

{Conditions by Basin}

Describing the condition of a water body 110 miles long poses a challenge. Hydrology (the movement of water) and sediment characteristics vary within each of the Sound's sub-basins, as does the degree of shoreline development. Water quality in any location varies by season. And in some locations, historical contaminant discharges still affect present-day conditions. In other words, the Sound can be described as healthy and vibrant, or distressed and impaired, depending on location, season, and issue.

But recent work by the EPA's Office of Research and Development to characterize water quality, the toxicity of sediments on the sea floor, and the variety of species living in or on the seafloor (benthic community) offers an approach to quantitatively characterizing conditions geographically in Long Island Sound. Using an index of different indicators for each of these measures, the Sound's western, central, and eastern basins can be rated as good, fair, or poor.

The Western Basin is the Most Stressed

As expected, the densely populated and developed western basin, which includes "the Narrows," a narrow section leading to the East River, is the most stressed, with fair water quality the majority of the time, sediment conditions rated as poor almost half the time, and a benthic community rated as poor 41 percent of the time. Water quality improves in the central basin, and improves to good most of the time in the eastern basin. Sediment and benthic conditions also improve in the central and eastern basins, although sediment conditions are not quite as good in the eastern basin compared to the central basin.

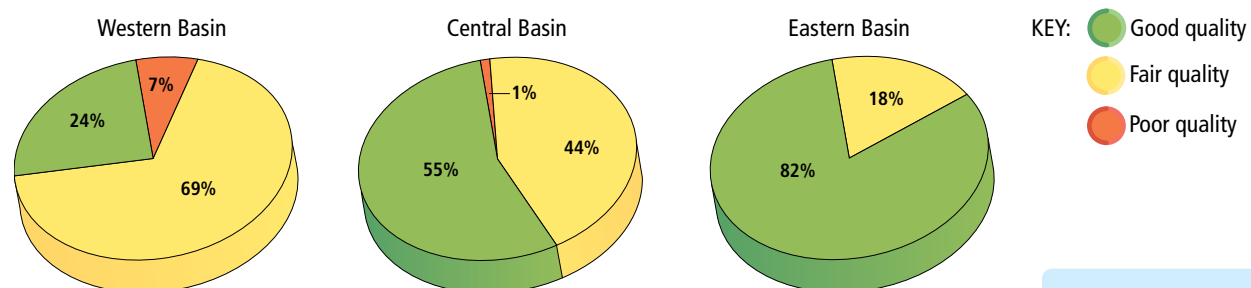
The gradient in improving conditions from west to east reflects the decrease in human population density among basins. In the watershed drainage to the western basin, 45 percent of the sub-watersheds are developed at levels that correlate to poor local water quality. This decreases to eight percent of the subwatersheds

draining to the central basin, and three percent in the eastern basin.

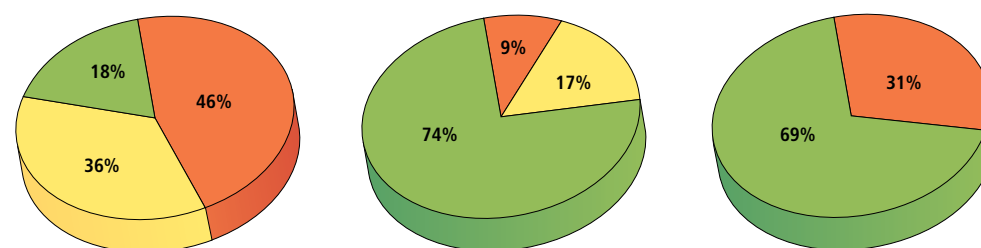
The gradient in improving conditions also reflects geological differences. For example, the eastern basin, carved out from a melted glacier, is deep, dipping to 350 feet at the Race. The narrow channel opening to Block Island Sound acts as a funnel, leading to fast moving currents that scour the bottom and actively mix the water. The western basin is shallower, generally less than 60 feet deep, with a sea bottom of fine sand and mud. Currents are weaker, and in the summer months there is little mixing between the lighter, oxygenated surface waters and the denser bottom layer. In combination with high nitrogen loads and phytoplankton production, reduced mixing leads to hypoxia in the western basin. The weak currents in the western Sound also make for conditions that are less likely to flush out toxic contaminants that settle in the fine sand.

Summary of Rating Criteria:

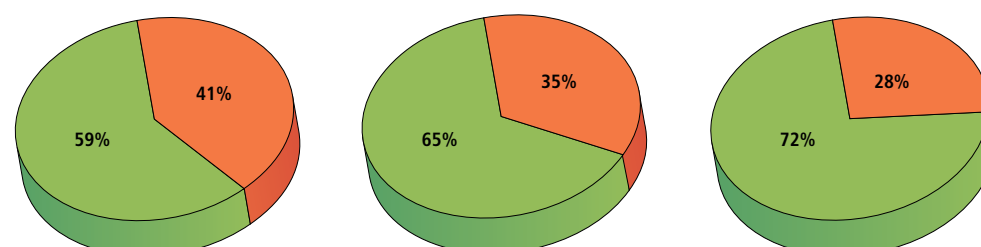
Water Quality Index ▶ Excess nutrients, such as nitrogen, can lead to too much plant production (indicated by abundance of chlorophyll a, a plant pigment), which can decrease water clarity and lower concentrations of dissolved oxygen. The index includes five water quality component indicators—dissolved inorganic nitrogen, dissolved inorganic phosphorus, chlorophyll a, water clarity, and dissolved oxygen. Monthly data (from May to October, when pollution has the greatest effect on water quality) were summarized Soundwide from 1991 to 2007.



Sediment Quality Index ▶ A wide variety of metals and organic substances, such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and pesticides are discharged into estuaries from urban, agricultural, and industrial sources from the Sound's watershed. These contaminants adsorb onto suspended particles and eventually accumulate in the sediments where they can disrupt the benthic community. The index is based on three sediment quality component indicators—sediment toxicity by measuring the survival of a marine amphipod, the concentration of sediment contaminants, and the total organic carbon in the sediment. Data were collected from 2000-2004 (excluding 2002).



Benthic Quality Index ▶ The worms, clams, and crustaceans that inhabit the sea floor of estuaries are collectively called benthic macroinvertebrates, or benthos. Benthos are often used as indicators of disturbances in estuarine environments because they are not very mobile; as a result, they cannot avoid environmental problems. The index indicates the condition of the benthic community by a measure of benthic community diversity and the presence and abundance of pollution-tolerant species. Data were collected from 2000-2004 (excluding 2002).



Coastal Condition Report

The information used for Conditions by Basin was originally collected by CT DEP and Stony Brook University for the EPA's National Estuary Program Coastal Condition Report. The EPA uses monitoring data from 28 National Estuary Programs such as the Long Island Sound Study to track conditions across coastal regions around the country.

Estuaries are transition zones between the fresh water from rivers and the saline conditions of the oceans. The nation's estuaries are a subset of U.S. coastal waters and encompass a wide variety of coastal habitats, including wetlands, salt marshes, coral reefs, mangroves and kelp forests, seagrass meadows, tidal mudflats, and upwelling areas. These habitats produce unique environments that support wildlife and fisheries and contribute substantially to the U.S. economy.



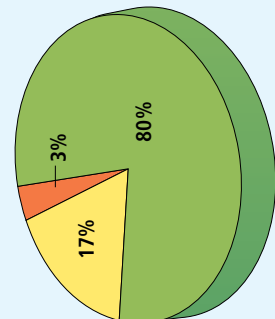


Subregional watersheds with:

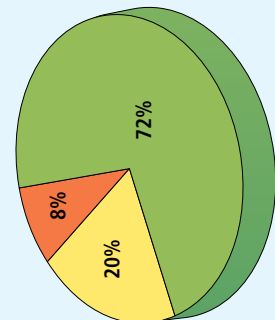
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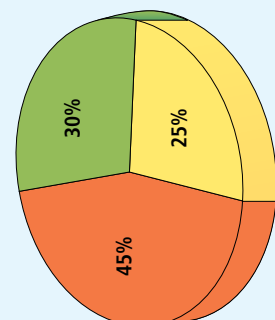
Eastern Watershed



Central Watershed



Western Watershed



Watershed Indicator ▶ Research from around the country shows that stream health tends to be good when the impervious coverage of the contributing watershed is below 10%. Impacts start to become evident once imperviousness exceeds 10%, and can become severe at watershed levels greater than 25%. These charts show the percentage of subregional watersheds in each of the three major LIS basins that fall into these three categories. As can be seen, the number of subregional watersheds with less than 10% imperviousness (indicating good water quality) increases from west to east.

