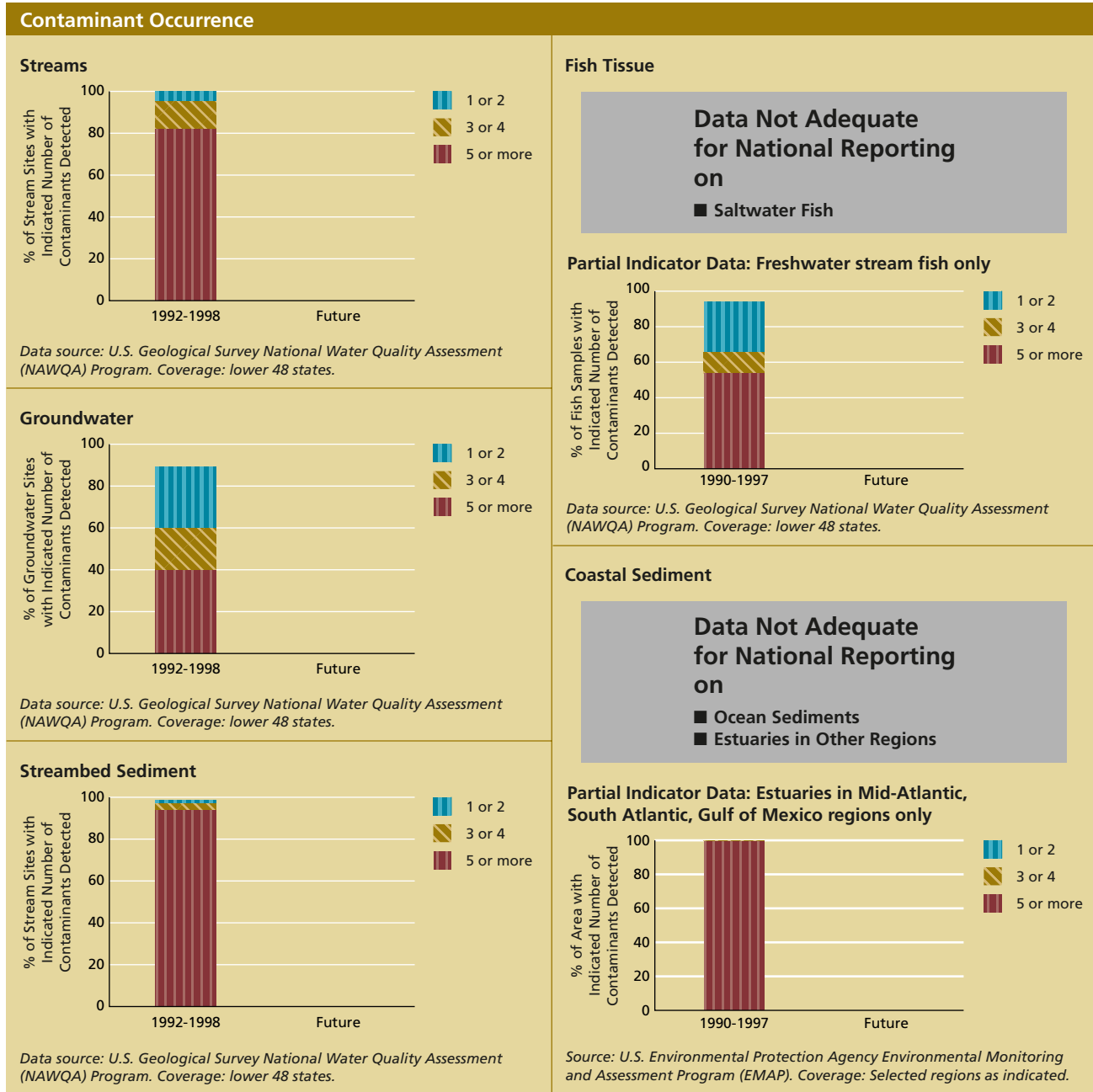




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SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

Chemical Contamination



What Is This Indicator, and Why Is It Important? This indicator reports on contaminants found in streams, groundwater, sediment, and fish tissue. The graphs above report how often different numbers of contaminants are found, and those on p. 49 report how often these contaminants exceed standards and guidelines for the protection of human health and aquatic life. Contaminants reported here include many pesticides, selected degradation products, polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), volatile organic compounds, other industrial contaminants, trace elements, nitrate, and ammonium. (Because nitrate, ammonium, and trace elements such as cadmium and chromium occur naturally, they are not included in the contaminant occurrence graphs.)

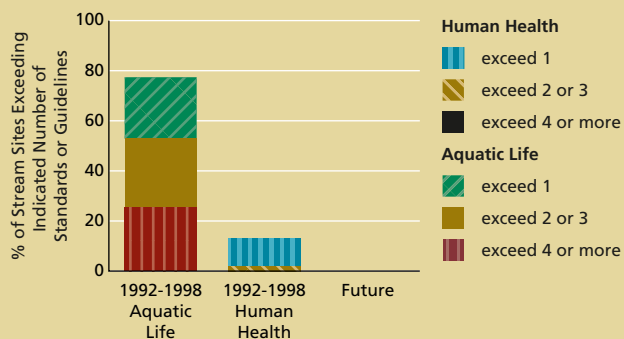


SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent	Nutrients, Carbon, Oxygen	Plants and Animals	Food, Fiber, and Water
Pattern	Contaminants Physical	Communities Ecological Productivity	Recreation and Other Services

Chemical Contamination (continued)

Contaminants above Standards and Guidelines

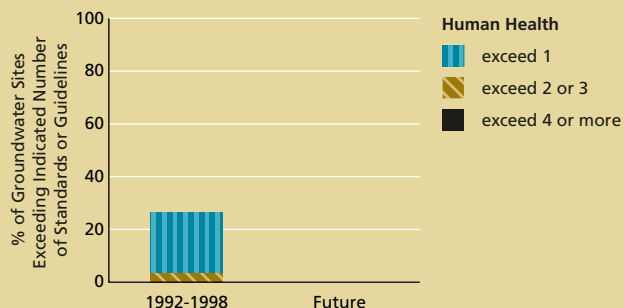
Streams



Data source: U.S. Geological Survey National Water Quality Assessment (NAWQA) Program. Coverage: lower 48 states.

Groundwater

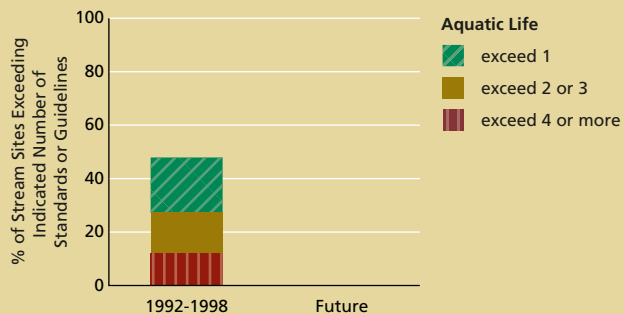
(Human health only; aquatic life guidelines are not applied to groundwater)



Data source: U.S. Geological Survey National Water Quality Assessment (NAWQA) Program. Coverage: lower 48 states.

Streambed Sediment

(Aquatic life only; human health guidelines are not applied to sediments)



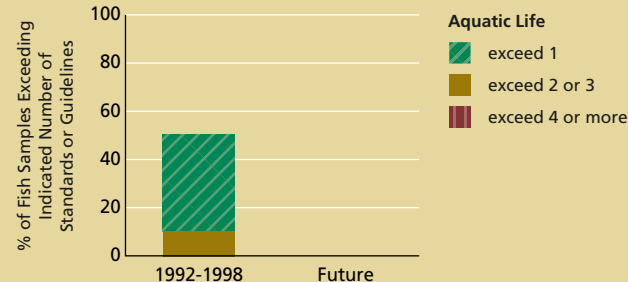
Data source: U.S. Geological Survey National Water Quality Assessment (NAWQA) Program. Coverage: lower 48 states.

Fish Tissue

Data Not Adequate for National Reporting on

- Saltwater Fish
- Human Health Standards

Partial Indicator Data: Freshwater stream fish and aquatic life standards only



Data source: U.S. Geological Survey National Water Quality Assessment (NAWQA) Program. Coverage: lower 48 states

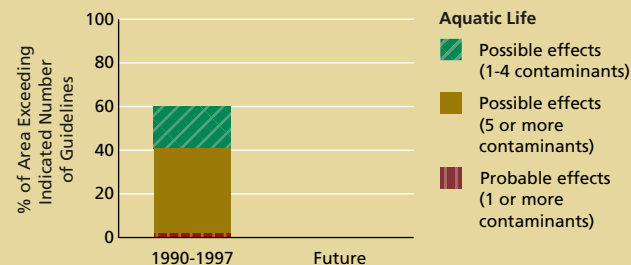
Coastal Sediment

Data Not Adequate for National Reporting on

- Ocean Sediments
- Estuaries in Other Regions

Partial Indicator Data: Estuaries in Mid-Atlantic, South Atlantic, Gulf of Mexico regions only

(Aquatic life only; human health guidelines are not applied to sediments)



Source: U.S. Environmental Protection Agency Environmental Monitoring and Assessment Program (EMAP). Coverage: Selected regions as indicated.

SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
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❶ Chemical Contamination *(continued)*

Synthetic chemicals, trace elements, and other contaminants can, in sufficient quantities, harm people as well as fish and other wildlife. Both the frequency of chemical contamination and the degree to which these contaminants exceed applicable standards and guidelines are important in understanding the extent and significance of chemical contamination. The number of contaminants found in streams, groundwater, and the like provides basic information on how widespread these compounds are in the environment. However, the presence of chemical contamination does not necessarily mean that the levels are high enough to cause problems; comparison to standards and guidelines provides a useful reference to help judge the significance of contamination.

There are no standards or guidelines for many contaminants. For example, drinking water standards and guidelines do not exist for 33 of the 76 pesticides analyzed in fresh waters, and there are no aquatic life guidelines for 48 of these 76 pesticides. Current standards and guidelines do not account for mixtures of chemicals and seasonal occurrences of very high concentrations. These gaps increase the importance of information on the occurrence of chemical contaminants. In addition, potential effects on reproductive, nervous, and immune systems, as well as on particularly sensitive people, are not yet well understood.

What Do the Data Show?

Streams. All tested streams averaged one or more contaminants at detectable levels throughout the year; about 80% averaged five or more contaminants at detectable levels. Three-fourths of streams tested had one or more contaminants at levels that exceeded guidelines for the protection of aquatic life; approximately one fourth had concentrations of four or more contaminants that exceeded these guidelines. Thirteen percent had at least one contaminant at levels that exceeded standards or guidelines for the protection of human health. Stream water was tested for pesticides, selected pesticide degradation products, and selected nutrients.

Groundwater. About 90% of groundwater wells tested had an average of one or more contaminants at detectable levels, and 40% had an average of five or more contaminants at detectable levels. About one fourth had contaminants at levels that exceeded human health standards or guidelines. Groundwater was tested for pesticides, selected pesticide degradation products, volatile organic contaminants, trace elements, and selected nutrients.

Stream sediments. Nearly all stream sediments tested had an average of five or more contaminants at detectable levels. About half had one or more contaminants at concentrations exceeding aquatic life guidelines. Stream sediments were tested for organochlorine pesticides, PCBs, PAHs, other industrial contaminants, and trace elements.

Freshwater fish. About half of fish tested had at least five contaminants at detectable levels, and approximately the same number had one or more contaminants at levels that exceeded standards for the protection of wildlife. Data are not available on exceedances of human health standards. Whole fish were tested for organochlorine pesticides, PCBs, and trace elements.

Although not shown on the graphs, all fish tested in the Great Lakes had five or more detected contaminants, and all Great Lakes fish had PCB concentrations that exceeded human health standards. (Great Lakes testing focuses on fish with a high likelihood of such contamination, such as coho salmon and lake trout.)

Coastal sediments. More than 99% of estuary sediments tested had five or more contaminants at detectable levels. About 60% of estuary sediments tested had contaminants above the levels designed to predict “possible effects” on aquatic life for one or more contaminants, and about 2% exceeded the level designed to predict “probable effects.” Estuary sediments were tested for PCBs, PAHs, pesticides, and trace elements. Data on ocean sediments are not adequate for national reporting.



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Chemical Contamination *(continued)*

Discussion The data shown here do not represent assessments of the risks posed to people or ecosystems in any specific location, since they do not incorporate factors such as whether the water tested is actually used as a drinking water source or whether aquatic animals are biologically active at the time of year when the contaminants are found.

The standards and guidelines used in this indicator are useful reference points, but they must be interpreted carefully, since different standards reflect different levels of protection from harm. Furthermore, different standards and guidelines may apply to water, sediments, and fish tissue.

Guidelines for the protection of aquatic life are often numerically lower than standards and guidelines to protect human health. Aquatic animals spend much or all of their life in water, and may be more sensitive to specific contaminants.

People consume drinking water from both streams and groundwater, and they eat fish, so human health standards and guidelines apply to all three. Guidelines to protect aquatic life are not applied to groundwater, and standards and guidelines to protect human health are not applied to either stream or estuary sediments.

Different agencies and programs are responsible for the collection and analysis of data from freshwater systems (streams and groundwater) and estuaries. The objectives of these programs differ, leading to different site selection procedures, suites of contaminants measured, and collection and analysis procedures. Guidelines for freshwater fish are set to protect fish-eating wildlife, and aquatic life guidelines for coastal sediments differ from those for stream sediments. Thus, the results are not directly comparable.

The contaminants that were analyzed in different media (streams, groundwater, etc.) varied, depending on the chemical properties of the contaminants, known environmental occurrence, and potential for adverse effects on people or ecosystems. For example, volatile organic compounds were analyzed in groundwater but not in stream sediments because their chemical properties make it extremely unlikely that they would be found there.

Data are not available to compare either fresh or saltwater fish contaminant concentrations with human health/consumption guidelines.

See also the coastal, farmland, and urban contaminants indicators (pp. 72, 97, and 189).

The technical note for this indicator is on page 210.