Executive Summary

The U.S. Department of Agriculture (USDA), the U.S. Environmental Protection Agency (EPA), and seven other federal agencies developed a Clean Water Action Plan to protect public health and restore our nation's waterways through 111 key actions. Included in those waterways are our coastal waters, and the Action Plan contains several key actions related to coastal waters. Key Action No. 60 calls for the development of a comprehensive report on the condition of the nation's coastal waters. This National Coastal Condition Report fulfills that key action of the Clean Water Action Plan and also serves as a foundation for the current administration's efforts to protect, manage, and restore coastal ecosystems. Four federal agencies and several state and regional/local organizations have come together to report on the current condition of the nation's coasts.

This National Coastal Condition report compiles several available data sets from different agencies and areas of the country and summarizes them to present a broad baseline picture of the condition of coastal waters. Although data sets presented in this report do not cover all coastal areas with respect to all ecological issues of concern, they do tell a story about coastal conditions from a multiregional perspective. For example, EPA's Environmental Monitoring and Assessment Program (EMAP) has monitoring data for the Virginian, Louisianian, and Carolinian provinces, which encompass 70% of continental U.S. estuarine acreage (or about 18% of U.S. estuarine acreage if Alaska is included). This report will serve

as a useful benchmark for analyzing the progress of coastal programs in the future and will be followed in subsequent years by reports on more specialized coastal issues.

Currently, comprehensive and nationally consistent data on the condition of coastal waters are not available for all coastal regions of the United States. However, we can begin to describe the condition of our nation's coasts using data for some variables that have been measured consistently across a number of regions. These data are derived largely from a combination of ongoing federal and state coastal monitoring programs. In this report, the condition of coastal waters is described based primarily on data from estuaries, which are the productive transition areas between freshwater rivers and the ocean.

Although the objective of this report is to evaluate the condition of coastal resources (in this case, primarily estuaries) on a national level, there is sufficient information to assess completely only northeastern, southeastern, and Gulf of Mexico estuaries. Partial assessments are possible for West Coast estuaries and the Great Lakes, and no assessment is currently possible for the estuarine systems of Alaska, Hawaii, and island territories (Figure ES-1). In order to do a complete assessment of coastal resources for a region of the country, data that are representative of the entire resource are required. Obtaining the data needed for estuarine assessment generally requires a particular type of monitoring that is now used in all 24 coastal states, but not yet in the Great Lakes region.
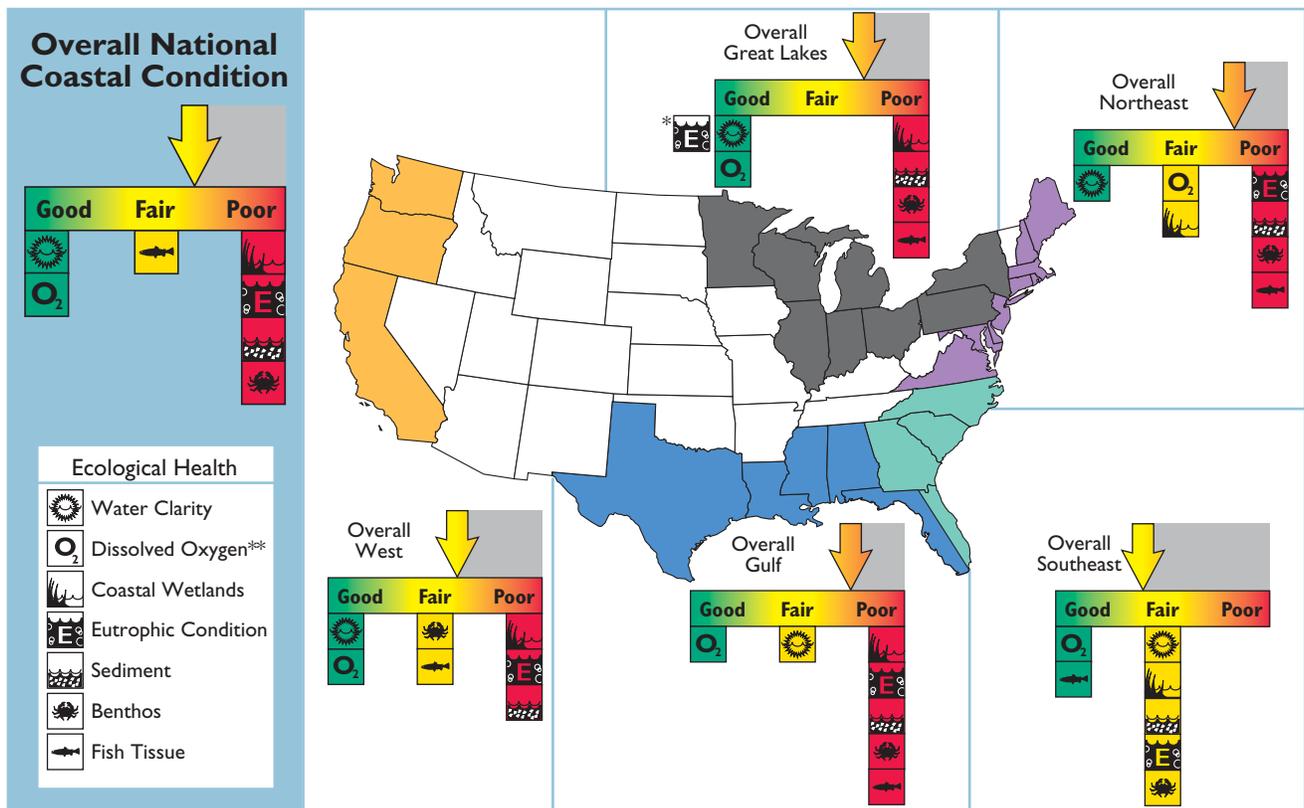

* No indicator data available.
** Does not include the hypoxic zone in offshore Gulf of Mexico waters.

Figure ES-1. Overall national coastal condition.

Summary of the Findings

Thousands of pieces of information on the condition of the estuarine and Great Lakes resources of the United States were collected from 1990 to 1997. Many of these data were analyzed to develop the assessment described in this report. Statistically and ecologically consistent and representative data were collected representing all of the estuarine resources in the Northeast, Southeast, and Gulf of Mexico, and data representing selected locations were collected throughout the remainder of the country. The resulting ecological assessment of the nation's estuaries using these mixed data sets shows estuaries to be in fair to poor condition, varying from poor conditions in the Northeast to fair conditions in the Southeast. No overall assessments were completed for Alaska, Hawaii, or the island territories. New ecological monitoring programs, both proposed and in place, will permit a comprehensive and consistent overall assessment of all the nation's coastal resources by 2005.

The major findings of the 1990 to 1997 study period are as follows:

- Overall condition of the nation's estuaries was fair based on seven basic indicators of ecological condition—water clarity, dissolved oxygen, loss of coastal wetlands, eutrophic condition, sediment contamination, benthic condition, and accumulation of contaminants in fish tissue.

- Fifty-six percent of assessed estuarine resources were in good condition while 44% were characterized by impaired human use or impaired aquatic life use.

- Generally, the nation's coastal areas were rated as poor if the mean conditions for these seven indicators showed that greater than 20% of the estuarine area in that region was degraded.

- Indicators that showed the poorest condition throughout the United States were coastal wetland loss, eutrophic condition, and benthic condition. Indicators that showed the best condition generally were water clarity and dissolved oxygen concentrations.

- These areal estimates represent over 70% of the estuarine area of the conterminous United States (all areas except New England and the West Coast). Consistent and comprehensive surveys are currently being conducted throughout all coastal states (including Alaska, Hawaii, and Puerto Rico), and the results of these surveys will be available in 2004. Consistent and comprehensive surveys of the nation's offshore waters (0-12 miles) are being planned for 2002, and the results will be available (assuming survey completion) in 2005.

Tables ES-1 and ES-2 summarize the estimates of areal degradation by region and nationally and the rating scores, respectively, for each indicator.

Table ES-1. Percent Area of Degradation[a] by Indicator and Region						
Indicator	**Northeast**	**Southeast**	**Gulf of Mexico**	**West**	**Great Lakes**	**United States**
Water Clarity	6	12	22	<1	—	4
Dissolved Oxygen	5	2	4[b]	0	—	4
Coastal Wetland Loss	39	40	50	68	51	48
Contaminated Sediments	41	13	43	—	—	35
Benthos	23	17	23	—	—	21
Fish Tissue Contaminants[c]	30	9	20	—	—	26
Eutrophic Condition	60	13	38	20	—	40
Overall[d]	43	46	49	—	—	44

[a] Percent area of degradation is the percentage of total estuarine surface area in a region or the nation.
[b] Area of degradation does not include hypoxic zone in offshore Gulf of Mexico waters.
[c] Represents the percentage of target fish populations.
[d] Overall percentage includes areas of impaired human use.

Table ES-2. Rating Scores[a] by Indicator and Region						
Indicator	**Northeast**	**Southeast**	**Gulf of Mexico**	**West**	**Great Lakes**	**United States[b]**
Water Clarity	5	4	3	5	5	4.3
Dissolved Oxygen	4	5	5[c]	5	4	4.5
Coastal Wetland Loss	2	2	1	1	1	1.4
Contaminated Sediments	1	3	1	1	1	1.3
Benthos	1	2	1	3	1	1.4
Fish Tissue Contaminants	1	5	1	3	1	1.9
Eutrophic Condition	1	4	1	1	—[d]	1.7
Overall	2.1	3.6	1.9	2.7	2.2	2.4

[a] Rating scores are based on a 5-point system where 1 is poor and 5 is good.
[b] U.S. score is based on an areally weighted mean of regional scores.
[c] Rating score does not include the impact of the hypoxic zone in offshore Gulf of Mexico waters.
[d] No eutrophication survey results are available for the Great Lakes.

Describing Coastal Condition

This report presents two types of data: (1) coastal monitoring data from programs like EMAP and the National Oceanic and Atmospheric Administration (NOAA) National Status & Trends Program (NS&T) that have been analyzed for this report and used to develop indicators of condition and (2) assessment and advisory data provided by states or other regulatory agencies and compiled in nationally maintained databases. Because the assessment and advisory data are contributed by different agencies that use different methodologies and criteria for assessment, they cannot be used for a broad-based comparison between different coastal areas. The data are presented in this report because they provide information about designated use support (e.g., is it safe to swim in an estuary), which affects public perception of coastal condition. These data also present coastal condition as it relates to public health.

The overall condition of the nation's coasts based on available data is fair (Figure ES-2). This assessment was made based on (1) EMAP sampling of environmental variables over 8 years (1990-1997) at more than 1,000 random probability-based sites representing 70% of all estuarine areas in the continental United States and (2) other monitoring and advisory data from EPA, NOAA, the U.S. Geological Survey (USGS), U.S. Fish and Wildlife Service (FWS), and state and tribal programs.
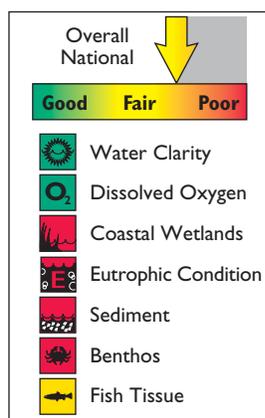
Overall National		
Good	**Fair**	**Poor**

- Water Clarity
- O₂ Dissolved Oxygen
- Coastal Wetlands
- Eutrophic Condition
- Sediment
- Benthos
- Fish Tissue

Figure ES-2. The overall estuarine condition for the nation is fair.

Seven primary indicators are used to rate coastal condition in this report: water clarity, dissolved oxygen, coastal wetland loss, eutrophic condition, sediment contamination, benthic index, and fish tissue contaminants (Table ES-3). Supplemental information (e.g., algae concentrations, sediment toxicity, fish pathology data) are also presented throughout the report where available. The seven indicators were assigned a score of good, fair, or poor for each coastal area of the United States (Northeast, Southeast, Gulf of Mexico, West Coast, and Great Lakes areas) (Figure ES-2). The indicator scores were then averaged to create an indicator score for overall condition of each coastal area. The assessments for each coastal area were combined to form national scores by calculating an average weighted by the amount of estuarine area in each coastal region (excluding Alaska).

The use of indicators to describe coastal condition is experimental in nature. In this report, the overall condition for each coastal area is assessed using a straightforward combination of the seven indicator scores. Continued research is necessary to establish the most appropriate indicators to use in describing coastal condition and the appropriate weighting factors for combining them for an overall assessment.

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.

Caution about Indicator Data

Using indicators to compare estuarine conditions throughout the nation can be misleading because the natural state of estuaries varies throughout the nation. For example, estuaries in the Southeast tend to have poor water clarity due to high turbidity that results from naturally high productivity and strong sediment transport and resuspension processes. So the "fair" water clarity rating in southeastern estuaries does not necessarily mean that water quality is poor or degraded.

Table ES-3. Indicators Used To Assess Coastal Condition

Icon	Poor Condition	Ranking
Water Clarity	Water clarity is considered poor if less than 10% of surface light reaches a depth of 1 meter.	**Good**: Less than 10% of the coastal waters have poor light penetration. **Fair**: 10% to 25% of the coastal waters have poor light penetration. **Poor**: More than 25% of the coastal waters have poor light penetration.
Dissolved Oxygen	Dissolved oxygen levels are considered poor when concentrations are less than 2 ppm.	**Good**: Less than 5% of the coastal waters have poor dissolved oxygen. **Fair**: 5% to 15% of the coastal waters have poor dissolved oxygen. **Poor**: More than 15% of the coastal waters have poor dissolved oxygen.
Coastal Wetland Loss	Areas with a greater than 40% decline in wetland acreage from 1780 to 1980 and/or a greater than 10% decline from the mid-1970s to the mid-1980s are considered to be in poor condition.	**Good**: Less than 25% decline in wetland acreage from 1780 to 1980 and/or less than 5% decline from the mid-1970s to the mid-1980s. **Fair**: Between 25% and 40% decline from 1780 to 1980 and/or between 5% and 10% decline from the mid-1970s to the mid-1980s. **Poor**: Greater than 40% decline from 1780 to 1980 and/or greater than 10% decline from the mid-1970s to the mid-1980s.
Eutrophic Condition	Eutrophic condition is a measure developed by NOAA that examines six different eutrophication symptoms and assigns a value of low, moderate, or high. High eutrophic condition is equivalent to poor condition for this indicator.	**Good**: Less than 10% of the coastal waters have high eutrophic condition. **Fair**: 10% to 20% of the coastal waters have high eutrophic condition. **Poor**: More than 20% of the coastal waters have high eutrophic condition.
Sediment Contamination	Sediment contamination is evaluated using ERM and ERL criteria. ERM is the concentration of contaminant that will result in ecological effects 50% of the time. ERL is the concentration of contaminant that will result in ecological effects 10% of the time. An estuary is in poor condition if it exceeds one ERM criterion or five ERL criteria.	**Good**: Less than 5% of the coastal waters exceed one ERM criterion or five ERL criteria. **Fair**: 5% to 15% of the coastal waters exceed one ERM criterion or five ERL criteria. **Poor**: More than 15% of the coastal waters exceed one ERM criterion or five ERL criteria.
Benthic Index	A poor benthic index score indicates that benthic communities are less diverse than expected, populated by greater than expected pollution-tolerant species, and contain fewer than expected pollution-sensitive species.	**Good**: Less than 10% of the coastal waters have a low benthic index score. **Fair**: 10% to 20% of the coastal waters have a low benthic index score. **Poor**: More than 20% of the coastal waters have a low benthic index score.
Fish Tissue Contaminants	An estuary is in poor condition for fish tissue contaminants if more than 10% of fish sampled have tissue residues greater than FDA and international criteria or more than 20% of fish sampled have tissue residues greater than EPA Guidance Values.	**Good**: Less than 2% of the coastal waters have poor fish tissue condition. **Fair**: 2% to 10% of the coastal waters have poor fish tissue condition. **Poor**: More than 10% of the coastal waters have poor fish tissue condition.

Coastal Monitoring Data

About 56% of the estuarine area in the continental United States is in good condition for supporting aquatic life use (animal and plant communities) and human uses (such as drinking water, agriculture, swimming, and boating) (Figure ES-3). About 34% of the estuarine area shows evidence of impaired aquatic life use, and 33% of the area shows evidence of impaired human use. In fact, 23% of estuarine area in the continental United States is degraded for both aquatic life and human uses.
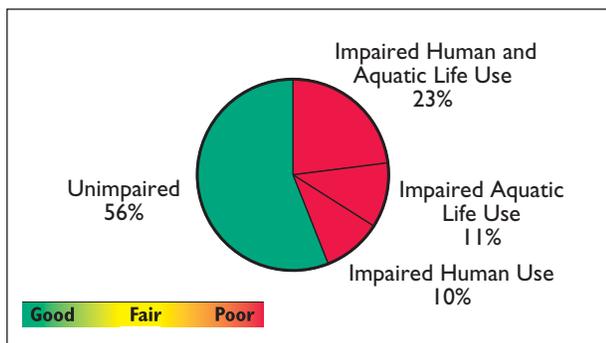

Figure ES-3. National estuarine condition (U.S. EPA/EMAP).

The overall water clarity of the nation's estuaries is rated as good. Water clarity is good in West Coast and northeastern estuaries as well as the Great Lakes, but fair in the Gulf of Mexico and southeastern estuaries. Dissolved oxygen condition (using occurrence of hypoxia as a standard) in the nation's estuaries is generally good.

Coastal wetland losses throughout the United States have been significant, and this indicator receives a poor rating. During the 200-year period from 1780 to 1980, nearly 50% of the existing wetlands in the conterminous United States were lost.

The overall score for eutrophic condition of estuarine waters for the nation is poor. Eutrophication in estuarine waters is increasing throughout much of the United States. All coastal areas are in poor condition as rated by eutrophic condition, except for the Southeast, which is in fair condition, and Alaska and Hawaii, which were not evaluated.

Sediment contaminant concentrations are generally poor throughout the estuaries and Great Lakes of the United States. Eleven to thirty percent of estuarine sediments in the United States show concentrations of contaminants (polycyclic aromatic hydro-carbons [PAHs], polychlorinated biphenyls [PCBs], pesticides, and metals) that are above guidance levels (concentrations that are likely to result in biological effects). Most of the sample sites that displayed the greatest exceedances are in the Northeast. Measure-ments of sediment enrichment due to human sources show that 40% of U.S. estuarine sediments are enriched with metals, 45% are enriched with PCBs, and 75% are enriched with pesticides (note that these percentages exclude Alaska, Hawaii, and the Great Lakes).
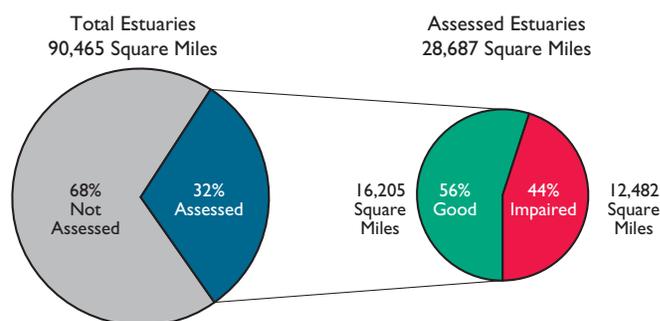
Benthic condition is poor in estuaries throughout the United States, largely due to contaminated sediments, low dissolved oxygen conditions, habitat degradation, and eutrophication. Benthic condition in the Great Lakes is also poor.

The overall rating for fish tissue contaminants for the nation is fair. Fish tissue contaminant concentrations are generally low throughout the estuarine waters of the United States with the exceptions of the northeastern estuaries, the Gulf of Mexico, and the Great Lakes.
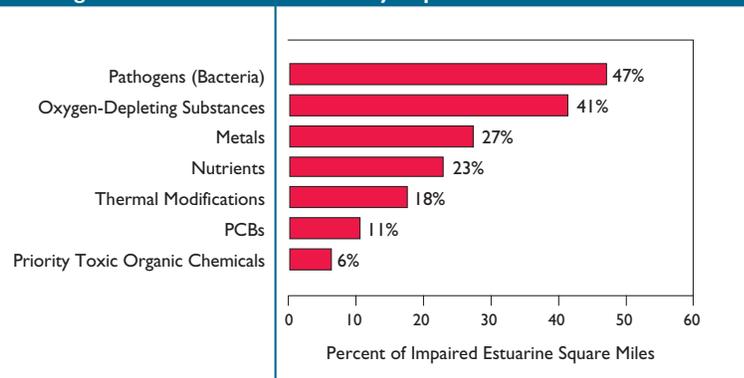
Assessment and Advisory Data

The nation's Clean Water Act Section 305(b) reporting process largely agrees with the assessment based on coastal monitoring data. States and tribes rate water quality for Clean Water Act reporting by comparing available water quality data to their water quality standards (water quality standards include narrative and numeric criteria that support specific designated uses, such as swimming and aquatic life use). Each state has different monitoring resources and uses a different methodology for assessment, so this information is not nationally consistent and is often incomplete. State 1998 water quality reports suggest that 44% of assessed estuaries and 12% of assessed coastal shoreline in the United States (excluding Alaska) was impaired by some form of pollution or habitat degradation. The most frequent use impairments were for aquatic life support, primary contact recreation (swimming), and fish consumption. The leading stressors resulting in these impairments were pathogens, oxygen-depleting substances (oxygen is consumed during the degradation of organic matter and the oxidation of some inorganic matter), metals, and nutrients (Figure ES-4). The primary sources of impairing pollutants reported by states were municipal point sources, urban runoff or storm sewers, atmospheric deposition, industrial discharges, and agriculture.

The number of coastal and estuarine waters under fish consumption advisories represents an estimated 71% of the coastline miles of the contiguous 48 states, including 92% of the Atlantic Coast, 100% of the

Total Estuaries 90,465 Square Miles

- 68% Not Assessed
- 32% Assessed

Assessed Estuaries 28,687 Square Miles

- 16,205 Square Miles
- 56% Good
- 44% Impaired
- 12,482 Square Miles

Leading Pollutants/Stressors of Estuary Impairment

- Pathogens (Bacteria) — 47%
- Oxygen-Depleting Substances — 41%
- Metals — 27%
- Nutrients — 23%
- Thermal Modifications — 18%
- PCBs — 11%
- Priority Toxic Organic Chemicals — 6%

Percent of Impaired Estuarine Square Miles

Leading Sources of Estuary Impairment

- Municipal Point Sources — 28%
- Urban Runoff/Storm Sewers — 28%
- Atmospheric Deposition — 23%
- Industrial Discharges — 15%
- Agriculture — 14%
- Land Disposal of Wastes — 12%
- Combined Sewer Overflow — 11%

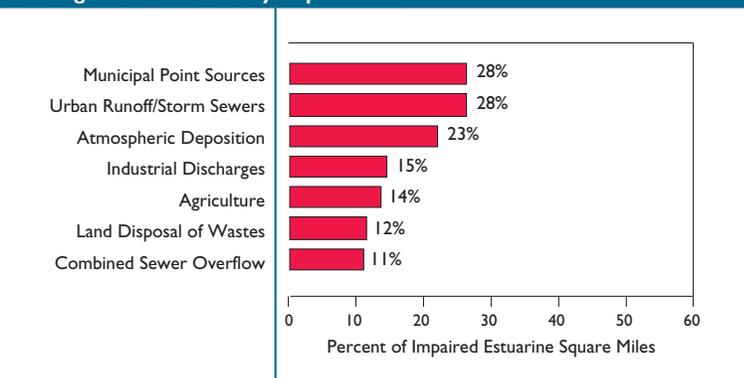Percent of Impaired Estuarine Square Miles

Figure ES-4. 1998 305(b) water quality assessment data for estuaries.

Gulf Coast, and 10% of the Pacific Coast. An estimated 82% of the estuarine square miles also were under advisory, including 81% of Atlantic Coast estuaries, 64% of Gulf Coast estuaries, and 30% of Pacific Coast estuaries (Figure ES-5).

In 1995, 4,230 individual shellfish-growing areas containing 24.8 million acres of estuarine and nonestuarine growing waters were classified in 21 coastal states. Sixty percent of waters were classified as approved (Figure ES-6). The top five pollution sources reported as contributing to harvest limitations were urban runoff, upstream sources, precipitation-related runoff of animal wastes from high-wildlife-concentration areas (e.g., water fowl), individual wastewater treatment systems, and wastewater treatment plants.

EPA's review of coastal beaches (U.S. coastal areas, estuaries, and the Great Lakes) showed that, of the 1,444 beaches responding to the survey, more than 370 beaches, or 26%, had an advisory and/or closing in effect at least once during 1999 (Figure ES-7). Approximately 13% of the coastal beaches experienced at least one closure. Beach closures were issued for a number of different reasons, including sewage, elevated bacterial levels, and preemptive reasons. The major causes of beach closures included stormwater runoff, pipeline breaks, combined sewer overflows, and unknown causes.
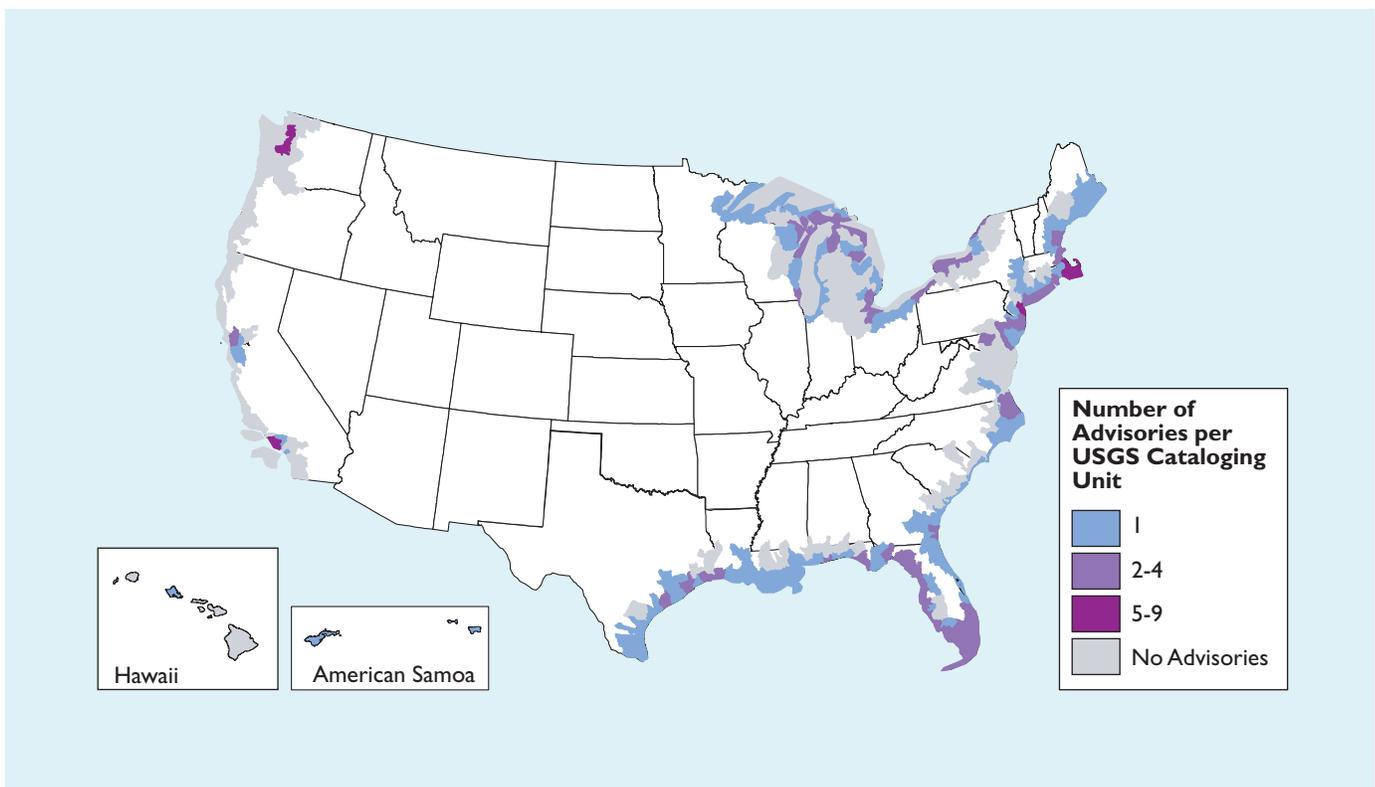

Figure ES-5. The number of coastal and estuarine fish consumption advisories per USGS cataloging unit. This count does not include advisories that may exist for noncoastal or nonestuarine waters. Alaska did not report advisories (U.S. EPA NLFWA, 2000c).

Shortcomings of Available Data

Very little information to support the kind of analysis used in this report (i.e., spatial estimates of condition based on indicators measured consistently across broad regions) exists for estuarine conditions in Alaska. Nearly 75% of the area of all the bays, sounds, and estuarine areas in the United States is located in Alaska, and no national report on estuarine condition can be truly complete without information on the condition of living resources and use attainment of these waters. Similarly, little information to support estimates of conditions based on the indicators
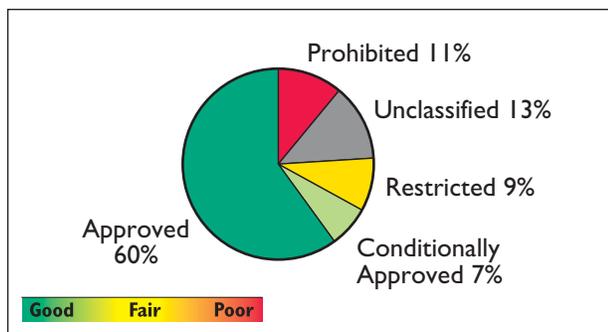

Prohibited 11%

Unclassified 13%

Restricted 9%

Approved 60%

Conditionally Approved 7%

Good   Fair   Poor

Figure ES-6. 1995 classification of shellfish-growing waters (NOAA).

Hawaii

Of beaches responding to the survey, the percent closed in each state at least once in 1999:

- 0-10
- 11-50
- 51-100
- No Data Available
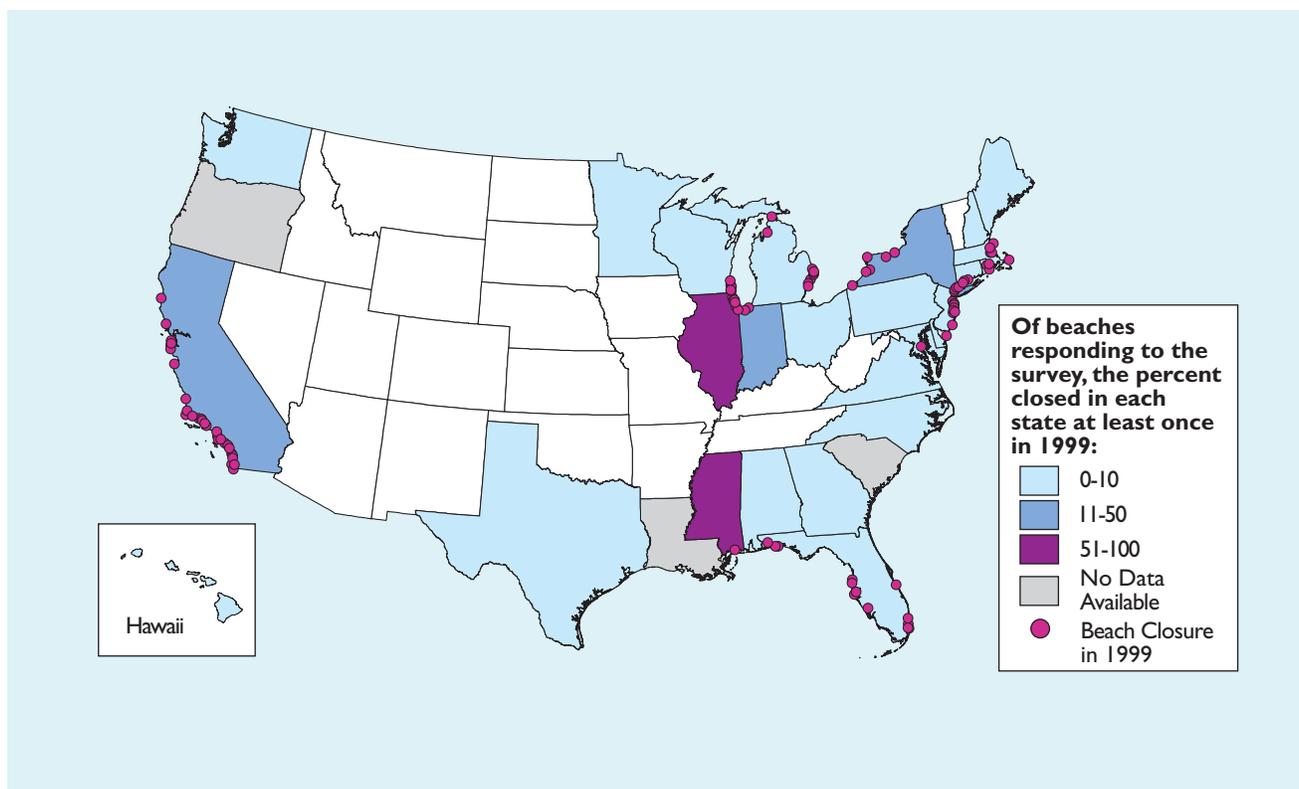- ● Beach Closure in 1999

Figure ES-7. The percentage of beaches responding to the survey that closed at least once in 1999. There were no BEACH survey responses from Alaska (U.S. EPA).

used in this report is available for Hawaii and the Caribbean/Pacific commonwealths. Although these latter systems make up only a small portion of the nation's estuarine area, they do represent a unique set of estuarine subsystems (such as coral reefs and tropical bays) that are not located anywhere else in the United States with the exception of the Florida Keys and the Flower Gardens. These unique systems should not be excluded from future national assessments, and plans are already under way for monitoring programs in Alaska, Hawaii, and Puerto Rico.

Attaining consistent reporting in all of the coastal ecosystem in the United States depends on our ability to focus fiscal and intellectual resources on the creation of a national coastal monitoring program. The conceptual framework for such a program is outlined in the National Coastal Research and Monitoring Strategy (www.cleanwater.gov). This Strategy calls for a national program organized at the state level and carried out by a partnership between federal agencies (EPA, NOAA, USGS, U.S. Department of the Interior [DOI], and USDA) and state natural resource agencies, as well as with academia and industry. This monitoring program would provide the capability to measure, understand, analyze, and forecast ecological change at national, regional, and local scales. A first

step in the development of this type of program was the initiation of EPA's *Coastal 2000* program, a national estuarine monitoring program organized and executed at the state level. However, this program is merely a starting point for what is needed to achieve a comprehensive national coastal monitoring program that can offer a nationwide coastal assessment.

This report represents our current best effort to characterize and assess the condition of the nation's estuarine resources; however, the report is incomplete because it cannot represent all estuarine regions of the United States or all of the appropriate spatial scales (national, regional, and local) necessary to assess the condition of estuaries. This assessment is also based on a limited number of ecological indicators for which there are consistent data sets available to support estimates of ecological condition on regional and national scales. Through a multiagency and multistate effort over the next decade, a truly consistent, comprehensive, and integrated national coastal monitoring program can be realized. Only through the cooperative interaction of the key federal agencies and coastal states will our next effort to gauge the health of America's coastal ecosystem be successful.