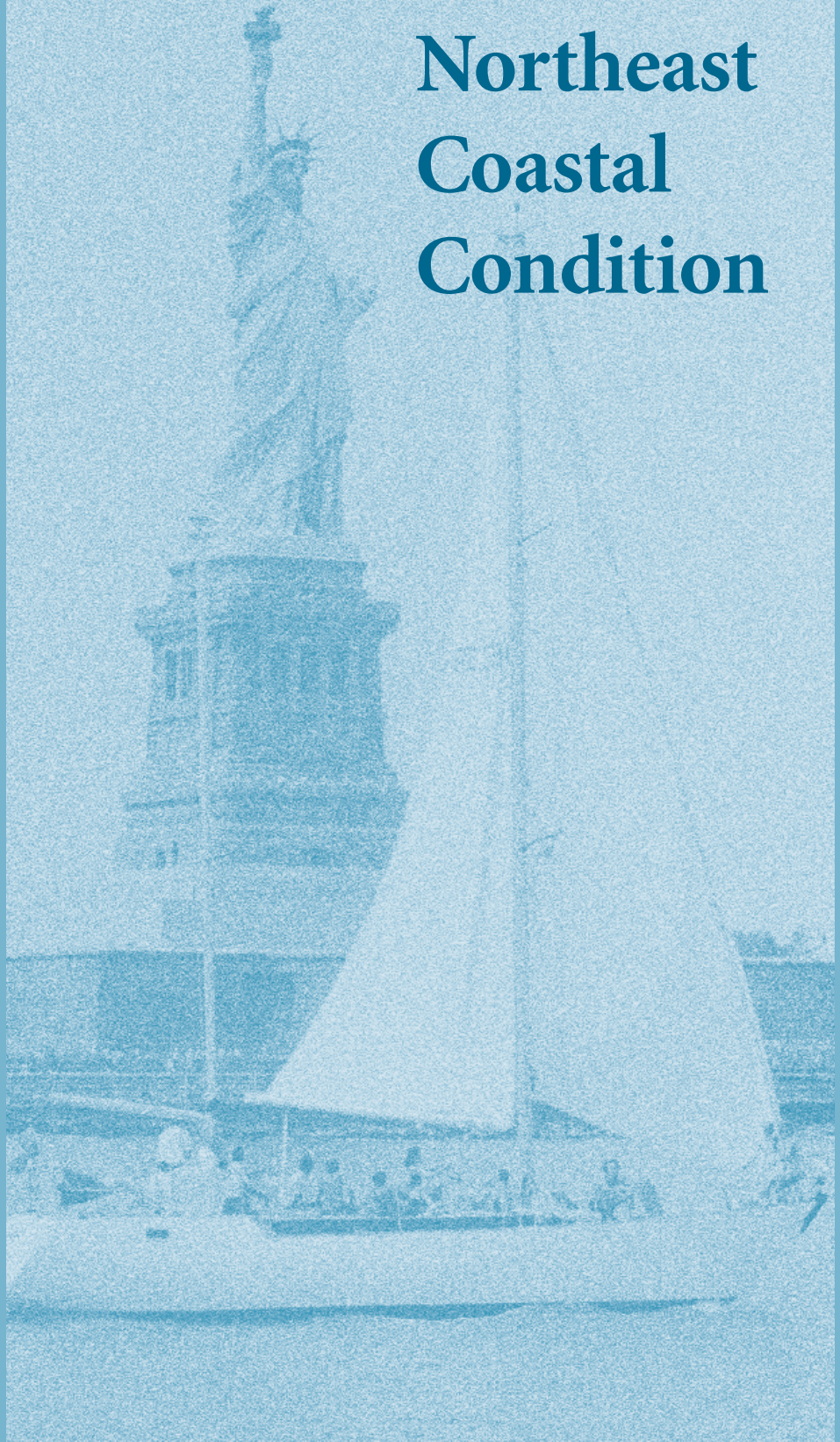
Chapter 3

Northeast Coastal Condition



Chapter 3

Northeast Coastal Condition

Ecological conditions

in northeastern estuaries are borderline poor (Figure 3-1). EMAP data were collected in the Virginian province from 1990 to 1993. Over half of the area surveyed (57%) showed undegraded ecological conditions (Figure 3-2). However, 23% of the sediments were characterized by degraded biology, and 30% of the estuarine area had impaired human uses. These areas were widespread but were especially common in the Chesapeake Bay (and its tributaries), the Delaware River, the Hudson River, and western Long Island Sound.

Northeastern coastal areas represent an extremely important commercial, population, and tourism center for the United States. The population of coastal counties on the Northeast Coast increased 52% between 1970 and 1990 (U.S. Bureau of the Census, 1996). Northeastern coasts are also a critical ecological habitat for many important species of fish and migratory birds. This area includes two biogeographic provinces: the Virginian and the Acadian. The Virginian biogeographic province extends from Cape Henry, Virginia, at the mouth of the Chesapeake Bay to Cape Cod, Massachusetts. The Acadian province reaches from Cape Cod to

Figure 3-1. The overall condition of northeastern estuaries is borderline poor.

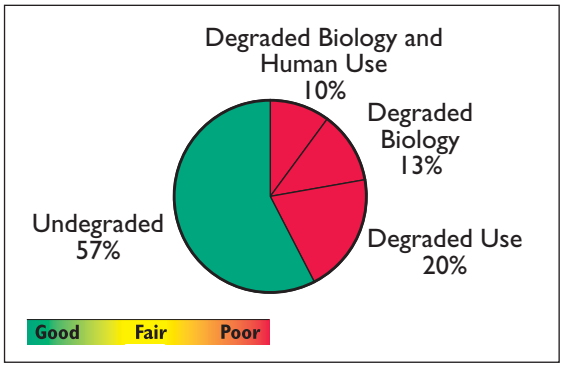


Figure 3-2. The condition of estuaries on the Northeast Coast (U.S. EPA/EMAP).

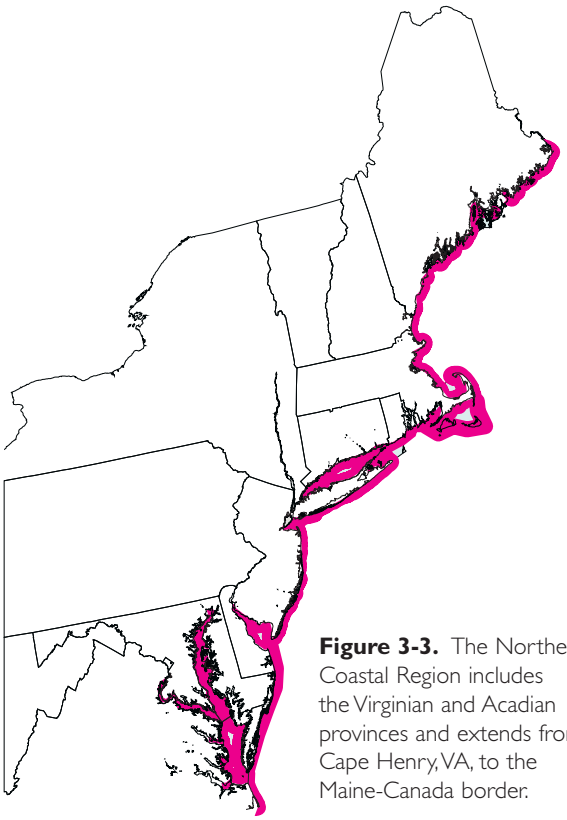


Figure 3-3. The Northeast Coastal Region includes the Virginian and Acadian provinces and extends from Cape Henry, VA, to the Maine-Canada border.

the Maine-Canada border (Figure 3-3). Coastal monitoring data exist for the northeastern United States from EMAP, NOAA's NS&T Program, and NOAA's National Estuarine Eutrophication Assessment. EMAP data are available for the Virginian biogeographic province, and NOAA's programs cover the Virginian province and the Acadian province to the U.S.-Canada border. Coastal 2000 monitoring information will be available for the Acadian province in 2002.

The Virginian province contains more than 9,073 mi^2 of estuarine area. Approximately 70% of estuarine surface area is in 12 large (>100 mi^2) estuaries, including 4,427 mi^2 in Chesapeake Bay, 1,291 mi^2 in Long Island Sound, and 795 mi^2 in Delaware Bay. A number of large urban and industrial centers (e.g., New York City, Philadelphia, and Baltimore) are close to the coast. In the Virginian province, coastal areas are densely populated, ranging from over 250 people per square mile in Delaware to almost 1,500 people per square mile in New York and Pennsylvania (Culliton et al., 1990). Coastline areas in the Virginian province are used extensively for industrial developments, port facilities, residential and commercial establishments, and recreational activities.

The Acadian province extends along the Northeast Atlantic Coast from the Avalon Peninsula at the Canadian border to Cape Cod and is characterized by well-developed algal and biotic communities. The shoreline is heavily indented and frequently rocky. This region is not as densely populated as the Virginian province, but it does contain several population centers such as Portland, Maine, and Boston, Massachusetts. Some

coastal counties of Massachusetts and New Hampshire have almost 1,300 people per square mile, and populations are projected to grow as much as 25% by 2015 (Culliton et al., 1990). Although no EMAP data exist for this biogeographic province, the NOAA National Estuarine Eutrophication Assessment examined the trophic state of 18 estuaries encompassing approximately 2,008 mi^2 in this region.

Coastal Monitoring Data

Water Clarity

Water clarity for the Northeast received a rating of good. EMAP data show degraded water clarity (less than 10% light penetration to 1 meter depth) in 6% of estuarine waters in the Virginian province and reduced water clarity (less than 25% light penetration to 1 meter depth) in 21% of estuarine waters in this region (Figure 3-4).

Water clarity can affect ecosystem health in coastal and estuarine habitats. Submerged aquatic vegetation (SAV) requires sunlight for photosynthesis and is particularly sensitive to reductions in water clarity. SAV provides habitat for a number of estuarine and near-shore species—especially for juvenile fish—and is thus critical for maintaining the ecological integrity of these systems. Loss of SAV was reported in 12 of the 22 estuaries surveyed in NOAA's National Estuarine Eutrophication Assessment. Severe loss of SAV is occurring in the main stem Chesapeake Bay, Patuxent River, Choptank River, Tangier/Pocomoke Sounds, and Gardiners Bay. Degraded water clarity was found in tributaries to the Chesapeake Bay, the Delaware River, western Long Island Sound, and the Hudson River.

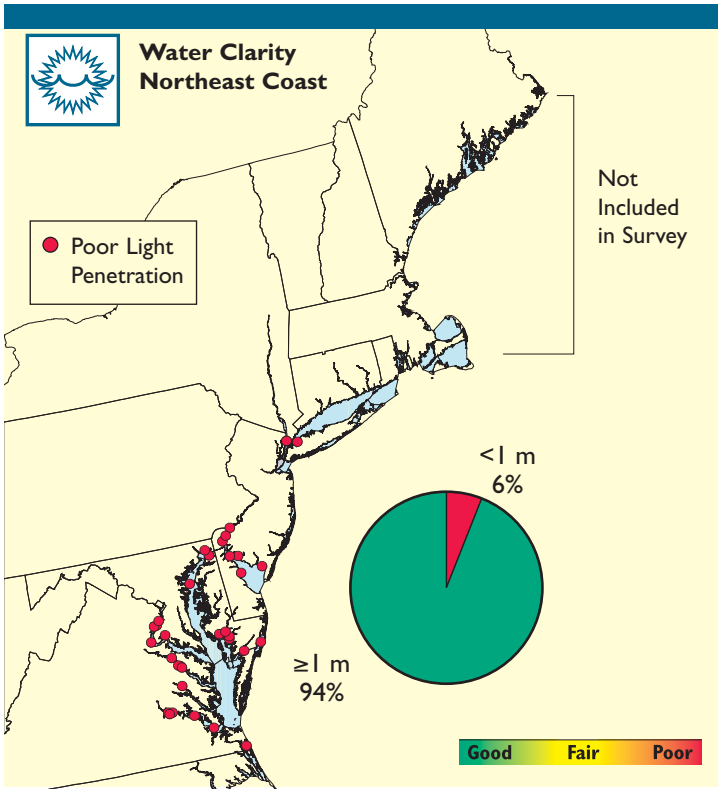


Figure 3-4. Light penetration data and locations for sites with <10% light penetration along the Northeast Coast (U.S. EPA/EMAP).

Dissolved Oxygen

Overall, levels of dissolved oxygen in Northeast estuaries are fair. EMAP studies found fair oxygen conditions (between 2.0 and 5.0 ppm O_2) in 20% of the bottom waters sampled and poor levels of dissolved oxygen (less than 2.0 ppm O_2) in 5% of bottom waters (Figure 3-5). Severe oxygen deficiencies occurred primarily within main stem Chesapeake Bay and the Potomac River, with isolated occurrences in the Rappahannock River (Virginia), western Long Island Sound, and the waters near Providence, Rhode Island.

Coastal Wetland Loss

Wetland losses in the Northeast are high—nearly 40% of all wetlands existing in 1780 disappeared by 1980 (Figure 3-6). Losses ranged from 9% in New Hampshire to nearly 75% in Connecticut and Maryland (Dahl, 1990).

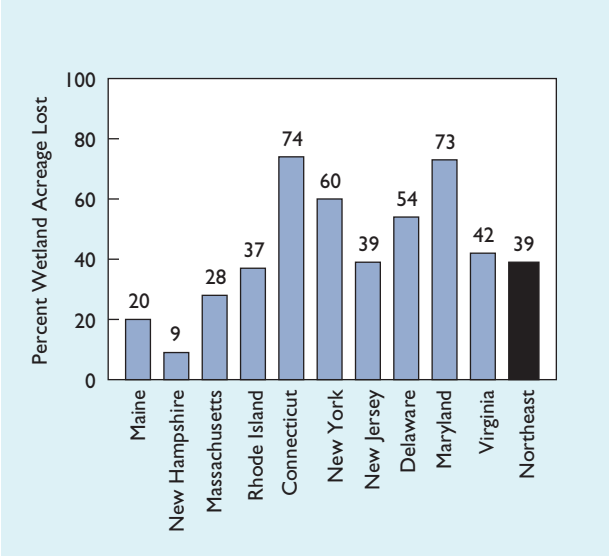


Figure 3-6. Percent wetland habitat lost from 1780 to 1980 by state and for the Northeast Coast overall (Dahl, 1990; Turner and Boesch, 1988).

Eutrophic Condition

Estuaries in the Northeast are in poor condition according to measures of eutrophic condition. Eutrophic conditions are high in 60% of the estuarine area (Figure 3-7), including Chesapeake Bay and its tributaries, Delaware Inland Bays, Barnegat Bay, Great South Bay, Boston Harbor, Narraguagus Bay, Casco Bay, Sheepscot Bay, Englishman Bay, Cobscook Bay, and the St. Croix River.

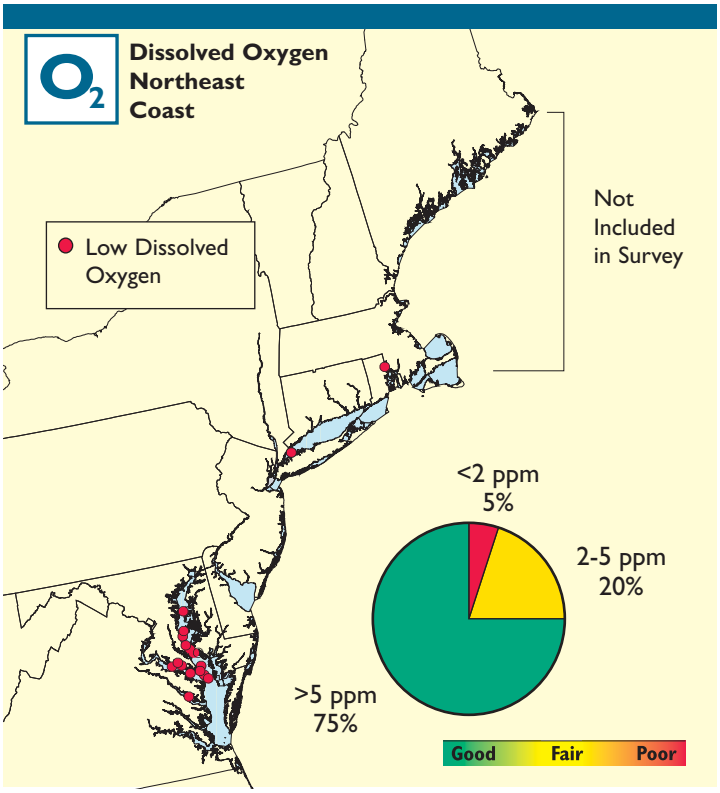


Figure 3-5. Dissolved oxygen data for sampled sites and locations for sites with less than 2 ppm for the Northeast Coast (U.S. EPA/EMAP).

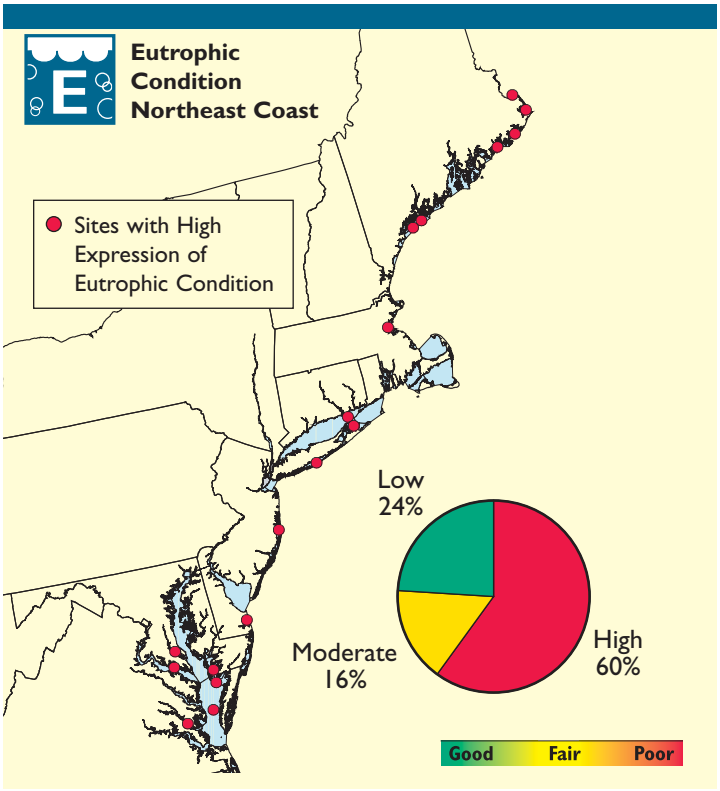


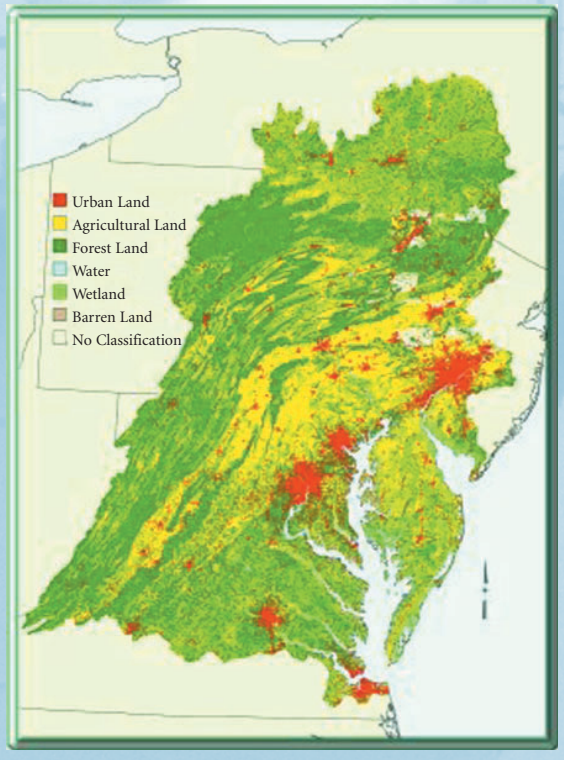
Figure 3-7. Eutrophic condition data and locations of estuaries with high expression of eutrophic condition along the Northeast Coast (NOAA/NOS).

highlight

Water Quality of the Near Coastal Mid-Atlantic Waters

The near coastal waters of the Mid-Atlantic are significantly affected by discharges from three major coastal systems—the Hudson, the Delaware, and the Chesapeake. The Delmarva Peninsula is uniquely positioned between two of these major systems, where it serves as a major zone of influence on the near coastal water quality conditions of the Mid-Atlantic. As in most coastal areas, a wide range of point and nonpoint sources contribute nutrient enrichment to the marine waters of the Mid-Atlantic. Changes over time in coastal waters are likely to be related to activities in the contributing watersheds. Population growth, development, and changes in land use patterns (see figure) can all have consequences on the condition of coastal waters.

An 18-year study on the state of the Mid-Atlantic near-shore coastal waters, summarized in a forthcoming report from EPA, showed that, although phosphorus levels were declining, the levels of dissolved inorganic nitrogen (DIN) in the area revealed significant increases in the range of 7% to 35% per year. Over the 10-year period from 1982 to 1992, DIN increased significantly in the Mid-Atlantic Bight overall, which implies that biological productivity in the area may be affected and perhaps lead to eutrophic conditions. The increasing DIN concentrations in the Mid-Atlantic Bight are cause for some concern because the situation may eventually threaten both the economic and aesthetic value of the region.



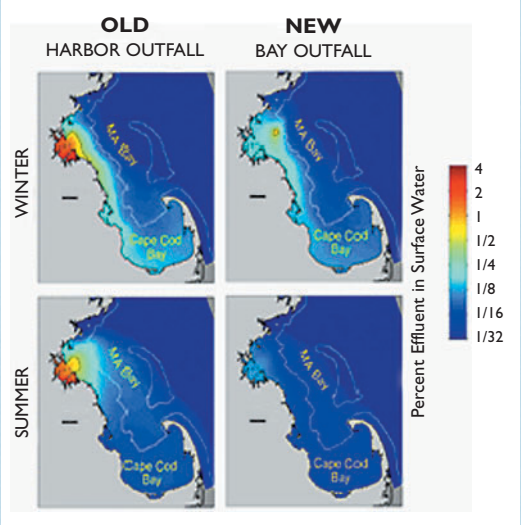
Land cover of the Mid-Atlantic region (U.S. EPA).

Massachusetts Bay

Boston Harbor, once one of the most polluted waterways in the nation, is in the final stages of a major cleanup. For 300 years, the harbor was the waste disposal site for a growing metropolitan center. By the 1980s, harbor fish were diseased, shellfish beds were closed, and swimming beaches were periodically unsafe. A $3.8 billion cleanup program, begun by the Massachusetts Water Resources Authority (MWRA), has significantly improved the environmental quality of the harbor. Since 1989, the U.S. Geological Survey (USGS) has been conducting research to understand and predict the fate of contaminants introduced to Massachusetts' coastal waters.

Earth Science Applied to Public Concerns

Relocating the sewage outfall from the harbor mouth to a new location 9 miles offshore in Massachusetts Bay was a controversial step in the cleanup program. Stellwagen Bank National Marine Sanctuary, which supports commercial and recreational fisheries and is home to endangered species of whales, sea turtles, and birds, is within 15 miles of the new sewage outfall. Concern that the new sewage outfall might threaten the environmental quality of the Bay prompted a series of computer simulations by the USGS. The simulations of effluent dilution indicated that the effluent concentrations from the new outfall would remain low throughout most of Massachusetts Bay (see figure).



Computer simulations of effluent dilution from old and new outfalls (USGS).

What Is the Future of Contaminants?

Understanding this coastal system and conducting long-term monitoring are essential in order to assess environmental change. Despite cleaner waters, pollutants that settle to the bottom with sediments can accumulate in the ecosystem, creating the potential for long-term problems. USGS studies in Boston Harbor and Massachusetts Bay are designed to provide an understanding of how sediments and associated contaminants are transported and where they accumulate in the Massachusetts Bay system. The results of these ongoing studies and maps and simulations can be accessed on the Internet at http://geology.wr.usgs.gov/wgmt/bostonharbor/boston.html. Additional information about coastal systems in the Northeast can be accessed on the Internet at http://woodshole.er.usgs.gov.

NOAA's National Estuarine Eutrophication Assessment divides estuaries of the Northeast into two distinct zones: the North Atlantic and Mid-Atlantic. This division follows the division between the Acadian and Virginian biogeographic provinces with estuaries of the North Atlantic including all estuaries from Cape Cod, Massachusetts, to Cobscook Bay, Maine, near the U.S.-Canada border. The Mid-Atlantic region includes estuaries from Buzzards Bay, Massachusetts, to Tangier and Pocomoke Sounds near the mouth of Chesapeake Bay. Many northeastern estuaries exhibit eutrophic conditions. Of the 52 estuaries constituting the Northeast in the NOAA assessment, 16 (58% of estuarine area) exhibited elevated levels of chlorophyll *a* (Figure 3-8). However, in the far Northeast (Acadian province), these conditions are believed to be a natural occurrence with human inputs being only a minor contribution. Human impact is believed to be high in Boston Harbor and Plum Island Sound.

Eutrophic condition in Mid-Atlantic estuaries tells a very different story. Human impacts are believed to be high in 16 of the 22 estuaries assessed. Nearly half of the estuaries displayed high levels of eutrophication, and all estuaries showed at least some symptoms of eutrophication. Every estuary reported at least moderate expression of elevated chlorophyll *a* concentrations and all estuaries reported some problems with low oxygen. Thirteen of the estuaries experienced nuisance algae blooms with severe problems in Barnegat Bay, Delaware Inland Bays, and the Patuxent River. The Choptank River, Tangier/Pocomoke Sounds, and Long Island Sound showed some expression of all six symptoms assessed in NOAA's study.

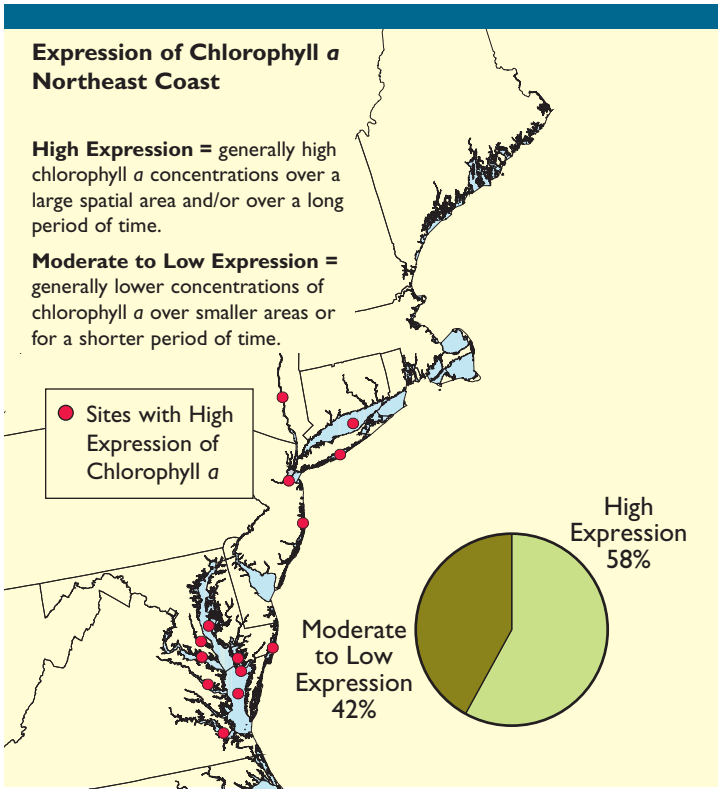


Figure 3-8. Chlorophyll *a* data for surveyed estuaries along the Northeast Coast and locations of estuaries with high expression of chlorophyll *a* (NOAA/NOS).

Sediment Contaminants

Sediment contaminant conditions in Northeast estuaries are poor. Sediments collected in EMAP sampling were analyzed for pesticides, metals, PCBs, and PAHs. For metals, ERM was exceeded in 4% of the area of estuarine sediments and ERL was exceeded in 41% of the area of estuarine sediments (Figure 3-9). This translates into more than 3,668 mi^2 of sediments within the Virginian province with metals at concentrations high enough to cause effects in 10% of animals exposed. PCBs and PAHs exceeded ERM in 3% of the sediments of northeastern estuaries and exceeded ERL in 27% of these sediments. Sediment pesticide

Sediment Contaminant Criteria

ERM (Effects Range Medium) – The concentration of a contaminant that will result in ecological effects approximately 50% of the time based on literature studies.

ERL (Effects Range Low) – The concentration of a contaminant that will result in ecological effects about 10% of the time.

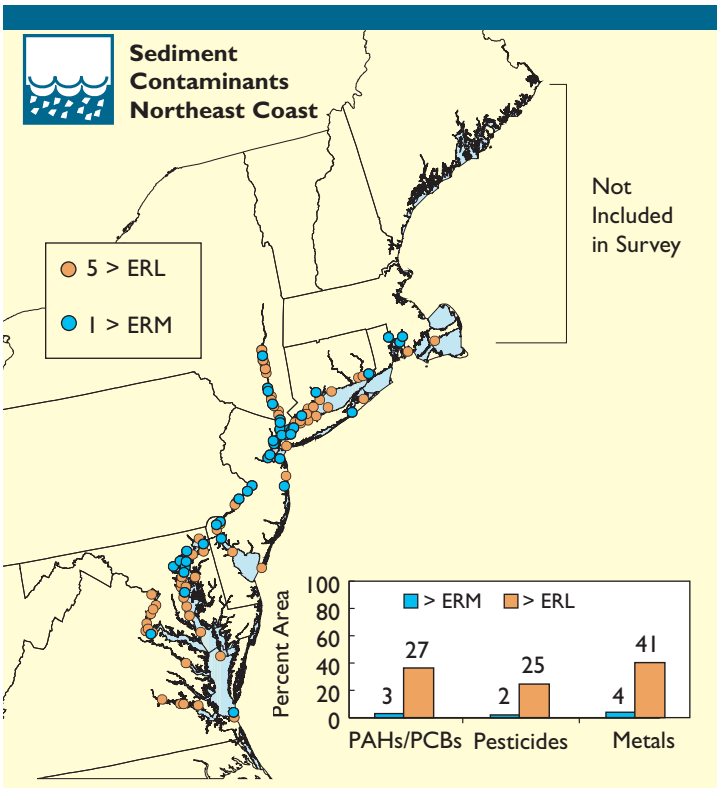


Figure 3-9. Sediment contamination for sampled sites and locations of sites with 5 > ERL or 1 > ERM along the Northeast Coast (U.S. EPA/EMAP).

concentrations exceeded ERM in 2% of the area of estuarine sediments and exceeded ERL in 25%. In other words, over 2,317 mi^2 of sediments within the Virginian province contained elevated concentrations of PCBs, PAHs, or pesticides that were high enough to cause biological effects. Sediments exceeding ERM levels occurred throughout the Northeast but tended to be concentrated at the head of the Chesapeake Bay, the lower Hudson River and western Long Island Sound, and the Delaware River. Multiple ERL exceedances occurred in these same areas but also included regions of the upper Potomac River, the James River, the mid-Chesapeake Bay, and the western half of Long Island Sound.

Benthic Condition

Benthic communities in northeastern estuaries are in poor condition (Figure 3-10). For the locations that showed poor benthic community quality, the co-occurrence of poor

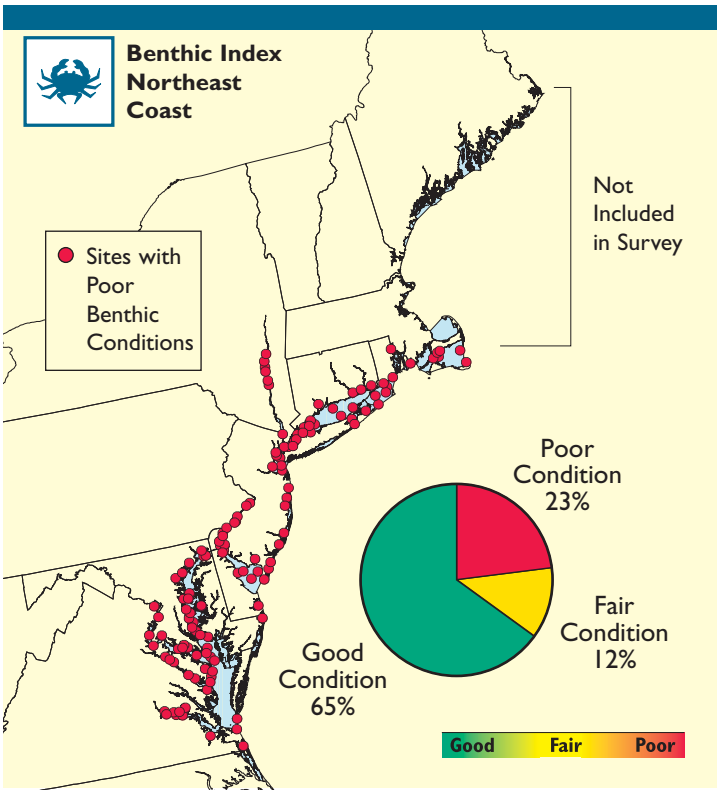


Figure 3-10. Benthic index condition data and locations with poor benthos along the Northeast Coast (U.S. EPA/EMAP).

environmental quality (exposure) is shown in Figure 3-11. Of the 23% of the northeastern estuarine area that had poor benthos, 21% also showed hypoxic conditions, 35% showed contaminated sediments, 9% showed sediment toxicity, and 2% showed poor light conditions (high levels of total suspended solids). One-third of the locations that showed poor benthic community conditions had no sediment or water quality degradation (as measured by the EMAP program), although several of these sites are suspected of having poor nutrient water quality. These locations were spread throughout the nine Mid-Atlantic states.

A bioassay for sediment toxicity showed less than 80% survival of *Ampelisca* in 9% of the area sampled throughout the region. Again, these stations tended to cluster in the Chesapeake Bay, Delaware River, Raritan Bay, and Long Island Sound. However, the highest incidence of sediment toxicity occurred in small estuaries, where 13% of sediments were toxic to the test organism (Figure 3-12). Severe toxicity (less than 60% survival) occurred in 2% of the estuary sediments assayed.

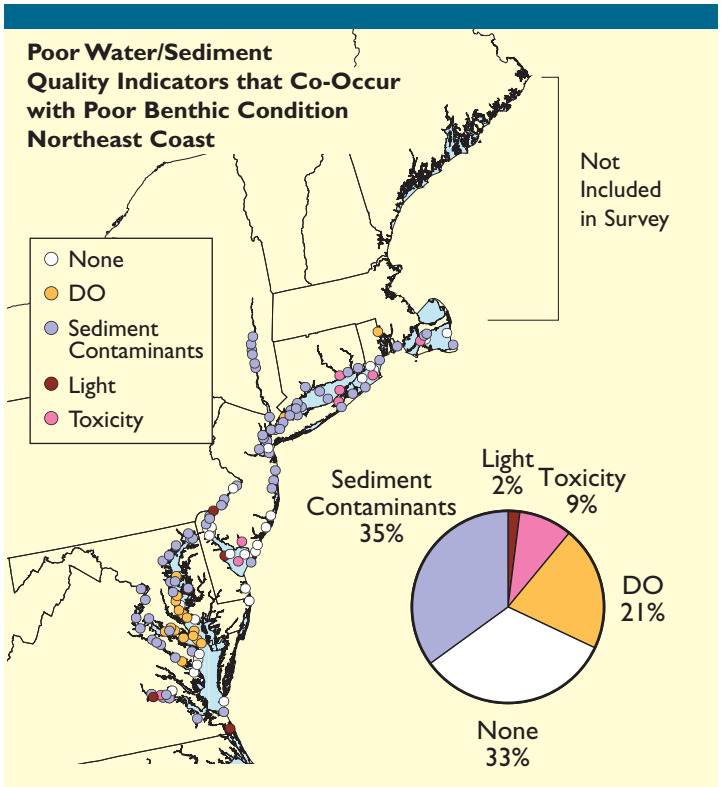


Figure 3-11. Indicators of poor water/sediment quality that co-occur with poor benthic condition in northeastern estuaries (U.S. EPA/EMAP).

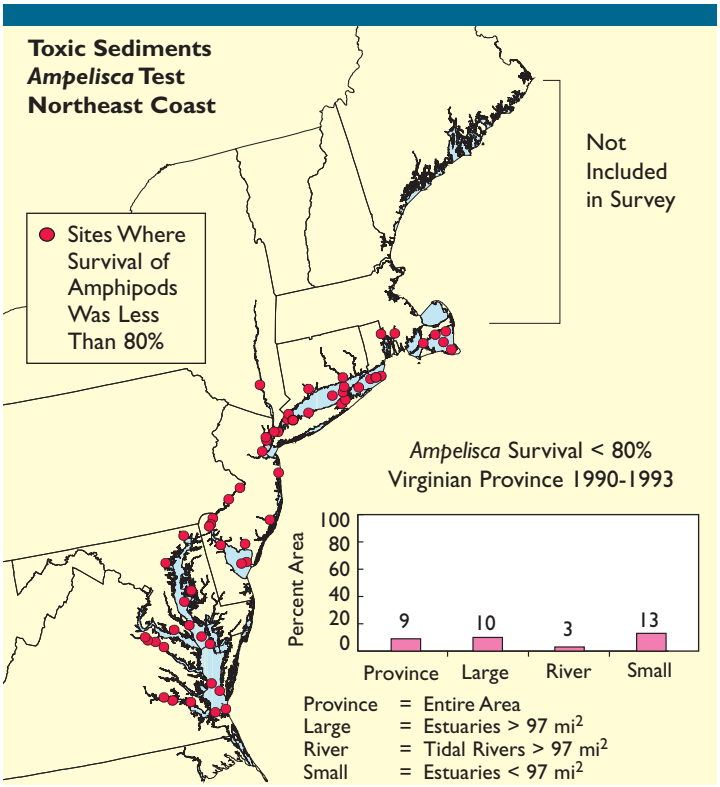


Figure 3-12. Amphipod data and locations with toxicity > 20% along the Northeast Coast (U.S. EPA/EMAP).

Fish Tissue Contaminants

Conditions of estuaries in the Northeast as measured by fish tissue contaminants are poor. Analyses for tissue residue contaminants in the edible portions of selected fish were conducted throughout the Virginian province. Toxic levels of contamination were detected in the filets of fish caught at four locations within the Delaware River, several locations in the mainstem of the Chesapeake Bay, and single sites in Raritan Bay, Narragansett Bay, and Buzzards Bay, amounting to about 30% of the fish examined (Figure 3-13). However, almost all of these elevated concentrations were for arsenic (21%) and almost all arsenic ingested by fish is converted to a nontoxic form (arsenobetaines). Thus, 9% of fish examined (white perch, weakfish, catfish, and Atlantic croaker) contained elevated levels of contaminants (primarily metals). Only 0.4% of over 13,000 fish examined showed signs of external pathologies.

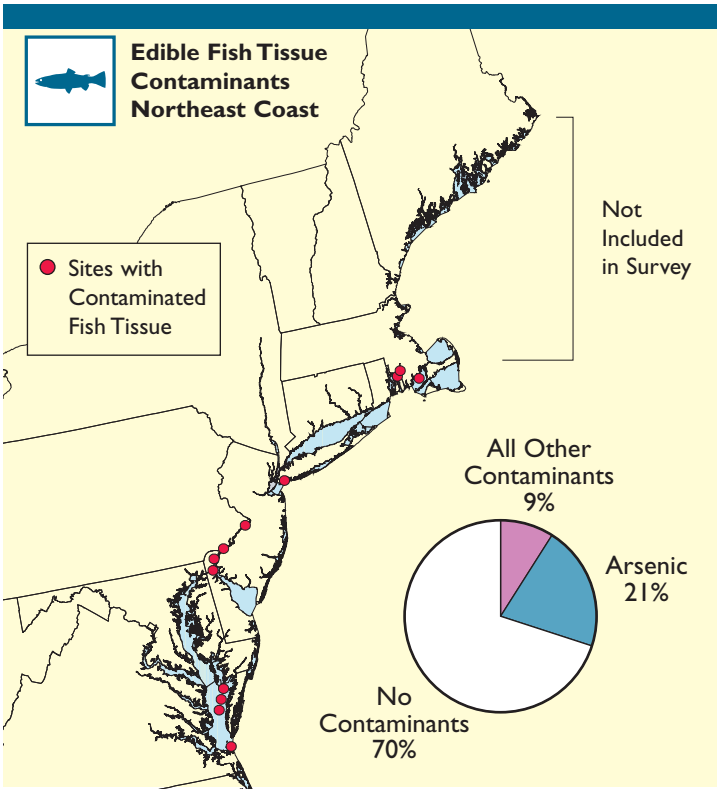
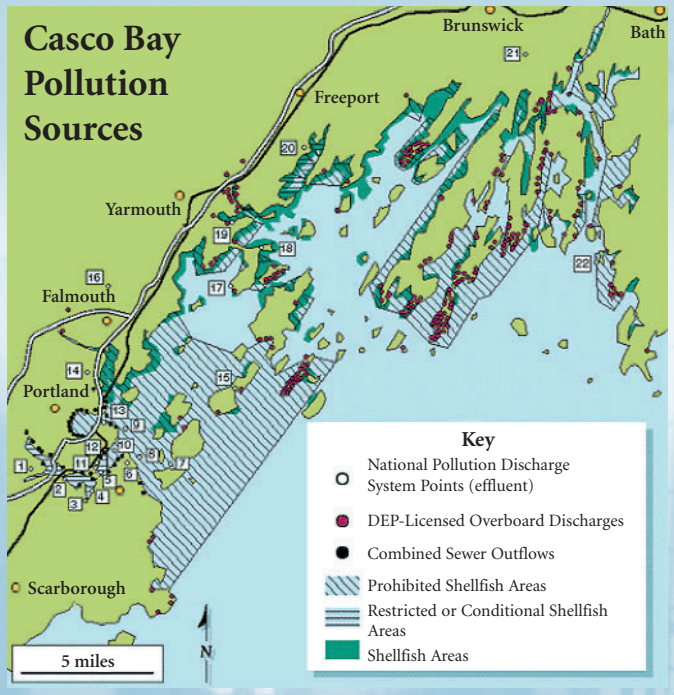


Figure 3-13. Contaminants in edible fish tissues for sampled sites along the Northeast Coast (U.S. EPA/EMAP).

This flounder is one of several flatfish species found on the banks and in the basins of the Stellwagen Bank National Marine Sanctuary (Photo: Dann Blackwood and Page Valentine, USGS).

Casco Bay Estuary Project



Pollution sources of Casco Bay (Casco Bay Estuary Project).

The Casco Bay Estuary Project is a cooperative effort between concerned citizens and local, state, and federal governments to protect Casco Bay, which lies at the heart of Maine's most populated area. Although the Casco Bay watershed represents only 3% of Maine's total land mass, it holds nearly 25% of the state's population. Residents depend on the bay and its watershed for multiple needs such as drinking water, recreation, food, transportation, industry, and waste disposal. However, when the Casco Bay Estuary Project began in 1990, few scientific studies had assessed the human impact on the pollutant levels of Casco Bay. Little was known about the pollutants in the sediments, the circulation patterns, or the sources of pollution (see figure). To ensure a better scientific basis for making policy decisions, the Casco Bay Estuary Project commissioned several major studies.

One study used Maquoit Bay as an example of predicting loadings of nitrogen and bacteria through the use of water quality loading models. Maquoit Bay is small, shallow, free from point sources of pollution and extensive urban development, and subject to excess concentrations of fecal coliform bacteria, and it suffered from a harmful algal bloom in 1988. Marine algal blooms are often triggered by excess nitrogen, so a model was developed to assess Maquoit Bay's potential sources of nitrogen (e.g., agricultural and residential runoff, sewage). The study found that septic systems, particularly failing ones, and manure or fertilizer were the largest sources of nitrogen and bacteria entering the bay. This finding provided a basis for developing measures to reduce pollutant loading to the bay.

Visit the Casco Bay Estuary Project on the Internet at http://www.cascobay.usm.maine.edu.

Delaware River Basin Commission

Approximately 6.4% of the nation's population relies on the waters of the Delaware River Basin for drinking and industrial use, and the Delaware Bay is only a day's drive away for about 40% of the U.S. population; yet the basin drains only 0.4% of the total continental U.S. land area. These figures indicate the tremendous potential for anthropogenic pressures to be placed on the estuary and the need for a strong governing body to manage and protect the water quality of the river and estuary.

The Delaware River Basin Commission (DRBC) was formed in 1961 by the signatory parties to the Delaware River Basin Compact (Delaware, New Jersey, New York, Pennsylvania, and the federal government) to share the responsibility of managing the water resources of the Basin. The Compact created a regional body with legal powers to oversee a unified approach to managing the river system without regard to political boundaries.

Today, the cleanup of the Delaware is hailed as one of the world's top water quality success stories. As a result of cleanup efforts, shad and other fish species are increasing in number. Currently, there is a major program on PCBs under way, resulting in fish consumption advisories covering the Delaware Bay and estuary. Other recent action by the DRBC has targeted certain toxic pollutants to ensure that stream quality objectives in the tidal Delaware River are met as part of a continuing program to protect human health and aquatic life. Two of the pollutants, 1,2-dichloroethane (DCE) and tetrachloroethene (TCE), have been identified by EPA as "probable human carcinogens." Under the resolution adopted by the DRBC, dischargers of DCE and TCE will be required to collect 1 year of effluent data to measure the magnitude and variability of these pollutants. This will be done before wasteload allocations are established for individual discharges.

The DRBC also plays an active role in community outreach and education efforts and conducts an annual water quality "snapshot" effort in which community participants are asked to collect and analyze water samples for water quality indicators such as dissolved oxygen and nitrates. This event and the resulting report bring attention to the Basin and to the public's interest and commitment to protecting its water resources.

Visit the DRBC online at www.state.nj.us/drbc.

Assessments and Advisories

Clean Water Act Section 305(b) and 303(d) Assessments

The states on the Northeast Coast assessed 11,791 (77%) of their 15,173 estuarine square miles for their 1998 305(b) reports. Forty-eight percent of the assessed estuarine waters fully support their designated uses, 16% are threatened for one or more uses, and the remaining 36% are impaired by some form of pollution or habitat degradation (Figure 3-14). Individual use support for estuaries is shown in Figure 3-15.

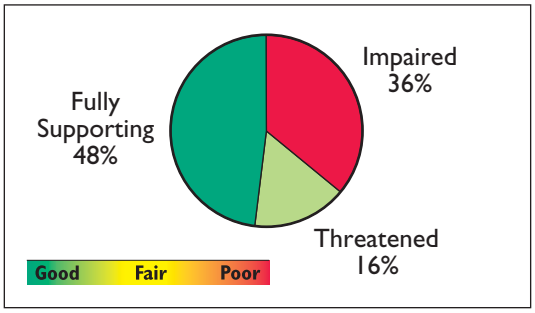


Figure 3-14. Water quality in assessed estuaries on the Northeast Coast (U.S. EPA).

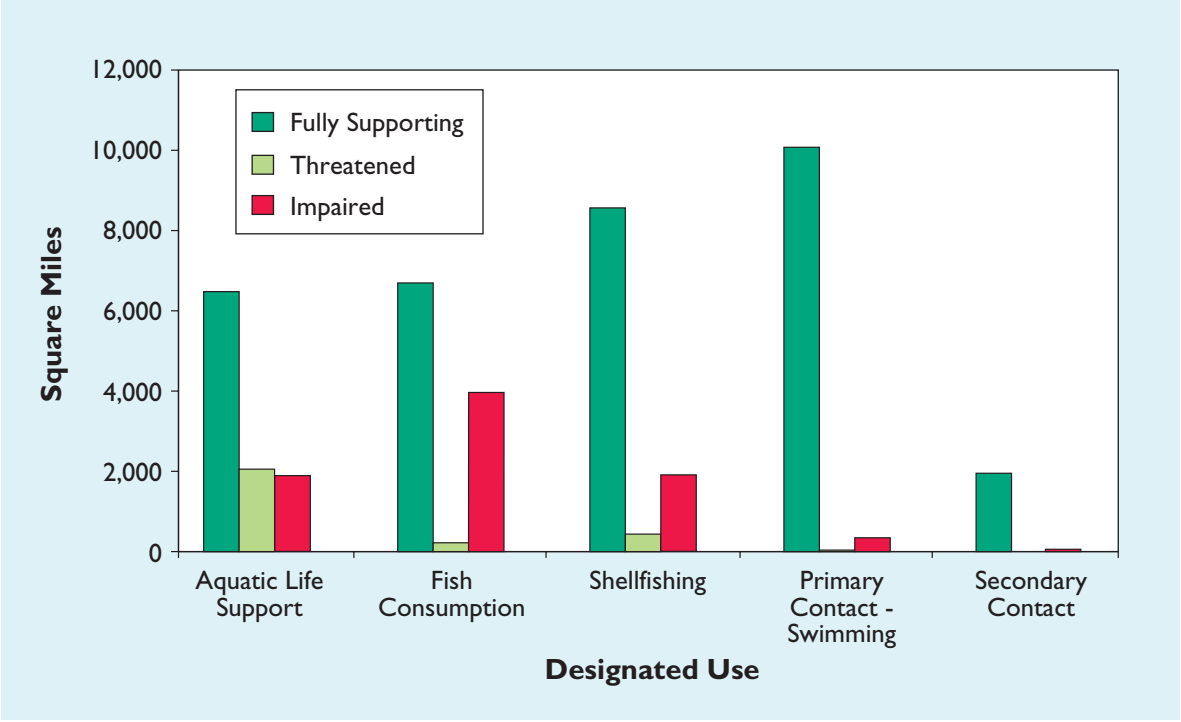


Figure 3-15. Individual use support in assessed estuaries on the Northeast Coast (U.S. EPA).

The states on the Northeast Coast assessed 401 (5%) of their 7,669 shoreline miles. Ninety-five percent of the assessed shoreline miles fully support their designated uses and no uses are reported as threatened, but 5% are impaired by some form of pollution or habitat degradation (Figure 3-16). Individual use support for the Northeast shoreline is shown in Figure 3-17.

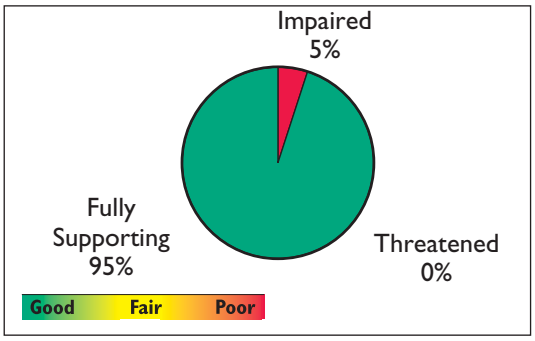


Figure 3-16. Water quality in assessed shoreline waters on the Northeast Coast (U.S. EPA).

The states reported individual use support for their assessed estuarine and coastal waters as shown in Table 3-1.

Table 3-1. Individual Use Support for Assessed Coastal Waters Reported by the States on the Northeast Coast under Section 305(b) of the Clean Water Act

Individual Uses	Assessed Estuaries Impaired (mi^2)	Assessed Shoreline Impaired (mi)
Aquatic Life	1,875 (18%)[a]	0
Fish Consumption	3,934 (36%)	18 (36%)
Shellfish Harvesting	1,488 (14%)	18 (7%)
Swimming	272 (3%)	0
Secondary Contact	40.2 (2%)	0

[a] Represents percentage of assessed waters impaired for each individual use.

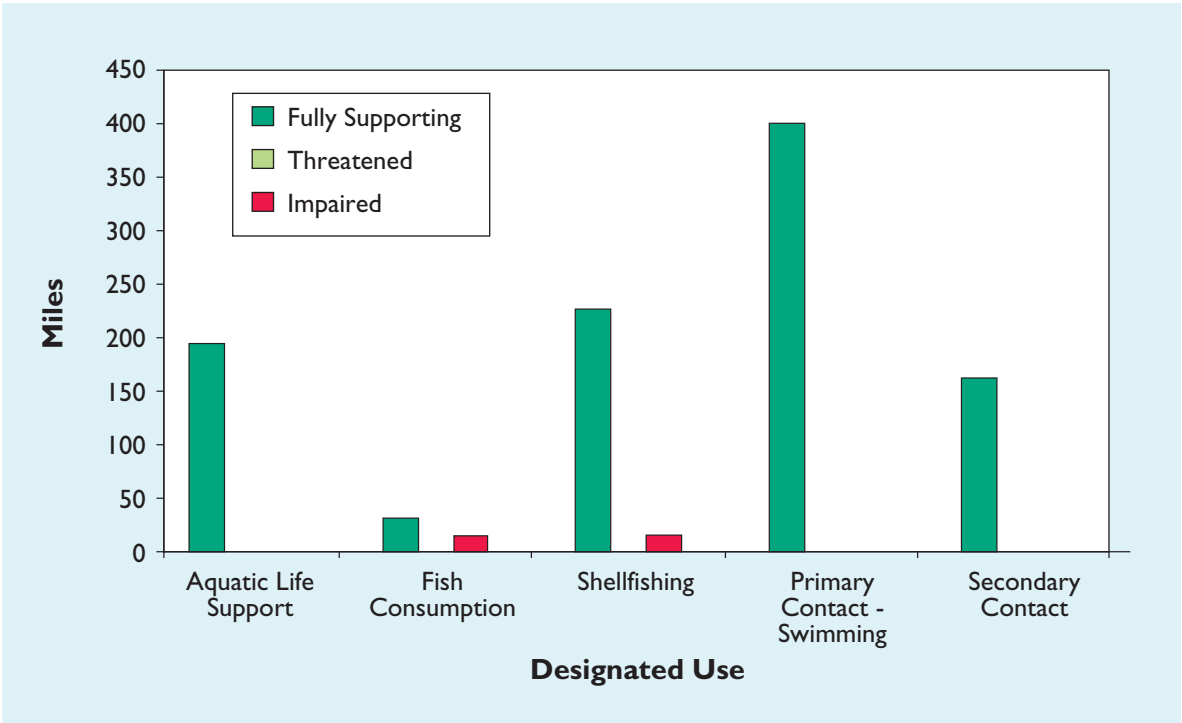
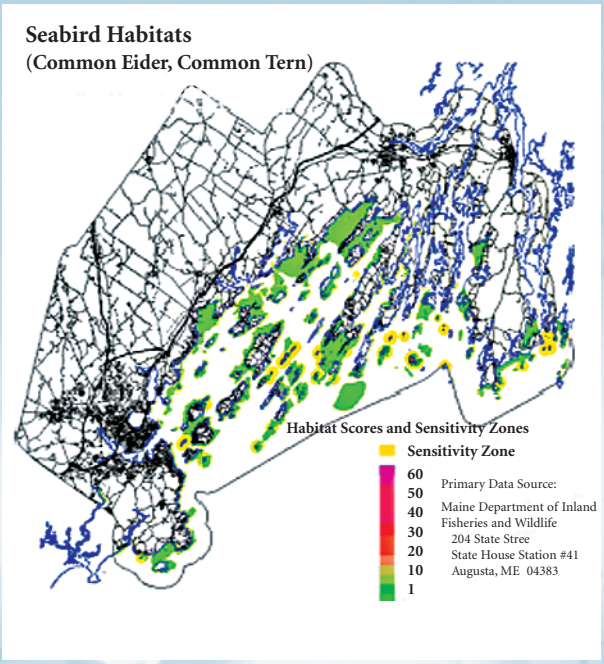


Figure 3-17. Individual use support for assessed shoreline waters on the Northeast Coast (U.S. EPA).

highlight

Coastal Habitat Study of the Gulf of Maine



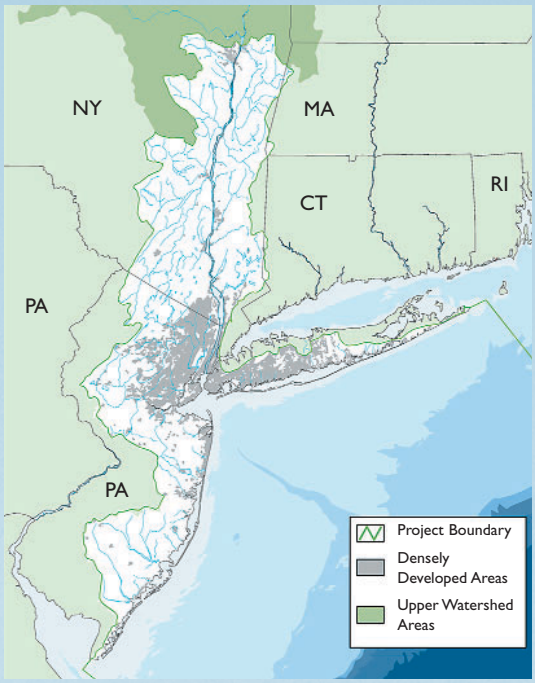
Casco Bay Seabird habitats, showing sensitive areas in yellow. Source: U.S. FWS Gulf of Maine Program.

The Gulf of Maine watershed includes more than 43,000 square miles of land in Maine, New Hampshire, and Massachusetts. The watershed includes the biologically productive Gulf of Maine as well as coastal habitats (salt marshes, mudflats, sandy beaches, intertidal zone, and islands) and inland streams, rivers, lakes, ponds, bogs, deciduous and coniferous woodlands, grasslands, and alpine tundra. The Gulf of Maine watershed provides productive nurseries for many marine fish; riverine pathways for historically abundant populations of anadromous fish; important habitat for breeding, migratory, and wintering waterbirds and neotropical migrants; and vital habitat for nationally threatened and endangered species. Unfortunately, increasing habitat loss and degradation from sprawling development, wetland and associated upland loss, overharvesting, oil spills, pollution, and other cumulative effects of development threaten the integrity of the Gulf of Maine watershed.

The U.S. Fish and Wildlife Service's Gulf of Maine Coastal Program has initiated a comprehensive project to identify, map, and rank important fish and wildlife habitat for priority species throughout the Gulf of Maine watershed. Biologists selected more than 60 species that regularly inhabit the Gulf of Maine watershed and are experiencing decline. Biologists are identifying, ranking, and mapping habitat for all of these species—from actual sitings or by developing habitat suitability models reflecting the environmental requirements for each species. Once species-specific maps are created using in-house geographic information system (GIS) technology (see figure), composite maps ranking habitats for all species will be developed. All of the data collected are available on a CD-ROM that will help land use planners and decision makers focus conservation efforts in areas of greatest biological value (Contact: Stewart Fefer, U.S. Fish and Wildlife Service, Gulf of Maine Coastal Program, 207-781-8364).

More information is available on the Internet at http://gulfofmaine.fws.gov.

Comprehensive Study of Habitat Complexes of the New York Bight Watershed



Areas of the coastal habitat project in the New York Bight watershed (U.S. FWS Coastal Program).

The U.S. Fish and Wildlife Service's Southern New England-New York Bight Coastal Program study *Significant Habitats and Habitat Complexes of the New York Bight Watershed* identifies and describes essential habitats of key marine, coastal, and terrestrial species inhabiting the New York Bight watershed study area to help guide ecologically sound land use decisions and land protection efforts. This habitat assessment includes 20 million acres of habitat, ranging from deep marine waters to freshwater wetlands and encompasses New York-New Jersey Harbor, the tidal waters of the Hudson River, the watersheds of the harbor and tidal Hudson, and the upland drainages of New Jersey and southern Long Island (see map).

The GIS analysis of habitat data identified 35 large, landscape-scale habitat complexes, such as barrier beaches, coastal lagoons, unfragmented blocks of forest or wetland areas, pine barrens, and freshwater tidal marshes. These large habitat complexes contain individual habitat units identified as important to a single species, multiple species, or communities.

Specific site narratives describe the location, boundaries, ecological communities and processes, various habitat subunits, general ownership or protected status, and the ecological significance or uniqueness for each large habitat complex. Site narratives also assess threats to the long-term integrity of both species populations and the physical structure of the habitat and recommend conservation considerations and protection/restoration strategies. The report's overview chapters discuss physiographic regions, marine zones, regionally significant populations, species groups, and natural communities.

You can view the New York Bight study on the Internet at http://www.fws.gov/r5snep/snep5.htm.

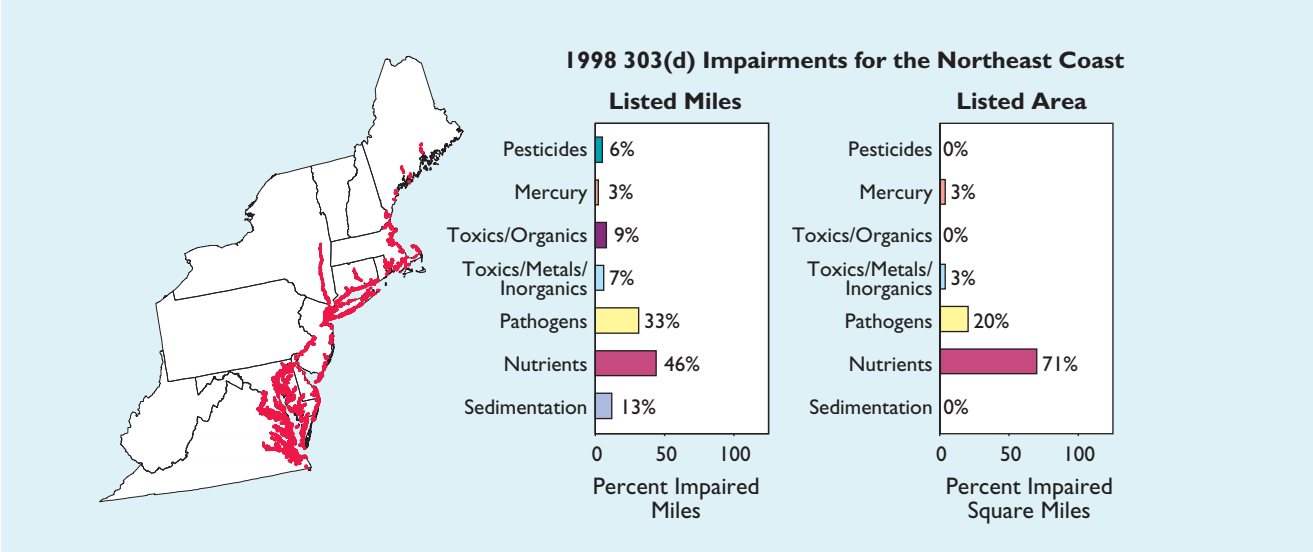


Figure 3-18. 303(d) listed waters on the Northeast Coast and the percentage of miles impaired by the major pollutant categories (note that a listing may be impaired by multiple pollutants) (U.S. EPA).

There are 697 waters located on the Northeast Coast that are listed as impaired under Section 303(d) of the Clean Water Act. The percentage of listed waters impaired by each of the major pollutant categories is shown in Figure 3-18.

State Fish Consumption Advisories

In 2000, 7 of the 10 Northeast Coast states (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, and Rhode Island) had statewide consumption advisories for fish in coastal waters, placing 100% of their coastal and estuarine areas under advisory. Due in large part to these statewide advisories, an estimated 81% of the coastal miles of the Northeast Coast and 67% of the estuarine area were under fish consumption advisories. A total of 36 different advisories were active in 2000 for the estuarine and marine waters of the Northeast Coast (Figure 3-19).

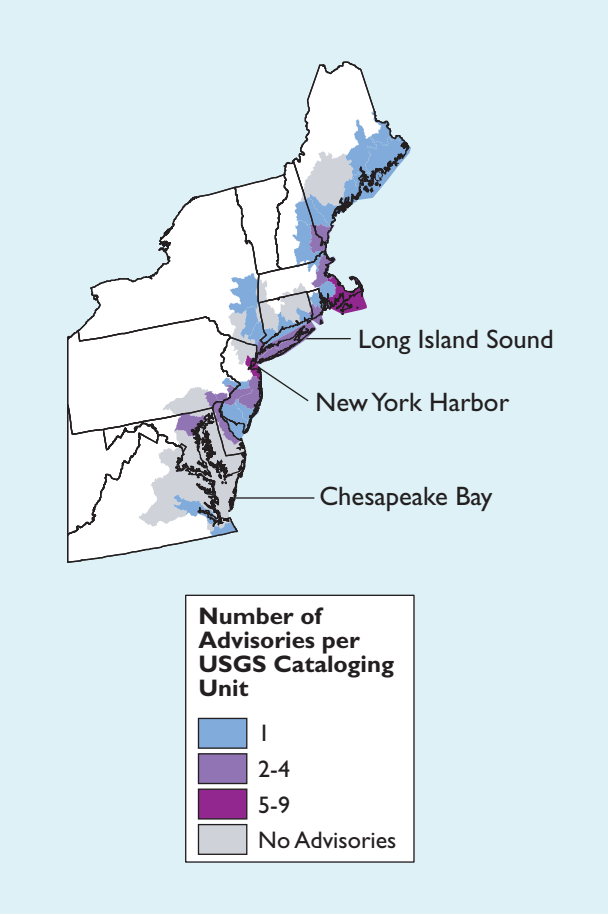


Figure 3-19. The number of fish consumption advisories on the Northeast Coast active in 2000 (U.S. EPA).

Advisories in the Northeast were in effect for 10 different pollutants (Figure 3-20). The majority of the listings (51%) were for PCBs. The James River estuary in Virginia was listed for kepone, while Boston Harbor was listed for multiple pollutants.

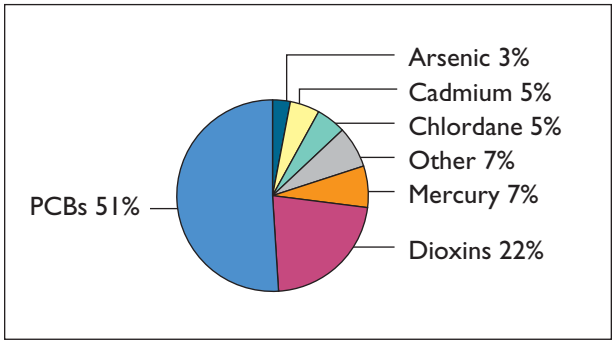


Figure 3-20. Pollutants responsible for fish consumption advisories in northeastern coastal waters (U.S. EPA NLFWA, 2000c).

These species were under advisory in 1999 for at least some part of the Northeast Coast:

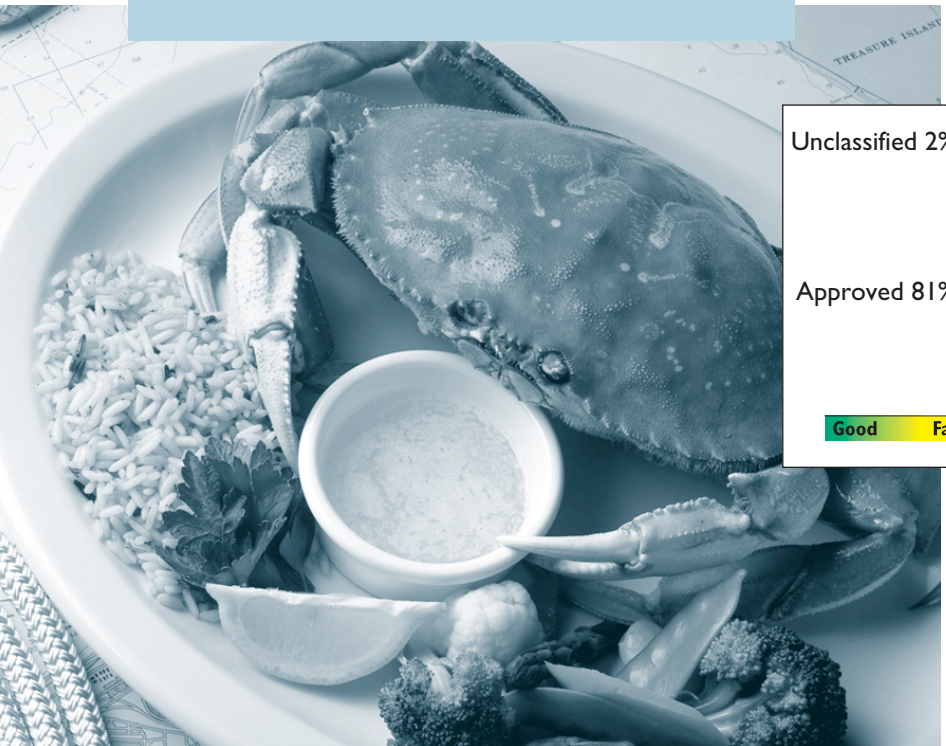
White catfish	Flounder	Bivalves
American eel	Goldfish	Lobster
Largemouth bass	Atlantic needlefish	Lobster (tomalley)
Smallmouth bass	White perch	Rainbow smelt
Striped bass	Scup	Tautog
Bluefish	Blue crab	Walleye
Common carp	Blue crab (hepatopancreas)	
Channel catfish		

Classified Shellfish-Growing Waters

In the Northeast, 9.6 million acres of shellfish waters (44% of the national total) were classified for shellfish harvest in 1995 (Figure 3-21). Of the classified acreage, 82% were approved and 18% were harvest-limited. Of the region's classified acreage, 37% is located in estuarine waters and 63% in nonestuarine waters. The top four pollution sources affecting harvest limitation in estuarine and nonestuarine waters are wastewater treatment plants, urban runoff, direct discharges, and upstream sources.

Two of the top shellfish species in the Northeast (rated high or medium in abundance) are hard clams (1.2 million acres) and surf clams (1.5 million acres). Twelve percent of surf clams and 28% of hard clams are located in waters that do not allow direct harvesting (i.e., restricted, conditionally restricted, and/or prohibited).

Total classified acreage in the Northeast has increased by over 1.5 million acres since the 1990 Register. While all three North Atlantic states (Maine, New Hampshire, and



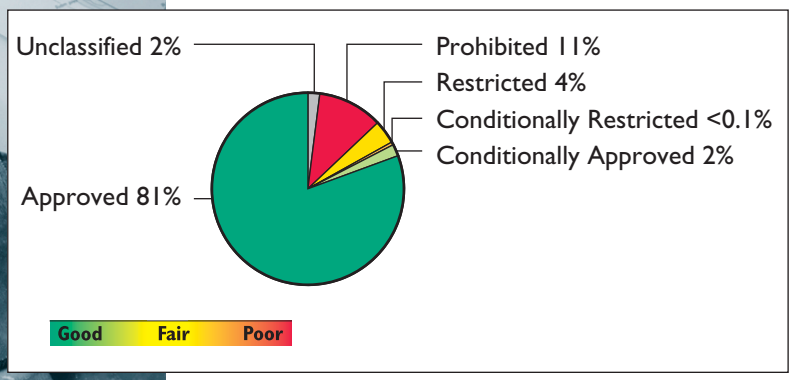


Figure 3-21. Classification of shellfish-growing waters for the Northeast (1995 Shellfish Register, NOAA, 1997).

Massachusetts) reported increases in the total amount of classified acreage, the biggest change occurred in Massachusetts, where classified nonestuarine acreage almost tripled. In the Mid-Atlantic states (Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, and Virginia), approved waters increased from 79% in 1990 to 84% in 1995. Five of the eight Mid-Atlantic states reported a decline in classified acreage located in estuarine waters.

Beach Closures

Of 566 coastal beaches in the Northeast that reported information to EPA, only 8.8% (50 beaches) closed for any period of time in 1999. The highest percentage of closed beaches was in New York, where 19% of the 26 beaches providing information were closed at least once in 1999. Figure 3-22 shows the percentage of beaches in each county that were closed at least once in 1999 and the locations of beach closures. Four states (Delaware, Maine, New Hampshire, and Virginia) did not have any coastal beach closings in 1999.

Over 98% of the beaches in the Northeast that reported information have monitoring programs. Virginia had the lowest percentage of monitored beaches in 1998, but in 1999 five of the six beaches reporting from Virginia had a monitoring program in place.

Causes for beach closures in the Northeast were primarily related to elevated bacteria levels. The sources of bacteria were generally different types of runoff, such as stormwater, and sewer overflows. In a number of cases, the elevated bacteria levels were thought to have been caused by wildlife. Often beaches were preemptively closed due to the threat of potentially high bacteria levels. In New Jersey, a number of beaches were closed due to raw sewage spills.

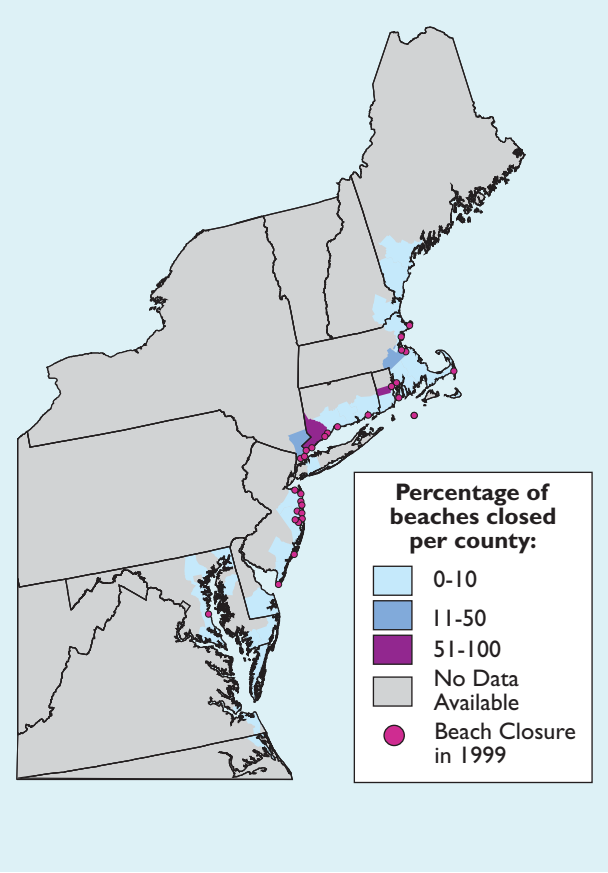


Figure 3-22. Percentage of beaches in each county that were closed at least once in 1999, of those beaches providing information to EPA.

Summary

Ecological conditions in northeastern estuaries are borderline poor (Figure 3-23). The primary problems in northeastern estuaries are sediment contamination, high eutrophic condition, significant loss of wetlands, and poor fish and benthic condition. Over 25% of sediments are enriched or exceed the ERL/ERM guidance. Sixty percent of the northeastern estuarine area has a high potential of increasing eutrophication or existing high concentrations of chlorophyll *a*. About 10% of fish have elevated levels of contaminants in their edible tissues. Nearly 40% of all wetlands along the Northeast Coast were eliminated between 1780 and 1980. Although some of these problems are improving, benthic community degradation, fish tissue contamination, and increasing eutrophic condition are worsening. Figure 3-23 displays the condition of the major indicators of ecological condition in northeastern estuaries. Although hypoxia issues exist in the deep trough of the Chesapeake Bay, dissolved oxygen conditions are generally fair for northeastern estuaries. Water clarity is generally in good condition. However, benthic community condition is borderline poor in these estuaries and appears to be worsening. Eutrophic condition, sediment contamination, and fish tissue contamination are considered to be in poor condition throughout the Northeast. The condition of these resources indicates that the estuaries of the Northeast Coast are among the most threatened in the country. However, major programs are being implemented and designed to address the existing problems. Continued monitoring is also necessary to track the progress of cleanup efforts and to prevent the worsening of conditions throughout the Northeast.

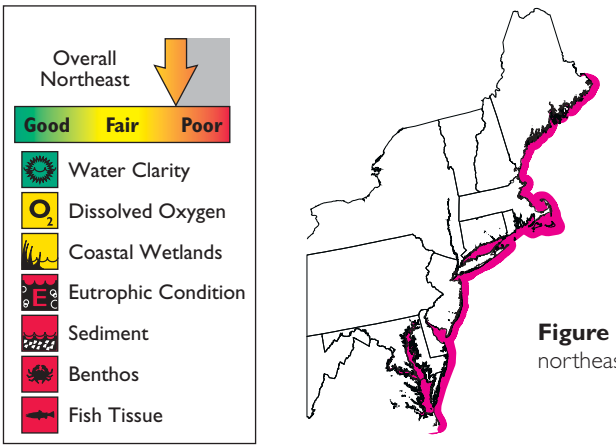


Figure 3-23. The overall condition of northeastern estuaries is borderline poor.

highlight

The Chesapeake Bay Program

The Chesapeake Bay Program is a unique regional partnership directing and conducting the restoration of the Chesapeake Bay since the signing of the historic Chesapeake Bay Agreement of 1983. The Chesapeake Bay Program partners are the states of Maryland, Pennsylvania, and Virginia; the District of Columbia; the Chesapeake Bay Commission, a tri-state legislative body; and EPA.

In the late 1970s, scientific and estuarine research on the Bay pinpointed three areas requiring immediate attention: nutrient overenrichment, dwindling underwater bay grasses, and toxic pollution. Once the initial research was completed, the Bay Program evolved as the means to restore this exceptionally valuable resource, with its highest priority being the restoration of the Bay's living resources—its finfish, shellfish, bay grasses, and other aquatic life and wildlife.

The second Chesapeake Bay Agreement was signed in 1987, which created the infrastructure and policy vision for which the Chesapeake Bay Program is known. The centerpiece of the 1987 Agreement was a goal to reduce nutrients entering the Bay by 40% by 2000. This history of setting strong numerical goals within a date-certain timeframe has become a hallmark of the Bay Program and is repeated in the new Chesapeake 2000 agreement.

The Chesapeake 2000 agreement lays the foundation and sets the course for the Bay's restoration and protection for the next decade and beyond. Highlights include

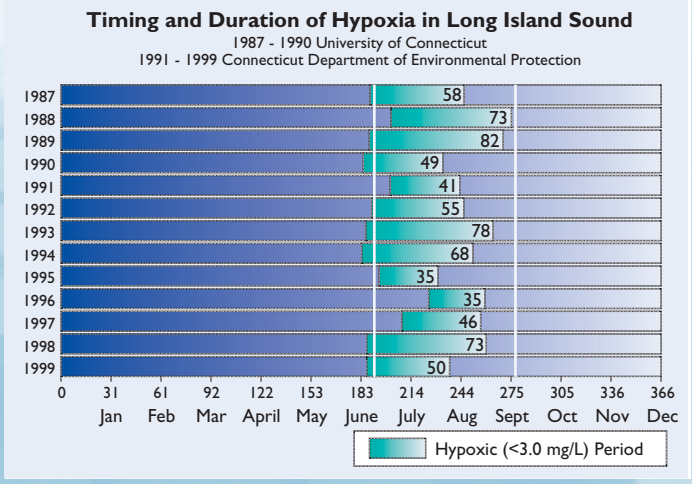
- **Water Quality** – "By 2010, correct the nutrient and sediment related problems in the Chesapeake Bay and its tidal tributaries sufficiently to remove [them] from the list of impaired waters under the Clean Water Act."
- **Sprawl and Growth Commitments** – A commitment to reduce the rate of harmful sprawl development of forests and farms by 30% by 2012 and to permanently preserve 20% of the Bay watershed by 2010 (currently about 16.4% is preserved).
- **Mixing Zone Elimination** – Voluntary elimination of mixing zones for both bioaccumulative and persistent chemicals by 2010.
- **Wetlands** – Commits to a "no net loss" of existing wetlands, a net gain of 25,000 acres by 2010, and a commitment to develop and implement locally generated wetlands preservation plans on 25% of the land area of the Chesapeake Bay watershed by 2010.
- **Education and Public Access** – Provide every school student in the Bay watershed with an outdoor Bay or stream experience by the time he or she graduates from high school. Also, increase public access to the Bay and its tributaries by 30% by 2010 and add 500 miles of water trails by 2005.
- **Oysters/Crabs** – The new agreement commits to a tenfold increase in the oyster population by 2010 and to setting of new Baywide harvest targets for blue crabs in 2001.

highlight

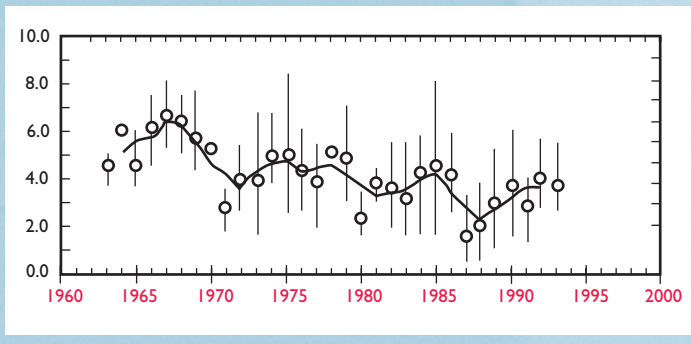
Long Island Sound Dissolved Oxygen

The Long Island Sound drainage basin is one of the most densely populated areas in the country. Approximately 8.4 million people live within the basin, including 3.5 million in New York City. Intense resource use and human population pressures have placed a significant strain on Long Island Sound. Passage of the Clean Water Act has led to measurable improvements in water quality, and many sources of pollution are now regulated. However, the problem of low dissolved oxygen remains a significant concern to the overall health of the sound.

Low dissolved oxygen occurs primarily during the summer months in the central and west portions of Long Island Sound. When dissolved oxygen levels fall below 3 mg/L, the health of aquatic life tends to suffer. Water in Long Island Sound tends to be highly stratified in the late summer months and has probably always experienced some periods of low dissolved oxygen. However, human inputs of nutrients add to the problem, resulting in more significant damage to ecologically and economically important organisms.



A time series of average dissolved oxygen concentrations in Long Island Sound shows generally decreasing measurements from 1963 to 1993. Conditions appear to improve from 1987 to 1993, but remain substantially degraded with respect to measurements made prior to 1970.



Average Bottom Dissolved Oxygen Concentrations (mg/L) from 1963 to 1993. Yearly averages reveal generally decreasing dissolved oxygen concentrations with stabilizing conditions from 1973 to 1987 and a slight recovery from 1987 to 1993.