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How we protect streams, rivers, and lakes

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Streams, rivers, lakes and bays (surface water) are vital resources that we depend on for public water supplies, aquatic and other wildlife, as well as recreational, agricultural, and aesthetic purposes. These bodies of water are fed by rainfall and melting snow that pick up contaminants from the surrounding landscape. As a result, surface water often contains a variety of pollutants.

To protect public health and the environment, state and federal authorities have set water quality standards for acceptable contamination levels and uses for which a given body of water is safe.

Water quality and standards

Water quality refers to the physical characteristics of water and the degree to which it contains chemical or biological contaminants. Aspects of water that can be measured in the field include temperature, flow, dissolved oxygen, and pH. Bacterial and chemical impurities require laboratory analysis of water samples. The relative importance of these different measures of quality depends on the water's intended use.

Water quality standards are numeric benchmarks that surface water must meet in order to be used safely. These standards have been established through research studies, and they vary according to the intended purpose for the water. Water quality standards are set and enforced by various authorities, including the Environmental Protection Agency (EPA) and the Texas Commission on Environmental Quality (TCEQ). When the physical, chemical, or biological condition of a body of water exceeds acceptable limits for its designated use, it is considered impaired.

Types of impairment

What it is that impairs water quality varies according to what a body of water is used for. The most common surface water impairment in Texas is bacteria. Other impairment types and the water uses they are associated with are shown on Table 1.

Most of the impairment categories listed occur naturally in surface water. For example, bacteria and nutrients are a normal and important part of a healthy aquatic ecosystem. However, when any of these exceeds acceptable concentrations, they become harmful and are considered pollutants.

Table 1. Water quality impairments with their associated designated uses.

Impairment type	Designated use
Bacteria	Recreation, oyster waters
Dissolved oxygen	Aquatic life
Toxicity	Aquatic life
Organics	Fish consumption, aquatic life
Metals (except mercury)	Fish consumption, oyster waters, aquatic life
Mercury	Fish consumption, oyster waters, aquatic life
Dissolved solids	General
Temperature	General
pH	General
Nutrients	General, public water supply
Biological	Aquatic life

How does water get polluted?

There are two general sources of water pollution: point source and nonpoint source. Point source pollution comes from a defined source such as a single a pipe or drainage ditch from a sewage or industrial facility. A common point source is the effluent released from a wastewater treatment plant. If poorly treated, this discharge can carry excess nutrients, bacteria, and metals into adjacent bodies of water.

Nonpoint source pollution is more diffuse and much more difficult to control (Fig. 1). This type of pollution occurs when rainwater runoff picks up pollutants from urban surfaces, storm drains, agricultural land, construction sites, or even lawns (Fig. 2). It can also include malfunctioning or failing septic systems, which allow untreated effluent to pollute local bodies of water indirectly.

Figure 1. Nonpoint source pollution: sediment runoff pollution from a construction site (Photo courtesy of USDA NRCS)

Figure 2. Non-Point Source Pollution: Runoff from roofs, pavement, and even lawns (top) can pick up pollutants that lead to storm drains. As an example, excessive nutrient runoff can lead to algae growth in water bodies (bottom).

Here are five simple ways you can help reduce nonpoint source water pollution:

- Use only the recommended amounts of fertilizer and/or pesticides for your lawn and landscape.
- Avoid getting any fertilizer or other chemicals on hard surfaces.
- Clean up after your pet.
- Keep grass clippings off sidewalks and roads.
- Be sure your septic system is functioning properly, and have it pumped out as needed.

Is my local lake or river polluted?

The Clean Water Act (1972) requires that states set water quality standards and monitor surface water according to its designated use. The act also requires the states to determine whether or not those water quality standards are being met. Section 303(d) of the act requires states to identify and list waters that do not meet quality standards. When a body of water does not meet the standard for its designated use, it is placed on the 303(d) List of impaired waters and the state must take corrective action to improve water quality.

Ways to improve water quality

Treating all surface water to improve its quality is not practical; it is much more efficient to reduce the sources of pollution. Two comprehensive ways for reducing pollution in Texas waterways are Total Daily Maximum Loads (TMDLs) and watershed protection plans.

A **Total Maximum Daily Load** (TMDL) is the maximum amount of a pollutant that a body of water can accept and still meet quality standards. It is a state driven process where all the sources of a specific pollutant are identified. Load reductions are then allocated through an implementation plan with involved stakeholders. This plan uses best management practices (BMPs) to keep pollution levels within the maximum daily load. Water quality is then monitored to measure progress.

Figure 3. Vegetative filter strip used along a stream to reduce sediment runoff. (Photo courtesy of USDA NRCS)

Figure 4. Storm drain label for educating the public about water pollution and watersheds.

A more proactive approach to meeting water quality standards is to establish a watershed protection plan (WPP). **Watershed protection plans** address all sources of water impairments by involving the entire watershed. It can be used in areas where water is impaired, but not polluted enough to be listed on the 303(d). This process brings together all involved parties and allows them to create a plan to reduce pollution flowing into bodies of water in their watershed. Under the WPP process, the best management practices are chosen by the stakeholders and are implemented voluntarily. The WPP is a living document that can be adapted to meet changing conditions.

The BMPs to reduce pollution in TMDLs and WPPs include structural practices such as vegetative filters strips to reduce sediment runoff (Fig. 3) and exclusion fencing to keep livestock out of waterways. Nonstructural BMPs, which include education (Fig. 4) and outreach to people living, working, and playing in the watershed.

How to learn more

To become active in local water quality issues, contact the local Texas AgriLife Extension office and find out if your area has a watershed protection plan or TMDL program. These programs are open to the public and rely on public feedback. Other Extension opportunities include educational events ranging from youth education on rainwater harvesting to septic system maintenance training.

Your local Texas AgriLife Extension office can provide information that is specific to your area. For statewide information online, visit the Texas Commission on Environmental Quality (*http://www.tceq.com/*) and the Texas Water Resource Institute, *http://twri.tamu.edu/*. For national information on water quality and the Clean Water Act, see the EPA Office of Water at *http://water.epa.gov/*.

For further reading

Summary of the Clean Water Act, by the Environmental Protection Agency. September 27, 2010. *http://www.epa.gov/lawsregs/laws/cwa.html*

Executive Summary: 2008 Texas Water Quality Inventory and 303(d) List, by the Texas Commission on Environmental Quality. March 19, 2008.

A Primer on Water Quality, Publication FS-027-01, by the U.S. Geological Survey, U.S. Department of the Interior. March 2001.

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