



New York State
Department of Environmental Conservation
Hudson River Estuary Program



Report Card on the First Five Years

George E. Pataki, Governor

Erin M. Crotty, Commissioner





Dear Fellow New Yorkers,

Five years ago, New York State set out a specific blueprint for revitalizing the Hudson River. The Hudson River Estuary Action Plan, first published in 1996, proposed strategies to protect the river's natural



resources, clean up contaminants, and promote the use and enjoyment of the river.

Since then, New York State has committed more than \$173 million to nearly 200 individual projects and initiatives needed to implement this plan. These efforts have included enhanced scientific research, improved Hudson River access, development of partnerships to preserve biodiversity, state-of-the-art mapping of critical natural resources, and acquisition of open space.

The results of this investment have been dramatic. Today the Hudson River is teeming with life, reborn after decades of abuse and neglect. Fishermen, birders, and children find renewed fascination with the river's mysteries and majesty. River cities, towns and villages are once again embracing the Hudson as the heart, and the front door, of their communities.

Much remains to be done, of course. But this publication, a "report card" on the first five years of the Hudson River Estuary Action Plan, demonstrates how much has already been accomplished. This remarkable progress would have been impossible without the support of communities, organizations and individuals throughout the Hudson River Valley and beyond, all of whom understand that restoring and preserving this remarkable river must be our legacy to future New Yorkers.

Sincerely,

George E. Pataki
Governor



To the Citizens of the Hudson River Valley,

The Hudson River Estuary Action Plan has sparked an unprecedented interest and investment in this remarkable river, just as Governor Pataki envisioned in 1996.

With Governor Pataki's leadership, the New York State Department of Environmental Conservation has overseen an impressive array of studies and projects developed under the Action Plan, all meant to help us better understand this complex ecosystem, repair past environmental damage, and return the river to the communities that line both its shores.

Now in its sixth year, the Hudson River Estuary Action Plan has measurable results, which are reported here in detail. I invite you to

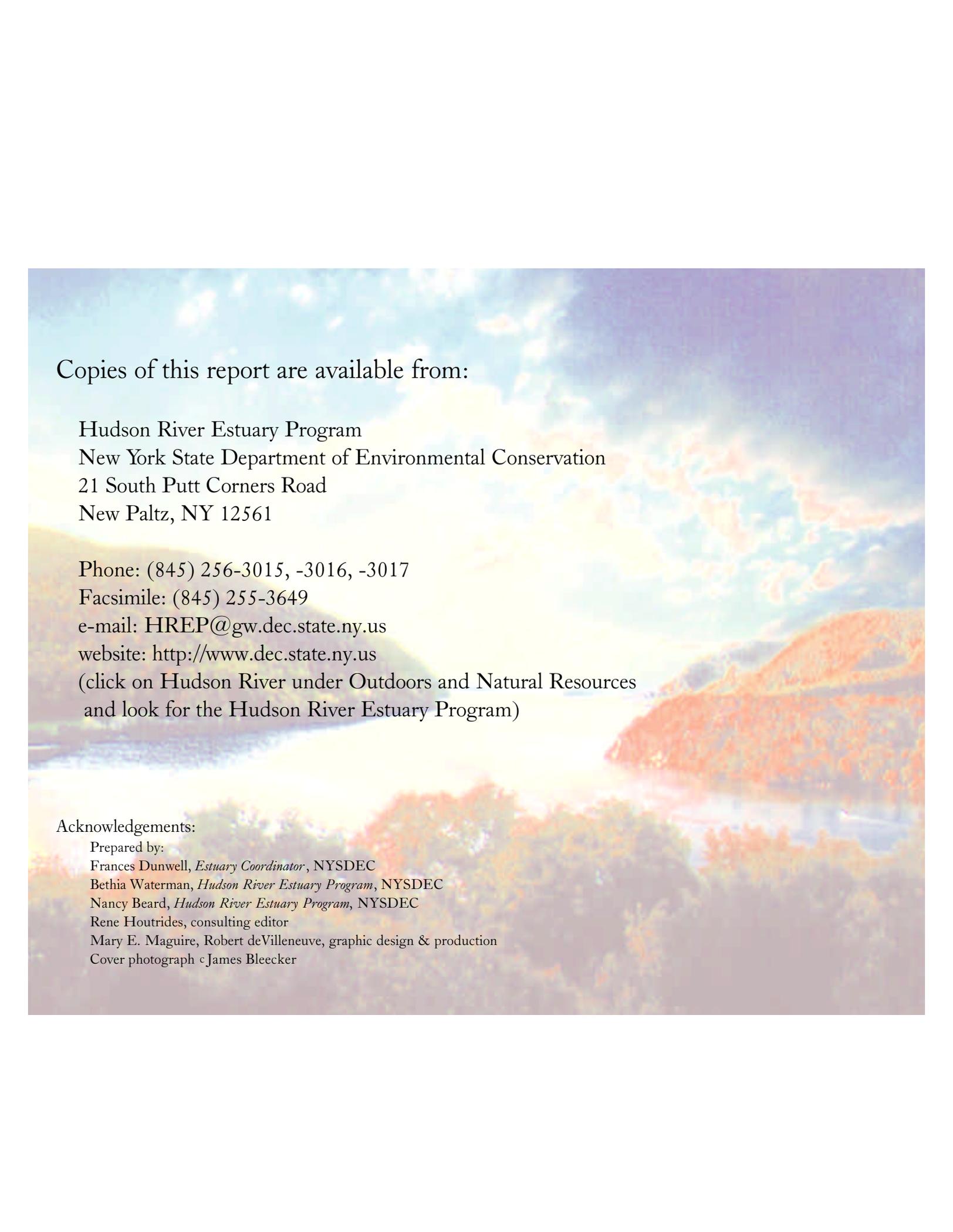


review this record, and I congratulate all those involved in these impressive accomplishments. I also look forward to the continuing effort to implement the Hudson River Estuary Action Plan in the years to come.

Sincerely,

Erin M. Crotty
Commissioner,
New York State

Department of Environmental Conservation



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(click on Hudson River under Outdoors and Natural Resources
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Hudson River, view from Rockwood Hall, Mt. Pleasant, Westchester County. The property was acquired in 1998 as part of Governor George E. Pataki's Open Space Protection Program.

Introduction

The Hudson River rises in the Adirondacks and flows into the sea at lower New York Harbor, a journey of about 320 miles. For the latter half of this distance, the river becomes an estuary where fresh water from upstream joins with tidal water from the ocean. Below the dam in Troy, the river is influenced by the rise and fall of ocean tides and the mixture of salt and fresh water. The tidal Hudson begins as fresh water in Troy, gradually turns brackish near the Hudson Highlands, and becomes noticeably salty at the Tappan Zee Bridge. This portion of the Hudson, from the Troy Dam to the Verrazano Narrows below Manhattan Island, is the focus of New York State's Hudson River Estuary Program.

The estuary is a rich ecosystem that supports spawning and nursery grounds for migratory fish of the Atlantic Ocean, as well as habitat for bald eagles, peregrine falcons, black ducks, mallards and a host of other species. It is a source of municipal drinking water and a playground for river recreation among boaters, anglers and swimmers.

The Hudson River Estuary Action Plan was adopted by Governor George Pataki in 1996 to guide state actions to conserve river habitats, clean up pollution and promote public enjoyment of the Hudson Estuary. The plan is updated every two years with the establishment of 20 measurable objectives. Implementation of the plan is the responsibility of the Hudson River Estuary program of the New York State Department of Environmental Conservation (DEC). The plan is funded by annual appropriations from the state Environmental Protection Fund as well as other sources. The plan coordinates the work of many different agencies and groups, all of which are striving to improve the Hudson. Commercial and recreational anglers, researchers, conservationists, educa-

tors, and industries all participate. Participants also include the United States Environmental Protection Agency, the U.S. Army Corps of Engineers, the U.S. Department of the Interior, the New York State Department of State Coastal Program, the New York State Office of Parks, Recreation and Historic Preservation, the American Heritage Rivers Initiative and the Hudson River Valley Greenway.

Under Governor Pataki's leadership, more than \$173 million has been accrued for the Hudson River Estuary including:

- \$30 million from the New York State Environmental Protection Fund (EPF), an average of \$6 million annually since 1996 for implementation of the Estuary Action Plan;
- \$50 million of New York State Clean Water/Clean Air Bond Act funds earmarked for water quality and habitat restoration projects from New York Harbor to Troy. Of this amount, \$39.2 million has been approved in grants to date;
- \$19.6 million as New York's share of a river-wide monitoring and trackdown of contaminant sources and pollution cleanup funded through the New York-New Jersey Port Restoration Agreement;
- \$22 million in additional New York State funds has been approved from the 1996 Bond Act for open space, state and municipal park improvements and brownfield cleanups; and
- \$51.7 million in other state and federal funds for waterfront revitalization, habitat restoration, public access, and nonpoint source pollution control.

This report describes accomplishments under the Estuary Action Plan since it was first adopted.



Protecting and

MANAGING MIGRATORY FISH

Shad

Shad populations have been declining in the Hudson since the 1980s. Using studies conducted under the Estuary Plan, Department of Environmental Conservation biologists have traced the decline to over-fishing on the Atlantic coast. Information from these studies will help determine interstate guidelines for regulating shad fishing. Other studies have shown that shad also may be severely affected by power plants located in areas of the river where fish spawn (lay eggs). Young shad are drawn into power plants along with the water used for cooling purposes, and are killed.

Shad do not eat when they are in the river during their two-month spawning run, which helps them avoid exposure to contaminants. As a result, shad is one of the few species of river fish that meets federal guidelines for human consumption.



Shad are born in the Hudson and migrate to the ocean. When they mature four to five years later, they return to the river in the spring to spawn. After spawning, the adults return to the ocean. Shad eggs need clean, clear water to develop. Young fish born in the Hudson leave the estuary after their first summer.



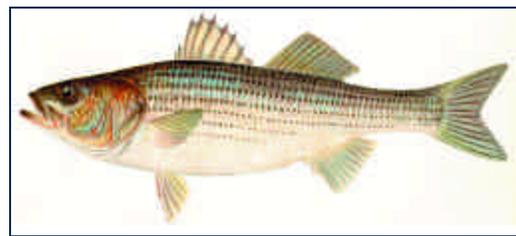
Shad are "anadromous" which means they spend most of their lives in the ocean but return to the fresh water portion of the estuary to spawn in late spring and early summer (red). Then they return to the ocean traveling as far north as the Canadian Maritimes in summer and fall (green) and as far south as North Carolina in the fall and winter (yellow). Their primary spawning range in the Hudson is from Kingston to Coxsackie.

Conserving the River

Striped Bass

Like shad, striped bass travel back and forth from the ocean to the Hudson River to complete their life cycle. Unlike shad, striped bass are plentiful. They have traditionally supported both commercial and recreational fisheries. The commercial fishery was closed in 1976 due to polychlorinated biphenyl (PCB) contamination, but the spring run of striped bass still attracts great numbers of anglers eager to try their luck.

The abundance of striped bass in the Hudson today is the result of coordinated management of populations here and all along the Atlantic coast. The Estuary Program helped to fund basic, ongoing studies necessary to this effort. Adult bass are netted in spring to determine if there are plenty of the older fish that produce more eggs. Later in summer, a survey of the young bass born that year tracks the success of the spawning season. Fisheries biologists have also begun to study how well striped bass survive being hooked and released in the growing sport fishery.



Striped bass is an extremely popular food and recreational fish. They can live for as long as 30 years. Striped bass need a water environment that is rich in oxygen. In spring, when they are in the Hudson, striped bass eat smaller fish, particularly herring, as their main food.

Just like shad, striped bass roam widely along the Atlantic coast and up the coastal estuaries like the Hudson River to spawn in the late spring and early summer (red). They travel north to Maine in summer (green), and then to South Carolina in the fall and winter (yellow). Their primary spawning range in the Hudson is from Croton Point, Westchester County, to Catskill, Greene County.



Atlantic Sturgeon

Like shad and striped bass, Atlantic sturgeon are born in the Hudson River estuary. By the time they are five years old, sturgeon are “adolescents” and depart for the ocean. Many years later, as mature adults, they return to the river to spawn. For females this generally happens around age twenty. Males return to the river earlier, at about age fifteen.

Sturgeon used to be plentiful, but since 1996, it has been illegal to fish for Atlantic sturgeon, because their populations have declined dramatically. Off-shore commercial trawlers often catch Atlantic sturgeon when netting for other fish. Even after they are returned to the water, some of the sturgeon die. Estuary Plan studies show that accidental catches may interfere with the ability of the sturgeon population to rebuild to healthy numbers.



DEC Fisheries biologist weighing an immature Atlantic sturgeon. The fish will be examined, tagged (so its future movement can be tracked) and then returned to the water unharmed.



Sturgeon are ancient fish that have existed since the age of dinosaurs. The Atlantic sturgeon is the largest fish in the Hudson. Adults usually grow from 6 to 8 feet long but have been known to grow to as much as 14 feet long. They can live for more than 60 years.

MANAGING RESIDENT FISH & BLUE CRABS

Black Bass

Black bass live in the river year round. There are two kinds of black bass—largemouth and smallmouth, and both are popular among sport fishermen. The population of black bass has declined and scientists of the Estuary Program are trying to determine why.

Black bass build their nests in the shallow water of tributaries. In winter, most black bass congregate in a few areas of the river, and if those areas are not protected, the entire black bass population is at risk. Consequently, our scientists have focused some of their studies on black bass habitats, which are proving to be very important.



Largemouth bass (bottom) and smallmouth bass (top) spawn in the late spring.





Shortnose sturgeon look similar to Atlantic sturgeon but usually only grow to be three feet long.

Shortnose Sturgeon

Shortnose sturgeon are an endangered species and have been protected since the 1970s. The Hudson River population of shortnose sturgeon is the largest on the east coast and appears to be increasing. Shortnose sturgeon use the entire estuary during different stages of their life cycle. Their spawning, wintering and nursery areas all must be conserved. Shortnose sturgeon spawn in freshwater from Cossackie to Troy. Unlike their cousins the Atlantic sturgeon, shortnose sturgeon do not migrate out to the coast. The farthest they are found from the Hudson is Long Island Sound.

Blue Crabs



The normal life span of a blue crab is about 18 - 26 months.

Blue crabs live in the river year round, where they feed on the bottom. Male and immature female blue crabs prefer areas of the estuary where the water is less salty. However, fertilized eggs require saltwater to survive, so males and females move toward the ocean to mate. As the young hatch, they migrate back upriver to less salty nursery areas.

New maps of the river bottom that were com-

missioned by the Estuary Plan will help to locate blue crab nursery areas that may need to be protected.

Blue crabs grow by molting (shedding their shells). Molting occurs from spring through fall, when water temperatures are 60 degrees or higher. A blue crab molts an average of 26 times before it completely matures.



Commercial and recreational crab harvesting occurs seasonally on the Hudson. It is illegal to harvest egg-bearing, female blue crabs.



ELIMINATING CONTAMINANTS IN FISH & BLUE CRABS

There are contaminants in the water throughout the Hudson River; among them are PCBs, cadmium, mercury, polycyclic aromatic hydrocarbons (PAHs), dioxins and dibenzofurans. Some of these contaminants end up in fish and blue crabs, and people who eat them also may ingest these substances. The Estuary Program is tracking down contaminants in order to develop strategies for eventually ridding the Hudson of them. Until the problem of contaminants in the Hudson is resolved, the public should strictly follow fish consumption advisories. The Estuary Plan has funded testing of the most commonly eaten fish to determine the levels of contaminants found in them. For more on this topic, see page 24.

Notice!

Some **fish** and
crabs from these
waters may be
harmful to eat.

Learn more! Call

NYS Department of Health
1-800-458-1158



The Estuary Plan is looking toward a clean future for the river, a time when signs such as this one can be removed.

A Peaceful River

The wind blows, the river flows.
I imagine I fly away and see two bald eagles.
They soar in the air, so gracefully.
One swoops down and grabs a fish, takes it to
the other, and they feed.
I imagine flying back to the rocks and listen to
the ice creak.
I love this river.

Keiona Guevara, New Windsor School,
New Windsor, NY
Hudson River Almanac Vol, V 1998-1999



Estuary Action Plan Report Card: **Migratory Fish, Resident Fish and Blue Crabs**

- ✓ Determined that the cause of decline in shad stocks is due to overfishing, mostly in the coastal ocean. Classic signs include fewer fish that also are smaller and younger than previously observed in the shad population.
- ✓ Studied young shad and young Atlantic sturgeon to determine their sensitivity to contaminants. Conclusions indicate possible sensitivity, but testing methods need to be changed to provide greater certainty.
- ✓ Collected data on levels of contaminants in commonly eaten fish and blue crabs. Provided the Department of Health with data on contaminant levels in fish for use in considering annual public health advice on consumption of fish.
- ✓ Studied the effects that contaminants may have on the hormonal system of Hudson River fish.
- ✓ Incorporated all fish contaminant studies into a single database.
- ✓ Estimated the number of largemouth and smallmouth bass in the estuary for baseline information. Located wintering areas of smallmouth bass.
- ✓ Monitored the Hudson River blue crab fishery for baseline information.
- ✓ Mapped aquatic vegetation which provides habitat for many species.
- ✓ Supported the establishment of the Hudson Fisheries Trust to develop programs to preserve the skills, history, lore and methods of the traditional Hudson River commercial fishery.



MAPPING HABITAT



Wetlands are places that are flooded or wet for enough of the year to provide habitat for plants and animals that thrive in watery conditions.

By comparing accurate maps from different years, it is possible to keep track of changes in the quality and quantity of habitat types. The Estuary Program is using aerial true color photography and color infrared photography to make digital images of tidal wetlands as they are today to compare, if possible, to where they were in the past.



This infrared photo of the northern portion of the Piermont tidal marsh is an example of the final product of the Lower Hudson Tidal Wetlands Trends Analysis project (Tappan Zee bridge to New York City). This project will explore vegetative changes in biodiversity and the effectiveness of the tidal wetlands regulations. Purple color indicates species within the marsh community.

The tidal wetlands of the Hudson River Estuary provide crucial habitat for many species of fish, birds, and mammals, and all are protected areas. Moving south from Troy to the New York Harbor, the plants that grow in these wetlands change as the salt content in the water increases. Brackish tidal wetlands are regularly flooded by ocean water that has been diluted with fresh water from upstream. These wetlands are found south of the Hudson Highlands down to Manhattan. Salt marshes now are rare in New York Harbor, though at one time there were thousands of acres of this type of habitat around Manhattan.

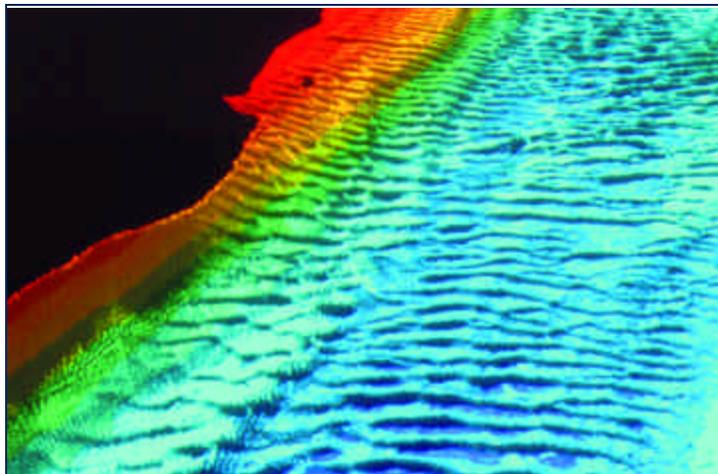
Tidal wetland maps show what is happening to plants above the water's surface. But in a river, what is happening below the surface is just as important. Through a project to map submerged aquatic vegetation (SAV), the Estuary Plan is building a baseline of valuable information about habitat. The different kinds of underwater plants that are able to survive in the river tell us much about what food is available for fish, waterfowl and crabs. These plants also provide



young fish with important shelter from predators. Submerged aquatic vegetation in the Hudson has been changing due to water quality conditions and damage from powerboats and personal watercraft.

Benthic or river-bottom mapping uses new technology, bouncing sound waves off the bottom of the river. The pattern of echoes then is translated into a map of the floor of the Hudson. Benthic maps show the location of old oyster beds, sunken ships and sediment types which may contain contaminants. In addition, sediment core samples taken from the river bottom are analyzed. Different layers of sediment give information from different years, just as tree rings do. Never before has it been possible to learn so much about the depth and flow of the river or what makes up its sediment. The Lamont Doherty Earth Observatory and SUNY Marine Sciences Research Center are working with the Estuary Plan on benthic mapping projects.

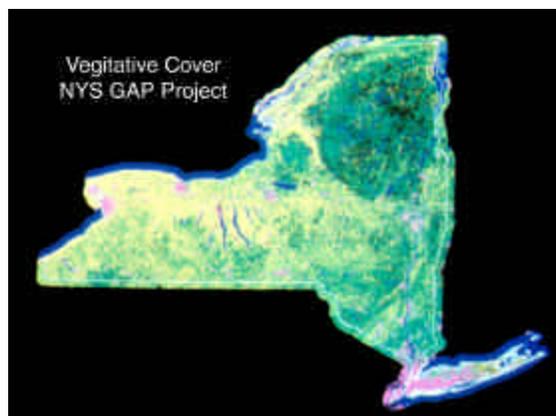
New maps will be compared to earlier maps to show how the river bottom changes over time. Both underwater vegetation maps and benthic maps will teach us more about where fish and blue crabs live, what they eat and what the bottom of the river looks like. Different types of river bottom (sediment, gravel, bedrock) may be important for the spawning of key species, and understanding these relationships will help us protect habitat for fish and crabs.



This is a map of the river bottom near Cruger Island in Dutchess County. The maps reveal ten-foot high sand waves which fish may use as shelter. Red indicates a shallow area, and blue represents a deep area. Green represents an area of intermediate depth.



Estuary Plan researchers preparing to collect a sediment sample from the floor of the Hudson River



Working in cooperation with Cornell University, the Estuary Plan has access to the information available from satellite images such as this one. Researchers can use satellite images to determine which forest types are found in different parts of the greater Hudson Valley ecosystem.



RESTORING HABITAT

Much river habitat has been destroyed during the last hundred years. When the Hudson's navigation channel was dredged, the dredged material was used to fill wetlands and shallows, a common practice until the 1970s. Between the Cities of Hudson and Albany, one-third of what used to be river was filled. Railroad construction in the mid-nineteenth century altered river habitat. Rip-rap walls were built along the riverbanks, and marshes and coves were cut off from the open river behind the railroad tracks, limiting the flow of water and nutrients and the movement of fish. The Estuary Program has worked with the Army Corps of Engineers and other organizations to gather information on habitats that can be restored. The information is being used to design habitat restoration projects which will be underway soon.



(Top) Obsolete industrial dams like this one occur on many tributaries to the Hudson. These dams, often dating back 100 years or more, present barriers to migratory fish passage and disrupt the natural flow of nutrients and sediments downstream.

(Center) This wetland on Schodack Island formed in an area of dredge spoil deposition as the retaining bulkhead (wood and rock) degraded. A restoration plan aims to expand this wetland to create more of this valuable and historic habitat.

(Below) *Hylobius transversovittatus* is a weevil believed to be a natural predator for purple loosestrife. Purple loosestrife was brought into the United States from abroad and has grown so rapidly that it has pushed out many native plants and damaged wetland habitat. As part of the Estuary Plan, 2,000 *Hylobius* eggs were released in the hope of controlling purple loosestrife. Plant inventories and mapping projects will determine the effectiveness of this strategy.



Estuary Action Plan Report Card: Aquatic Habitat and Habitat Restoration

- ✓ Initiated the development of biological indicators to measure water quality and ecosystem health. The goal is to establish guidelines for defining normal river bottom species (benthos). It then will be possible to compare actual benthos to the criteria for normal benthos (expected completion 2001).
- ✓ Mapped 39 miles of Hudson River bottom habitats using sonar technology. Initiated plans to map an additional 115 miles.
- ✓ Mapped 125 miles of aquatic plant habitat from Yonkers to Troy. Identified types of plants in these beds, which are primarily water chestnut and water celery.
- ✓ Mapped tidal wetlands from New York City to the Troy Dam using aerial photography. Entered information into computer geographic information maps to create a baseline for measuring changes over time. Assessed changes since 1974 in the tidal wetlands of New York harbor.
- ✓ Designed a plan to remove railroad ties from the Croton Bay river mouth. Project partners include Village of Croton-on-Hudson and US Military Academy at West Point.
- ✓ Initiated preliminary plan to restore two wetland habitat areas at Schodack Island. Project partners are NYS GPRHE, NYS DOS, Army Corps of Engineers and The Nature Conservancy. Goals are to restore tidal flow and control invasive plant species.
- ✓ Provided technical assistance on feasibility of restoration at sites in Yonkers, Beacon, Kingston, Rondout Creek, Hudson, Haverstraw, Coxsackie, Athens and Philipstown.
- ✓ Approved grants and environmental benefit funds to support local habitat assessment at Wicker's Creek, Westchester County; wetland restoration at Beczak Environmental Center in Yonkers; and a Cornell project to raise the awareness of recreational boaters about submerged aquatic vegetation.
- ✓ Worked with Governor Pataki's Hudson River Task Force for Marine Law Enforcement to assure improved coordination in the protection of natural resources. The task force ensures that different police agencies along the length of the river are communicating, sharing resources and conducting cooperative training.
- ✓ Supported technical training program on stream system assessment and restoration methods which will build local capacity for technical assistance to tributary or watershed restoration efforts.
- ✓ Worked in partnership with the Lower Hudson Coalition of Conservation Districts to provide technical assistance to local initiatives associated with the assessment, protection or restoration of natural resources in the estuary watershed.

LEARNING TO CARE FOR THE RIVER

It is important for Hudson Valley residents to participate in keeping the river and its surrounding environment healthy. The Estuary Plan works with citizens, municipalities and nonprofit organizations in maintaining a healthy river habitat and in educating citizens in how to use the river responsibly—all part of good stewardship of natural resources. Grant money helps support local projects which encourage river awareness.

As part of the plan to reach out to people, the *Hudson River Almanac* is published every year. Thousands of people, from elementary school students to scientists, contribute writing and photographs to the Almanac. The Almanac is a record of the many ways the public experiences natural events along the Hudson year round.

The Estuary Plan also cooperates with the Hudson River Environmental Society in offering seminars, conferences and other educational programs. Education gives everyone who cares about the Hudson the tools to become involved in making the river better.



The new Hudson River Estuary Task Force for Marine Law Enforcement announced by Governor Pataki in 1999, includes members from local police, county sheriffs and state, environmental conservation and park police. Well-trained enforcement agencies working together, can respond more quickly and efficiently to environmental emergencies or public safety problems along the Hudson River and its surrounding areas.



Student volunteers monitor water quality with support from the Estuary Program.



Signs like this one, with the estuary logo of the sturgeon, are posted along state highways. The signs let travelers know that they are crossing a tributary to the Hudson. Signs also remind the public that these waterways are part of an ecosystem that needs to be protected and preserved as critical habitat for fish and wildlife.



Estuary Action Plan Report Card: Education and Interpretation

- ✓ Assisted Orange County with the construction of an interpretive center at the Kowawese Unique Area at Plum Point.
- ✓ Installed material to alleviate shoreline damage from the 1996 floods and to prevent shoreline erosion near the Nutten Hook Ice House historic site.
- ✓ Approved grants to support six additional interpretive sites along the Hudson, including:
 - a boat for education programs at Norrie Point Environmental Education Center (Dutchess County BOCES)
 - plans for an interpretive center at Hudson River Park in New York City (The River Project)
 - plans for interpretive exhibits at Riverbank State Park in northern Manhattan (NYC Soil and Water Conservation District)
 - development of a major multimedia exhibit about the natural and cultural history of the Hudson River at an art museum in Yonkers (The Hudson River Museum)
 - winterization of the Constitution Marsh Nature Center so that it can be used year round (National Audubon)
 - creation of a major new exhibit on the Hudson watershed at the Mud Creek Environmental Learning Center (Columbia County Soil and Water Conservation District).
- ✓ Approved eight grants for local interpretation and education programs to be conducted by municipalities and nonprofit organizations.
- ✓ In cooperation with the NYS Department of Transportation and the Thruway Authority, erected more than 50 new signs at major highway crossings and on Hudson River bridges with the estuary logo identifying tributaries in the watershed.
- ✓ Created pages on DEC's website to make Hudson River estuary information available worldwide. <http://www.dec.state.ny.us>
- ✓ Hosted an AmeriCorps member to educate the public about the Hudson River Estuary
- ✓ Published *The Nature of the Hudson* report to identify strategies for improving Hudson River interpretive centers and signage, and designed a system of information kiosks to be installed in 2001 at 11 access sites
- ✓ Published six annual editions of the *Hudson River Almanac*.
- ✓ Presented conferences on river habitat and estuary management through the Hudson River Environmental Society
- ✓ Provided grant assistance to local Soil & Water Conservation Districts to conduct education programs in the estuary.



CONSERVING A RICH ECOSYSTEM

For a river to be healthy, the land and forests surrounding it must be healthy. Both the land and the waters are home to plants and animals that are part of the river's ecology. The Estuary Plan maps "ecological communities" or groups of interacting plant and animal populations that share a common environment. These maps are used to help protect significant plants and animals and the ecosystems upon which they depend. The Estuary Plan relies on voluntary support from communities and citizens, each of whom can be an effective partner in conserving the Hudson Valley's rich ecosystem.



By 1900, bald eagles were no longer breeding along the Hudson River, although numbers of birds continued to spend the winter months along the lower river. By 1960 even wintering birds had disappeared, both as a result of habitat loss and alteration, human disturbance, and, later, chemical contaminants.

Thanks to active eagle reintroduction efforts, contaminant cleanup, and perhaps most significant, habitat protection and restoration, eagle populations have now rebounded along the Hudson. Since 1997 when a pair of eagles fledged the first eaglet in 100 years, 20 eaglets have fledged on the Hudson estuary.

In the spring of 2000, four pairs of eagles nested on the river, producing ten eaglets. Wintering numbers also continue to grow, with more than 30 eagles using the Hudson for winter feeding and roosting. Funding from the Estuary Plan has expanded our knowledge of eagles on the Hudson River.



A wealth of wildlife, like these twin fawns, depend on the rich and varied habitats along the Hudson River Estuary.



Estuary Action Plan Report Card: Conservation of Biodiversity

- ✓ Conducted a "GAP analysis" using satellite photos to identify major habitat types in the Hudson Valley.
- ✓ Continued biodiversity inventories of rare plant and animal species and significant ecological communities through the New York Natural Heritage Program. The information will be digitized so it can be used as part of the Geographical Information System (GIS). The goal is to create the finest and most extensive databases ever focused on the counties bordering the Hudson estuary.
- ✓ Developed a Hudson River Estuary Corridor Biodiversity Conservation Framework to identify important areas of biodiversity within the Hudson Valley, locate threats to biodiversity in these areas, and develop strategies for dealing with such threats through voluntary measures consistent with home rule.
- ✓ Monitored PCB levels to determine potential effects on nesting eagles along the Hudson. Fitted four adult eagles with radio transmitters so that biologists can monitor the birds' movements. Created public programs on other native Hudson River raptors. Educated the public about the role the Hudson River plays in the recovery and continued survival of the bald eagle and other birds of prey.
- ✓ Expanded the Hudson Valley portion of the NYS Amphibian and Reptile Atlas. Compiled 10 years of data containing more than 55,000 reports on amphibians and reptiles of the Hudson. Elicited the cooperation of 353 volunteers from 153 towns in gathering the information and began analyzing the data. Project partner is Cornell University.
- ✓ Began compiling a Hudson River Valley Breeding Bird Atlas in 2000 to expand and complement the statewide effort. This is the first year of a five-year project in partnership with Cornell University.
- ✓ Supported development of a *Biodiversity Assessment Manual for the Hudson River Estuary Corridor*. The manual, developed by Hudsonia Ltd., will be used by local planning boards, landowners and conservation groups to help them make informed environmental decisions in their communities. (Will be available in 2001).
- ✓ Collected and continued to analyze movement of contaminants in the food chain. These studies include: uptake by land species from the consumption of aquatic insects, injury to river otter, mink and muskrat, and contaminants in reptiles and amphibians in the Hudson River ecosystem.
- ✓ Approved grants for conservation and stewardship projects totaling \$136,549 in 2000.
 - Arbor Hill Environmental Justice Corporation, Upper Hudson River Stream Keeper Project (Albany County).
 - Dutchess County EMC, Dutchess County watershed program.
 - Town of Putnam Valley, Peekskill Hollow Brook Conservation and River Stewardship project (Putnam County).
- ✓ Surveyed bog turtle sites in the lower Hudson watershed. Established baseline population data for bog turtles.



PROTECTING THE SHORELINE AND SCENERY



Rockwood Hall offers outstanding views of the Hudson and Palisades. This property was acquired in 1998 under Governor Pataki's Open Space Protection Program with funding from the Environmental Protection Fund.

The Hudson River and its environs are world-recognized scenic areas. The Estuary Plan works to make sure that the land along the Hudson's shores remains beautiful. Projects include purchasing land and opening scenic vistas. New York State in conjunction with conservation groups and private citizens, maintains river scenery with support from the Estuary Plan through the grants program and under the State Open Space Plan with funding from the CleanWater/Clean Air Bond Act and the Environmental Protection Fund.

The estuary program also arranges for protection of open spaces which provide public access to and use of the Hudson shorelands. Acquisition of significant habitat areas is included in conservation efforts.



Olana is the former home of the great American painter, Frederic Church, who memorialized this view of the Hudson in a series of paintings. Olana overlooks the river, and a large tract of beautiful land around the house has been purchased by the New York State Office of Parks and Historic Preservation.



Estuary Action Plan Report Card: Open Space

- ✓ Approved grants for local acquisition of 121.4 acres of habitat lands:
 - * 31.4 acres at Stony Point Marsh/Minisceongo Creek (Rockland County)
 - * 90 acres of conservation easement at Mill Creek (Columbia County) by The Nature Conservancy.
- ✓ Protected 1,900 acres of lands and conservation easements through the following acquisitions:
 - * 62 acres at Turkey Point in the town of Saugerties (Ulster County)
 - * 1,024 acres proposed at Fishkill Ridge in Fishkill (Dutchess County)
 - * 9.9 acres at Arden Point in Garrison (Putnam County)
 - * 69 acres at Bristol Beach State Park and Eve's Point in Saugerties (Ulster County)
 - * 450 acres of easements and conservation lands protecting views from Olana State Historic Site, former home of landscape painter Frederic Church, in Greenport (Columbia County)
 - * 88 acres of upland and 35 underwater acres at Rockwood Hall property in Tarrytown (Westchester County)
 - * 50 acres of conservation easement and 50 acres of fee acquisition on Montrose Point in the Town of Cortland (Westchester County)
 - * 60 acres of Moodna Marsh in New Windsor (Orange County)
- ✓ Transferred 974 acres of state land to other state or local agencies to assure their use for conservation and/or recreation.
 - * 11 acres in Ossining for addition to the Crawbuckie Nature Preserve. (NYSOGS/DHCR to the Village)
 - * 192 acres at Papscahee Island Nature Preserve (NYSOGS to Rensselaer County)
 - * 401 acres of underwater lands in Manhattan (NYSDOT to DEC)
 - * 180 acres at Anthony's Nose (U.S. Division of Military and Naval Affairs, Camp Smith, to OPRHP)
 - * 190 acres at Schodack Island (NYSOGS to NYSOPRHP)
- ✓ Endorsed NYS OPRHP Hudson Estuary Local Aid Grants for Land Acquisition since 1996 total 550.37 acres at a cost of \$3,372,809 from Clean Water/Clean Air Bond Act and EPF funds:
 - * Hudson Waterfront Acquisition, 2.6 acres (City of Hudson)
 - * Acquisition of Verplanck Landing, 32 acres (Dutchess County)
 - * Thomas Cole House Rehabilitation (Greene County)
 - * Riverfront Park Purchase, 30 acres (Rockland County)
 - * Clausland Mountain Open Space Acquisition, 50 acres (Rockland County)
 - * Sleightsburgh Spit Park, Town of Esopus, 79.279 acres (Ulster County)
 - * Acquisition of Habishaw Property, Yonkers waterfront 3.5 acres (Westchester County)
- ✓ Improved the state's Geographic Information System to map protected open space, scenic areas and other natural resources of the estuary ecosystem.
- ✓ Convened a task force to explore ways to conserve river scenery.
- ✓ Awarded grants for local conservation of scenic vistas at Untermyer Park in Yonkers and Manitoga Preserve in Philipstown.

Enjoying the River

FISHING ON THE RIVER

New York residents, visitors and tourists have always taken pleasure in Hudson River fishing. To ensure that fish populations stay high enough to allow for continued fishing, the Estuary Plan conducts surveys of how many and what kinds of fish are caught, and how many are kept and how many are released. Surveys also are conducted to determine which fishing techniques are best for fish survival, and the information is used to help establish fishing regulations.

In addition to maintaining high populations of sport fish, the Estuary Program provides access to the shoreline for fishing and other uses. In order to reach the river, shore anglers need to be able to travel safely across the railroad tracks that run along much of the Hudson. The estuary program supports improvements to fishing piers and other types of access. People who want to launch boats also need access to the river. There are not enough boat launches to meet demand, and some existing boat launches are badly in need of repair. Many people also use public boat launch sites for swimming, recreational fishing, picnicking or just as places from which to enjoy the river's beauty. The Estuary Plan is working to provide both safer access to shore-fishing sites and additional boat launch sites.



Newburgh boat launch site before renovation.



Newburgh boat launch site today.

SWIMMING IN THE RIVER

Years ago, swimmers enjoyed the river. Then, unfortunately, pollution from sewage and garbage made the water unsafe for swimmers. Since 1965, when the Pure Waters Bond Act was passed, improving water quality has slowly made the Hudson swimmable again. Today, several public beaches provide people with beautiful places to swim. Estuary Plan projects are in place to increase the number of available swimming sites and to ensure that water quality in the Hudson continues to improve.



Families enjoying Kingston Point Beach.



ACCESS ACROSS THE RAILROAD TRACKS



A bridge over the railroad tracks will give the public access to Schodack Island State Park for the first time ever. Schodack Island State Park is a 1,058-acre area with seven miles of shoreline.

Safe access to the river across the railroad tracks is important for fishing and for other forms of recreation along the shores of the Hudson. In 1998, Governor Pataki established a task force to increase river access opportunities. With staff support from the Estuary Program and partner agencies, the task force is working in cooperation with railroad corporations, the New York State Department of Transportation and other state agencies to provide increased recreational opportunity for all New York State residents.

HUDSON RIVER WATER TRAIL



On Earth Day, 2001, Governor George E. Pataki announced a \$1 million grant to the Hudson River Valley Greenway to establish a Hudson River Water Trail stretching from Battery



This fishing pier will give the residents of Verplanck a new way to enjoy the river.



The "Great Hudson River Paddle" celebrated the beauty of the Hudson River. Governor Pataki paddled in the first leg of the trip.

Park in the Village of Waterford, Saratoga County, to Battery Park in Manhattan. The trail will provide access for small boats along 156-miles of the river.

This effort, which is being coordinated by the Hudson River Valley Greenway in conjunction with DEC, OPRHP, the Department of State and local shoreline communities has already identified 36 existing public trailer and hand launch sites for inclusion in the water trail system which will eventually have at least 50 launch areas. The project is expected to be fully implemented over the next three years.

(Inset) Governor Pataki, on Earth Day 2000, greets paddlers at a stop at Kingston Beach in Ulster County.



Estuary Action Plan Report Card: River Access

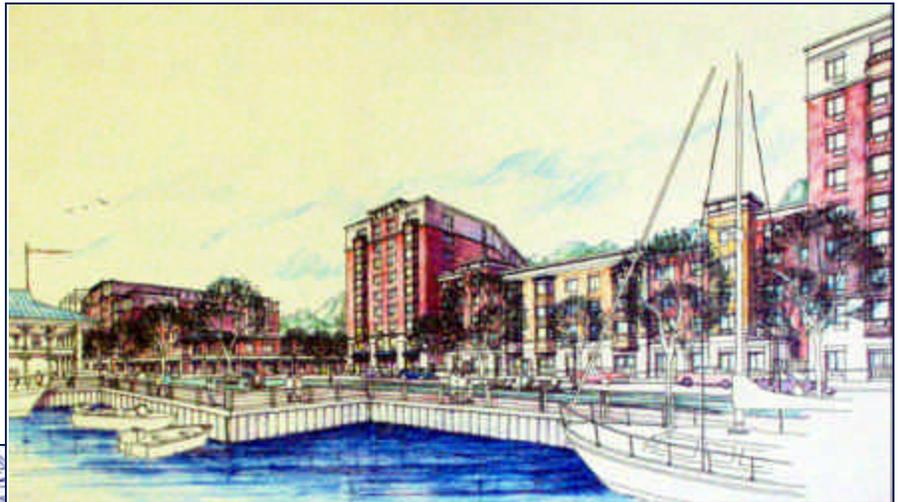
- ✓ Funded a municipal fishing pier for Verplanck in the town of Cortland and grants for handicapped shore fishing access at the Village of Castleton-on-Hudson and for shore fishing access in Peekskill.
- ✓ Conducted surveys of recreational striped bass fishing on the Hudson. Estimated catch rates and total harvest for striped bass.
- ✓ Planned four-season creel survey of recreational fishing for all species.
- ✓ Secured \$1 million in Environmental Benefit Funds for a new 1.7 mile fishing and recreation trail on the shore of Beacon. The ten-foot wide trail will make it easier for the public to reach the river for fishing, hiking and other recreation.
- ✓ Worked with Governor's Task Force on Estuary Access to establish three new shore fishing sites and six river access sites at railroad crossings in the Metro-North corridor.
- ✓ Initiated survey of past and present public swimming sites on the Hudson. Safety issues will be analyzed and opportunities to increase swimming on the Hudson will be explored.
- ✓ Approved Estuary Grants for the following:
 - Wildlife observation and bird banding station platform at Livingston-Ramshorn Marsh (Greene County)
 - Waterfront trail in Peekskill (Westchester County)
 - Walkway for Wildlife Observation at Sleightsburgh Spit, Town of Esopus (Ulster County)
- ✓ Provided \$7,830,156 in estuary access improvements through the Intermodal Surface Transportation Efficiency Act Transportation Enhancements.
- ✓ Inventoried current boat launch sites and identified possible locations for new state-sponsored launch sites.
- ✓ Upgraded trailer boat launch sites in Newburgh, Peekskill, Mills-Norie State Park and Athens. Initiated development of an upgrade at Cossackie.
- ✓ Built a new boat launch site in Bethlehem and initiated development of a bridge providing access to Schodack Island State Park and a planned new boat launch site there.
- ✓ Approved grants to fund ten hand launches on the estuary (Newburgh, Cortland, Cold Spring and seven in NYC,) and a feasibility study for a county boat launch proposed for Haverstraw.

Cleaning the River

RECLAIMING THE WATERFRONT

The Hudson Valley economy is growing and changing. A key element in the region's growth is the revitalization of riverfront communities both as tourist destinations and as vibrant places to live and work. Responsible riverfront growth takes environmental conservation into account.

Some waterfront properties have been used for industrial purposes, polluted and then abandoned. These areas are known as "brownfields." One of the Estuary Plan goals is to assist municipalities in cleaning up abandoned, polluted properties. Funding is available through the 1996 Clean Water/Clean Air Bond Act. Many of these sites are now being redeveloped as park land where the public can enjoy the river.



This drawing of proposed revitalization of the Yonkers downtown waterfront shows how waterfront areas can become attractive destinations once again. State funding from the Clean Water/Clean Air Bond Act has provided for brownfield studies and cleanups. A waterfront trail will become part of the restored riverfront in Yonkers. This is an example of the cooperation between the state and local government to increase the public's enjoyment of the waterfront.

The city of Hudson has received grant money to reclaim a portion of its waterfront that is a brownfield site. Once a petroleum storage area, the site contained abandoned oil tanks which have now been removed. This drawing of what the restored waterfront will look like shows parkland on the properties now being cleaned up.



Estuary Action Plan Report Card: Waterfront Revitalization and Brownfields

- ✓ Established interagency coordination on grant programs for economic development, parks, historic preservation, waterfront revitalization brownfields cleanup, and water quality improvement. Along the Hudson Estuary, this process supports revitalization efforts of riverfront communities and is coordinated with the Estuary Action Plan.
- ✓ Completed the investigation of five brownfield sites and continued the investigation of eight brownfield sites. Additional sites will be investigated this year.
- ✓ Began or completed brownfield cleanups at the following locations:
 - City of Troy, South River Street Site, proposed location for new office facilities and truck garage
 - Irvington Waterfront Park. The site will be transformed into a public park.
 - Town of Cortland, Steamboat River Front Park. Property will be developed as part of a larger public park and recreation area.
 - The former Hudson Petroleum site on the city of Hudson's waterfront scheduled for reclamation this year. (DOS provided grants for survey of the tank farm, tank removal and preliminary site remediation.) The area will be turned into a combined public park/commercial site.
 - Two sites in the City of Poughkeepsie:
 - The Former Hamilton Reproduction Site, which the city plans to sell to an adjacent manufacturing facility for use as a parking lot
 - The Qual Krom Site, which the city plans to redevelop for residential use
 - City of Beacon, Brunetto Cheese property. The city plans to use the property for transitional housing for older homeless adults.
 - The Yonkers Downtown Waterfront. Four contaminated properties totaling 8.4 acres are involved. Phase I has been approved for reclamation. The area will be developed into a mixed-use site including a public trail.
 - Three sites in Albany County:
 - Albany - Former Railroad Operations site. The County plans to market the site for redevelopment.
 - Albany - Gansevoort/Franklin St. The County plans to market the site for redevelopment.
 - City of Albany IDA - Former Jared Holt manufacturing site. The City plans to use the site for residential or commercial development
 - Two sites in the City of Newburgh, Orange County:
 - Provan/Ford site - The City plans to sell the property for commercial or industrial purposes.
 - Jonas Automotive - The City plans to redevelop and market the site.
- ✓ Explored permit issues for removal of abandoned structures and identified model project opportunities underway.
- ✓ Supported 78 local projects totaling \$7,442,048 for waterfront revitalization through EPF grants awarded by NYS DOS coastal program.
- ✓ Provided grant assistance for local Soil and Water Conservation Districts to offer technical and project management assistance to communities seeking to undertake waterfront revitalization efforts.

IMPROVING WATER QUALITY

Significant progress has been made in cleaning up sewage pollution in the Hudson, yet problems remain which must be addressed. These include accidental sewage discharges and sewer overflows during power outages and wet weather events. Overflows occur in many places that have combined sewer and storm drains which flood during periods of heavy rainfall. In addition, increased population along the Hudson in recent years has pushed existing sewage treatment plants to their maximum capacity, and many along the river need to be upgraded. Water pollution comes from other sources in the watershed as well. Sediment from construction sites, oil and gasoline from parking lots, and fertilizers from lawns and farms end up in the tributaries and the estuary.

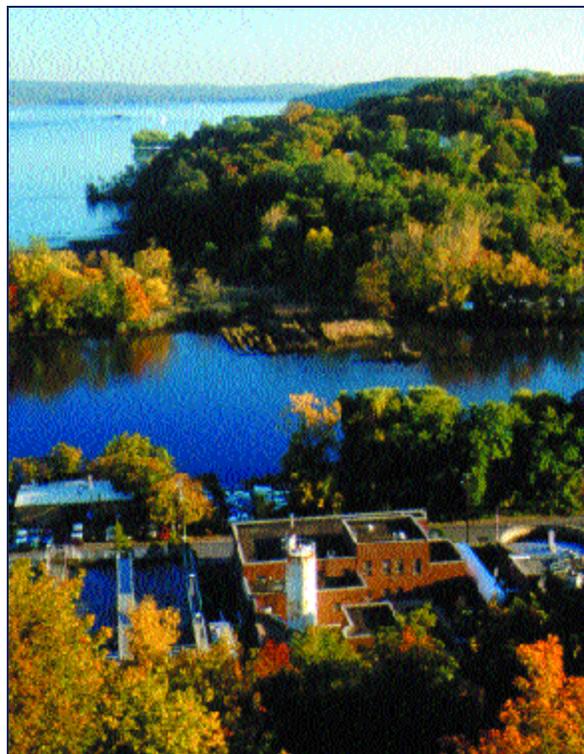
Chemical contaminants are another factor in water quality. Contaminants are chemicals and metals that don't break down or break down slowly. Most contaminants in the Hudson are left over from industrial practices which continued until the 1970s. Contaminants may injure plants, animals, fish and humans. Some of the contaminants in the Hudson are polychlorinated biphenyls (PCBs), heavy metals, furans, dioxin, pesticides, and polycyclic aromatic hydrocarbons (PAHs).

PCBs are the most significant pollutants in the Hudson. They were used in the manufacturing process at two sites on the upper Hudson and were released into the river, where they have accumulated in sediments and in the bodies of fish, mammals, amphibians, and reptiles. PCB use was banned in 1977 but the chemical still persists in the river. Governor Pataki has supported active remediation of PCBs in the Hudson

Like towns and cities, boats are a source of human waste discharges to the river. The state's petition to the federal government to create "Vessel No Discharge Zones" (prohibiting boats from dumping waste into the river), combined with funding to provide more pump-out facilities where boat waste can be processed properly, has helped to improve water quality.

Some contaminants can be tracked to an old industrial site. Sometimes the contaminant source is harder to locate because the chemical enters the river with runoff water or rain. By analyzing contaminant levels in sediments from the Hudson, Estuary Plan scientists can determine when a particular contaminant entered the river.

The estuary program is examining contaminant levels in insects, reptiles, amphibians, mink, muskrat, and other species. It has made a long-term commitment to reducing contaminants in the river by tracking them and determining which contaminants are found in the river, where they are located and where they are coming from.



The Clean Water/Clean Air Bond Act has helped improve water quality by funding upgrades to municipal sewage treatment plants.



Estuary Action Plan Report Card: Water Quality

- ✓ Funded 67 projects totaling \$39.2 million with the Clean Water/Clean Air Bond Act (Hudson River Estuary and New York Harbor water quality categories) in order to:
 - reduce sewer overflows from rainfall;
 - prevent untreated sewage discharges during power outages;
 - control pollution from runoff;
 - restore aquatic habitat;
 - provide water quality improvements at waterfront revitalization sites.
- ✓ Petitioned the EPA to expand the Hudson River no-discharge zone to include the entire estuary.
- ✓ Took 210 sediment samples from 62 sites as part of a program to track down the sources of contaminants in the river.
- ✓ Developed a computerized database for the identification and location of contaminated sediments.
- ✓ Continued to assess the impact of sediment contamination on Hudson River ecosystems.
- ✓ Department of Agriculture and Markets provided \$3,225,684 from Bond Act and EPF funding for agricultural non-point source abatement in counties bordering the Hudson.
- ✓ Began development of a comprehensive monitoring plan to track river health and to establish a data management system to assure effective storage, retrieval and use of the data by all users. The goal is to systematically and efficiently collect the water quality contaminant and biological data needed to monitor progress in meeting the goals of this estuary management plan.



ENSURING THE RIVER'S FUTURE

The Hudson River Estuary is a unique landscape with abundant and diverse natural resources. Through the Estuary Action Plan New York State is cataloging the rich tapestry of life that gives the Hudson Valley one of the highest biodiversity rankings in the state.

Scientists are conducting intensive studies of key estuarine fish including striped bass, sturgeon and shad. As a result of the plan, public access to the Hudson has improved through land acquisition, fishing access and boat launch improvements. Through the Estuary Action Plan, New York State is committed to restoring the Hudson to its full potential for generations to come.



Enjoying sunset at Senasqua at Croton-on-Hudson.



Estuary Action Plan Report Card: Research and Monitoring

- ✓ Created two positions to hire technicians to support the Hudson River Fisheries Unit.
- ✓ Provided administrative assistance to support the Hudson River National Estuarine Research Reserve.
- ✓ Provided administrative assistance to support the implementation of the Estuary Action Plan.
- ✓ Initiated the development of biological indicators to measure water quality and ecosystem health. The goal is to establish guidelines for defining normal river bottom species (benthos). It then will be possible to compare actual benthos to the criteria for normal benthos (to be completed 2001).
- ✓ Funded \$65 million in monitoring projects aimed at understanding water quality, fish and wildlife and toxic chemicals in the ecosystem.
- ✓ Foster better understanding of ecosystem processes through development of the Rivers and Estuaries Center on the Hudson initiated by Governor Pataki in 2000.
- ✓ Continue the Estuary Program's progress protecting the river, enjoying the river and cleaning up the river into the future with Action Plan 2001.

