have caused the States to issue health advisories against eating certain fish and shellfish caught in the estuary. The presence of toxics in sediments can impair biological productivity, and threaten the health of estuarine organisms and the birds that feed on them. In addition, these contaminants have accumulated in the harbor's bottom sediments, making disposal of dredged material difficult and costly.

Sample Actions:

One of the most important initiatives to address the toxics problem in the harbor is the Contamination Assessment and Reduction Project (CARP), which quantifies levels and sources of contaminants in the estuary. To date, more than \$30 million has been allocated to this effort from the PANYNJ through the Bi-State Dredging Agreement. These funds are administered primarily by the States of NY and NJ and the Hudson River Foundation. By the end of 2002, virtually all the field data had been collected and is currently being processed. In addition to addressing contaminated sediments, the CARP's mathematical model will be used to determine Total Maximum Daily Loads (TMDLs) for toxics in the harbor. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards.

In 1998, the HEP Toxics Work Group completed a review and revision of the list of Chemicals of Concern for the estuary. There are multiple trackdown and cleanup efforts underway based on the work of the Toxics Work Group and through the efforts of CARP. NYS Department of Environmental Conservation (NYSDEC) and NJ Department of Environmental Protection (NJDEP) are in the process of completing an extensive field trackdown effort based, in part, on CARP work that identified 21 sites of ongoing contamination that should be further investigated to identify specific sources.

In 2003, the US Environmental Protection Agency (EPA) will undertake the third in a series of surveys to assess spatial sediment contamination throughout

the harbor. Previous surveys were conducted in 1993 and 1998. The three sampling periods can then be compared to assess whether sediment quality in the harbor is improving.



Blue Claw Crab hepatopancreas (green substance commonly called "tomalley") can accumulate high concentrations of PCBs and dioxins.

In 2002, in response to high levels of PCBs and dioxins in blue crabs in the Newark Bay complex, NJDEP made funds available to nonprofits doing multilingual outreach to local anglers. Efforts to reduce toxic contamination in the Harbor Estuary are helping to create an ecosystem that will meet the fishable/swimmable goals outlined in the Clean Water Act.

Dredged Material Management

Establish environmentally sound, economically feasible dredged material disposal options while reducing toxic contamination.

Toxic contaminants have accumulated in the sediment of the Harbor Estuary, complicating the disposal or use of dredged material. NY-NJ Harbor is not naturally deep, and its rivers continuously deposit sediment. Approximately 2-3 million cubic yards of sediment must be removed each year through ‘maintenance’ dredging to preserve current channel depths. Often these sediments have accumulated contaminants of concern, making their disposal problematic and expensive.

Harbor deepening projects are also underway to accommodate the larger ships of today. Channels and berthing areas are deepened through dredging and, where necessary, blasting of in-place bedrock. In general, dredged material from deepening efforts is cleaner than that from maintenance dredging.

One goal of the ACOE’s Dredged Material Management Plan is to assure that future dredged materials are “clean”. In order to achieve this goal, efforts are underway to reduce further inputs of toxics.

Sample Actions:

In 1997 the offshore Mud Dump Site for dredged material was closed, and the offshore Historic Area Remediation Site (HARS) was established. The HARS



Channel Deepening in the Kill van Kull. Photo by Laura Bartovics/NY Sea Grant

is being remediated for past toxicity and bioaccumulation. Before any material is placed at the HARS, it must be demonstrated to be “clean”. In general, deepening material will be suitable for beneficial use, including placement at the HARS. Maintenance materials that are not HARS suitable may be stabilized and used in beneficial reuse projects, such as

capping landfills and remediating brownfields. A pilot project utilizing stabilized dredged material from the harbor has been successfully used to restore the natural slope of a Pennsylvania surface mine.

The NY/NJ Harbor Sediment Decontamination Project is investigating a third option for dredged material. Started in 1994, this joint ACOE/EPA project is among the most advanced programs in sediment decontamination and commercial-scale reuse applications internationally. In 2003, the Project will sell its first decontaminated dredged material to a manufactured soil company. The ACOE Dredged Material Management Plan also provides a list of alternatives for beneficial reuse.

State Agencies (cont.)

NYS Department of Environmental Conservation (NYSDEC)

Manages and protects natural resources and environmental quality in the state. Uses permits to control air and water quality, and undertakes studies for protection and use of water resources.

NYS Department of State - Division of Coastal Resources

Administers New York State’s Coastal Management Program. Works with New York’s communities to revitalize underutilized waterfronts and increase public access.

Municipal Agencies

NYC Department of Environmental Protection (NYCDEP)

Provides and protects drinking water, treats wastewater, and administers a CSO abatement program.

NYC Department of Parks and Recreation - Natural Resources Group (NRG)

Designs and implements habitat restoration projects and manages NYC natural resources.

Regional Agencies

Port Authority of New York & New Jersey (PANYNJ)

Maintains three major port facilities in the Harbor Estuary, and promotes restoration projects as part of port improvement.

NJ Harbor Dischargers Group (NJHDG)

An alliance of ten sewerage authorities running twelve wastewater treatment plants discharging into the Harbor Estuary.

Interstate Environmental Commission (IEC)

Regulates, enforces and monitors ambient and effluent water quality requirements, limitations and standards in the interstate marine waters of the IEC district (NY, NJ and CT).

Rainfall-Induced Discharges

Reduce pollutants from combined sewer overflows, storm water discharges and nonpoint source runoff to remove adverse effects.

Pollution enters the Harbor Estuary every time it rains. Because large portions of the watershed are paved, the land cannot absorb much of the rain that falls in the area. Instead, rain runs across the pavement, gathering oil, gas, litter, and animal waste as it makes its way toward a storm drain. Runoff is a major contributor of nonpoint source pollution and can significantly impact the health of the estuary. Runoff can also erode soil and carry excess nutrients into the harbor.

Furthermore, during large rain events untreated sewage is often sent directly into the Harbor Estuary. This is due to the fact that most cities in the metropolitan region have combined sewers, which use a single pipe to transport both stormwater runoff and sanitary waste to treatment plants. During dry weather this system generally works well, but most plants can only handle about twice their dry-weather volume. This means that heavy rains often result in combined sewer overflows (CSOs), which release untreated wastewater, stormwater, and street debris into local waterways. Untreated sewage can carry disease-causing pathogens, as well as nutrient-rich organic material, which can be damaging to the Harbor Estuary's ecosystem.

Sample Actions:

New York City Department of Environmental Protection (NYCDEP) is in the process of instituting a \$1.5 billion combined sewer overflow abatement program to reduce the amount of pollutants entering the harbor during rainfall events. Part of this abatement program involves the construction of retention facilities to hold wet-weather overflows for treatment during dry weather.



NJDEP developed a CSO strategy in 1990. NJDEP issued CSO discharge general permits to owner/operators of combined sewers, which required construction of facilities to capture most solids and floatables. The general permit also began the process of developing long term CSO control plans. NJDEP has taken enforcement action against municipalities that are non-compliant with the provisions of CSO discharge permits.

Creative solutions, like the Staten Island Blue Belt, offer non-structural, infiltration-based options for treating stormwater. In this program, stormwater runoff is piped into wetlands, rather than into the sewer system. Many groups are developing educational programs and pilot projects on stormwater retention. The Gaia Institute researches, designs, and develops ways to use pocket parks, vacant lots, and deeply planted street trees throughout the city to capture and filter stormwater. The Bronx Council for Environmental Quality and the Association of NJ Environmental Commissions have coordinated conferences and workshops on non-structural solutions to stormwater management.

Public education is crucial to reduce rainfall-induced discharges in the Harbor Estuary. The Great Swamp Watershed Association is helping educate youth about nonpoint source pollution by taking an EnviroScape interactive watershed exhibit to local schools. Similarly, the Weequahic Park Association and Watershed Management Area #7 in NJ have worked together to involve elementary school students in stormdrain stenciling projects.



Street plantings, like this one in Queens, purify the air, beautify neighborhoods and help keep rainwater out of the sewer system. Before and after photos from NYC Parks

Floatables

Reduce floatables to prevent beach closures, adverse ecological impacts, and navigational hazards.

Floating debris, such as wood, litter, and sewage related wastes pose a significant threat to the Harbor Estuary. Some floatables lead to beach closures, and large floatables can pose navigational hazards. Floatables can also adversely affect coastal ecosystems. For example, abandoned boats and other debris can become lodged in marshes destroying vegetation and creating mosquito breeding habitat. Debris can enter the Harbor Estuary from a variety of sources. Street litter washed into the sewer system is a major source of floating debris in the harbor. Litter from water dependent activities, such as boating and beach-going, can also become floatable debris. Materials deposited along the shoreline can reenter the waterways as floatables during high and moon tides.

Sample Actions:

CSO abatement projects listed in the “Rainfall-Induced Discharges” section will help reduce the amount of floatable debris entering the Harbor Estuary. For example, NYCDEP has rehooded catch basins underneath the streets to prevent floatables from entering the system during wet weather. It has also constructed booms and netting systems at 23 CSO outfalls in NYC to contain floatables that originated as street litter as they are discharged into the waterways.

The highly successful interagency Floatables Action Plan has resulted in the removal of tons of debris every year. The EPA, US Coast Guard, and NJDEP

conduct helicopter surveillance of beaches for floatable slicks during the summer. The ACOE, NYCDEP, and the Passaic Valley Sewerage Commissioners, in cooperation with NYC Department of Sanitation barges, deploy skimmer vessels to remove floatables from the water’s surface. The American Littoral Society and Clean Ocean Action conduct coastal cleanups with thousands of volunteers every year.

The best way to reduce floatables is to focus on prevention. Some agencies, like NYCDEP, run public education efforts, including subway ads, to reduce littering and thereby reduce floatables at their source. Community groups also create highly effective public education campaigns.



Floatable debris washes ashore in the Harbor Estuary. Much of this debris originates as street litter. Photo by Don Riepe/ALS

Land Use Matters!

Twenty million people live in the drainage basin of the Harbor Estuary. Our land use decisions and lifestyle choices directly affect the estuary.

Lawn care fertilizers, which contain nitrates and phosphates, can wash into and contaminate the estuary. An overload of nutrients can cause algal blooms and lead to low levels of dissolved oxygen.

Chemical pesticides contain toxics and can contaminate the estuary.

Animal waste left on the street washes into the Harbor Estuary through the sewer system and contributes pathogens and nutrients to the waters.

Oil and gas leaks and spills from cars in the estuary’s drainage area can eventually run into the harbor. In ten years this amounts to more than all the oil that spilled from the Exxon Valdez disaster. Motor oil and other automotive fluids discarded into sewers and drains also add to the problem.

Street litter washes down stormdrains and can end up as floatable debris in the estuary. Once it’s floating, it can wash ashore elsewhere in the harbor.

GLOSSARY

Combined Sewer Overflow (CSO): event triggered by a heavy rain, in which a portion of a combined sewer's contents are sent directly into a receiving waterbody, instead of a treatment plant

Biochemical Oxygen Demand: a measure of pollution, a high BOD means there is a large amount of organic matter in the water, and a lot of dissolved oxygen is consumed in its decomposition

Dissolved Oxygen: oxygen that is present (dissolved) in water and therefore available for fish and other aquatic organisms

Effluent: liquid waste discharged into the environment from a source such as an industry or sewage treatment plant; it can be treated or untreated

Eutrophication: process whereby excess nutrients stimulate plant and algae growth, which in turn can lead to hypoxia

Floatables: solid waste materials and natural debris that float on or just beneath the water's surface

Hypoxia: low concentrations of dissolved oxygen in water. This condition is harmful to many aquatic organisms

Infiltration: process by which the earth is used to capture and filter stormwater

Pathogens

Reduce pathogen inputs to the estuary to protect human health and establish healthy coastal waters for bathing and shellfishing.

Pathogens are microscopic disease-causing organisms that enter the water by way of untreated human sewage and animal waste. These organisms can cause human illness through direct contact while swimming, or through the ingestion of contaminated shellfish. Sources of pathogenic contamination include combined sewer overflows and stormwater runoff.

Sample Actions:

CSO abatement projects listed in the "Rainfall-Induced Discharges" section help address the pathogenic contamination that occurs during rain events. The HEP Pathogens Work Group is developing a Total Maximum Daily Load (TMDL) for pathogens in the estuary, with pathogens data collection being conducted by the Interstate Environmental Commission (IEC). Permits for municipalities that own and operate combined sewer systems will be revised to reflect the TMDL.

Pathogens can also enter the Harbor Estuary through wastewater treatment plants. In 1986, IEC began requiring year-round disinfection of the effluent from all sewage treatment plants discharging into the harbor. This reduced the amount of pathogenic contamination in the estuary and has allowed more areas



Purification of clams at a NJ depuration plant.
Photo by Cathy Yuhas/NJ Sea Grant

to be opened for shellfishing. In 1989 and 1990, NYSDEC opened 12,000 acres of shellfish beds off the Rockaways (in the NY Bight) for direct harvest. In 1997, NJDEP opened the lower Navesink River for seasonal direct harvest for the first time in 25 years. However, the majority of the Harbor Estuary remains unsafe for direct harvest, so shellfish must go through a purification process before marketing.

The most common disinfection technique for wastewater involves the use of chlorine, which can have a toxic effect on aquatic life. NYCDEP is conducting pilot studies on disinfection methods that would lower the total chlorine residue in water, while still maintaining fecal coliform kill levels. Some NJ plants use ultra-violet radiation, instead of chlorine, to disinfect.

The River Project, an interpretive center on the Hudson River in Manhattan, conducts water quality monitoring to check for pathogens after rainfall events.



Pathogens enter the estuary from a variety of sources, such as sewage treatment plants, combined sewer overflows, and runoff.

Nutrients and Organic Enrichment

Reduce nutrient and organic inputs to eliminate the adverse effects of low dissolved oxygen levels, eutrophication and algae blooms.

Fish and other aquatic animals require adequate concentrations of dissolved oxygen (DO) to breathe. However, when excess nutrients and organic matter are present in the water, DO levels can become dangerously low, a condition called hypoxia. Bottom waters are usually the first to be affected, and the mussels, crabs, fish, and other aquatic organisms living there can become stressed or die.

An overabundance of nutrients, particularly nitrogen, in an estuarine system can lead to excessive growth of plants and algae, a process known as eutrophication. As this plant material dies, falls to the bottom, and undergoes microbial decomposition, bacteria use up dissolved oxygen in the water. Organic matter discharged into the estuary can also reduce DO levels as it decomposes.

Nutrients and organic materials enter the Harbor Estuary from a variety of sources. Effluent from sewage treatment plants is a major source of nutrients. In addition, CSOs bring untreated human waste, a source of both nutrients and organic matter, into the estuary following heavy storms. Even in lighter rain events, soil and animal wastes enter the harbor in runoff. Soil that has been fertilized is especially nutrient-rich.

Sample Actions:

Many efforts listed in the “Rainfall-Induced Discharges” section help reduce the amount of nutrients that enter the Harbor Estuary through CSOs and runoff during rain events.

Over the past 20 years, the 30 sewage treatment plants that empty into the Harbor Estuary (19 in NY and 11 in NJ) have been upgraded from primary to secondary treatment, with the exception of the Newtown Creek plant in Brooklyn, which is scheduled to finish its upgrade in 2007. Some plants are going further by instituting a variety of nitrogen reduction technologies. The NYCDEP is implementing Biological Nutrient Reduction (BNR) at seven of its fourteen plants.

The System-Wide Eutrophication Model (SWEM) was developed by the NYCDEP to correlate the effects of nutrient inputs to eutrophication in the Long Island Sound. It has been updated and is now being applied to the Harbor Estuary to help identify dissolved oxygen problem areas, and the major contributors to those problems. SWEM will be used to develop Nutrient TMDLs by 2006.



Nutrient overloads can lead to lower levels of dissolved oxygen, causing fish kills.
Photo by Don Riepe/ALS

Nonpoint source

pollution: pollution that comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up natural and human-made pollutants

Nutrients: essential chemicals (nitrogen, phosphorous, potassium) needed by plants for growth. Excessive amounts of nutrients in the water can contribute to massive growth, accumulation and eventual decay of aquatic plants, especially algae. This uses up oxygen, which can lead to hypoxia

Pathogens: microscopic disease-causing organisms such as bacteria and viruses that are found in untreated human sewage and animal waste

Runoff: the water from rain or snow that flows over land and eventually reaches a body of water

Secondary treatment: biochemical treatment of wastewater after settling, removes at least 85% of total suspended solids and biochemical oxygen demand

Toxics: chemicals, such as PCBs, dioxin, pesticides, heavy metals and PAHs, which can be harmful to living things and can accumulate in the food chain

Total Maximum Daily Load (TMDL): a calculation of the maximum amount of a pollutant that a waterbody can receive daily and still meet water quality standards



Where is the Harbor Estuary?

The NY-NJ Harbor Estuary encompasses the waters of New York Harbor and the tidally influenced portions of all rivers and streams flowing into it. The “core area” of the Estuary Program extends from Piermont Marsh on the Hudson River to an imaginary line at the mouth of the Harbor connecting Sandy Hook, New Jersey and Rockaway Point, New York (the Sandy Hook-Rockaway Point Transect).

This core area includes the bi-state waters of the Hudson River, Upper and Lower Bays, Arthur Kill, Kill Van Kull, and Raritan Bay. In New Jersey, it includes the Hackensack, Passaic, Raritan, Shrewsbury, Navesink, Rahway, and Elizabeth Rivers, as well as Newark and Sandy Hook Bays. In New York, it includes the East, Harlem, and Bronx Rivers, as well as Jamaica and Flushing Bays.

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