

Development is often accompanied by new activities that add pollutants to landscapes and nearby waters. Polluted stormwater runoff — also referred to as nonpoint source pollution — is the number one cause of water pollution in North Carolina, according to the N.C. Division of Water Quality.



Poor water quality threatens estuarine ecosystems. (Photos from left: blue crab - NOAA Photo Library, oysters - Gary Allen, smooth cordgrass - Brad Marx)

Estuaries in North Carolina

Situated between rivers and near-shore ocean waters, estuaries are coastal waters where tidal action and river flow mix fresh and salt water. In North Carolina, estuaries come in the form of bays, sounds, mouths of rivers and salt marshes.

There are several distinct habitats within North Carolina's estuaries. Four habitats threatened by poor water quality are highlighted here. Each habitat contributes a vital role to the overall health of coastal ecosystems.

Water Column: the basic habitat and circulation medium through which all other fish habitats are connected

- provides basic physical and chemical requirements for aquatic life;
- provides water circulation for transport of fish eggs and larvae, as well as food and oxygen to nursery, spawning and foraging grounds; and
- is especially important for species that live near the surface, such as river herring, Atlantic menhaden and bluefish.

Submerged Aquatic Vegetation (SAV): underwater plants that produce oxygen and inorganic material used in other habitats

- reduces cloudiness and turbulence;

- provides nursery habitat for blue crabs, red drum, pink shrimp, spotted seatrout and gag grouper;
- provides surface for post-larval shellfish attachment; and
- provides foraging grounds for large predators like flounder, rays and red drum.

Shell Bottom: beds where living shellfish filter algae and bacteria from the water column

- protects shorelines from erosion;
- clears water column so light can reach plants, encouraging growth of SAV;
- provides nursery habitat for at least 12 economically important fishery species including blue crab and stone crab;
- provides foraging grounds for larger bottom-feeding fish like drum, black sea bass and southern flounder; and
- provides refuge and spawning sites for small resident species like toadfish, gobies and grass shrimp.

Soft Bottom: sand source and storage reservoir for nutrients, sediment and chemicals, which are cycled between the bottom and the water column, keeping the ecosystem in balance

- bottom algae and tiny, bottom-dwelling animals provide food for young and adult fish like spot and croaker;
- provides hiding places for burrowing marine animals; and

- shallow soft bottoms near wetlands provide nursery areas for fish and invertebrates including flounder and shrimp.

Effects of Pollution

Degraded water quality from polluted runoff threatens all of these habitats. Factors that affect pollution levels in runoff include:

- intensity and duration of the storm;
- type and amount of vegetation at the site, and where it is located on the site;
- type of pollutants and amount of accumulation on the ground; and
- stormwater control and treatment devices on the site.

The major concerns from stormwater are:

Turbidity & Sedimentation (*Definitions on Fact Sheet 3*)

Potential Sources: construction sites, agricultural runoff, forestry, roads, mining, resuspension from dredging

- Suspended sediment in the water column may clog fish gills, reduce feeding success of visual predators and transport bacteria and toxins.
- High turbidity negatively affects SAV's ability to survive and grow.
- Excess sedimentation deters invertebrates from attaching to shell bottom.

Nutrient Enrichment & Oxygen Depletion

Potential Sources: wastewater discharges, agricultural runoff, urban areas, animal operations, air emissions

- Excess nutrients may fuel toxic algal blooms in the water column.
- Low oxygen in the water column and soft bottom may kill fish and invertebrates in the water column, soft bottom or shell bottom.
- Reduced light caused by nutrient enrichment negatively affects SAV's ability to survive and grow.

Toxic Chemical Contamination

Potential Sources: herbicides, pesticides, golf courses, urban development, marinas, fuels, transportation, boating, industry

- Heavy metals, petroleum products and other toxins may kill sensitive shellfish larvae or lower their reproductive success.
- Toxin accumulation in soft bottom may kill invertebrates or lead to bioaccumulation in tissues of top predators.
- SAV may be killed by spraying for aquatic nuisance species.

Bacterial Contamination

Potential Sources: stormwater runoff, failing septic systems, overloaded sewage systems

- Water-borne bacteria may cause human illness.
- Public health risks may lead to restrictions on swimming, shellfish harvest and consumption.

Read North Carolina Sea Grant **Water Quality Fact Sheet 4: Actions & Resources** for potential solutions and more information. Preserving or restoring wetlands is one potential way to mitigate the effects of polluted runoff. Wetlands are estuarine habitats that include swamps, marshes and lowlands. They serve as vital nursery habitats and can filter pollutants from overland runoff.

Information for this document was drawn from:

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