

THE TEXAS WATER SOURCE

UPDATING CHAMBERS AND LIBERTY
COUNTY LANDOWNERS ON LAND
MANAGEMENT & WATER ISSUES

August 2021

Dissolved Oxygen — What is the Forest's Role?

The West Fork of Double Bayou was listed as impaired (not meeting its water quality standards) on the 2012 Texas Integrated Report 303 (d) for low dissolved oxygen for aquatic life usage (listed as impaired since 2004); and for elevated levels of bacteria for contact recreation (listed as impaired since 2006). The East Fork of Double Bayou was identified as a concern for getting close to not meeting the water quality standards because of elevated levels of bacteria and for low dissolved oxygen. A Watershed Protection Plan (WPP) was written and tactics are being implemented to help alleviate these issues.

Dissolved oxygen (DO) is a measure of how much oxygen is dissolved in the water - the amount of oxygen available to living aquatic organisms. Organisms such as fish, invertebrates, plants, and bacteria require DO for respiration. When DO falls below a certain threshold, some organisms cannot live.

Oxygen enters water by diffusion from the air, from aquatic plant photosynthesis, and by aeration through water movement. DO is not a pollutant but rather a marker to indicate water quality and health for aquatic life. The amount of dissolved oxygen in a stream or lake can indicate a lot about the quality of the water.

Low DO is caused by a number of factors in the bayous. Increased water temperature and excessive nutrients, oils, and other chemical

compounds can cause oxygen levels to decrease. Another factor can be high bacteria levels, because an increase in bacteria will often lead to higher consumption of oxygen that can result in lower DO levels. Naturally occurring leaves, limbs, and logs in streams play an important role in ecosystems as habitat and food sources for fish and other aquatic organisms. However, too much of this organic matter can accumulate if it is regularly being dumped into the stream by water flow from the land. As this organic matter decomposes, oxygen in the stream is used up, leading to lower DO levels. The water quality management measures discussed in the WPP will be targeted towards bacteria, but their benefits will also extend to mitigating lower DO levels.

Best Management Practices (BMPs) can be implemented to protect dissolved oxygen levels during forest management activities. For example, during harvest activities, it is recommended to leave a streamside management zone (SMZ) along streams. One benefit of this is shading the stream, keeping the water cool; and cold water holds more oxygen than warm water.

For more information:

- <http://tfsfrd.tamu.edu/storymaps/forestwatersheds>
- <https://www.doublebayou.org>

Water Quality Standards

The federal Clean Water Act (CWA) of 1977 required that all states establish standards for measuring the health of surface waterbodies. States must develop standards that describe how water bodies are used, establish water quality criteria, and develop programs to monitor the state's water quality.

The Texas Commission on Environmental Quality (TCEQ) is charged with managing the quality of Texas's streams, rivers, lakes, and bays. This includes establishing the state's surface water quality standards and setting their criteria.

Water quality standards identify appropriate uses for the state's surface waters, such as aquatic life, recreation, and sources of public water supply (or drinking water).

Water quality criteria are the minimum or maximum limits set for substances found in water depending on the use of a water body. For example, an "aquatic life use" would require a minimum concentration of dissolved oxygen in order for fish to live. Yet, a "recreational use" for a water body

does not need to focus on dissolved oxygen. Instead, "recreational use" would require the concentration of fecal indicator bacteria to be below a certain number in order for the water to be safe for human contact.

Other parameters that could be involved in determining criteria in water quality standards include temperature, pH, dissolved minerals, and toxic substances.

TCEQ established designated uses for Double Bayou's water quality, including uses for: Aquatic Life, Primary Recreation, Swimming, General and Fish Consumption. These designated uses require certain levels of water quality to maintain their associated standards.

For more information:

- <https://tinyurl.com/3xcrca5k>
- <https://www.tceq.texas.gov/waterquality>

Organization Spotlight

Houston Advanced Research Center

Houston Advanced Research Center (HARC) was established in 1982, sprouting from the vision of the late George P. Mitchell. As a non-profit university consortium acting as a "technology incubator" to bridge basic research and market applications, HARC's mission is "to provide independent analysis on energy, air, and water issues to people seeking scientific answers."

In 2001, HARC re-aligned its mission, focusing their research on sustainable development and the science and engineering to understand and address issues related to air quality, clean energy, water resources, and climate risk. In fact, HARC's headquarters is a Leaders in Energy and Environmental Design (LEED) certified green building. It has achieved a Platinum Level LEED certification -

making it the first LEED platinum green building in The Woodlands, Texas. Platinum is the most environmentally stringent LEED certification issued by the U.S. Green Building Council.

HARC does environmental research around the Houston area. Projects include: Hurricane Ike storm surge and wave impacts; Hurricane Harvey impacts; aquatic and marine litter and debris; impervious cover; roles of trees/forests in flood mitigation; state of Galveston Bay and surrounding watersheds; preparation of the Double Bayou Watershed Protection Plan; and more.

For more information:

- <https://harcresearch.org>

Invasive Species in the Watershed

There are a handful of non-native, exotic plant species that can be found in the Double Bayou Watershed. Some of them are considered more invasive than others. The following species are some of the more aggressive. They reproduce quickly and can take over when not controlled.



Chinese tallow (*Triadica sebifera*) is a deciduous tree that is often used in ornamental landscaping. It has round leaves that taper to a point and turn orange to red in the fall. The tree is considered medium size, with mature trees usually around 50' tall. Leaves and fruit considered toxic to livestock and humans.

The tree is considered medium size, with mature trees usually around 50' tall. Leaves and fruit considered toxic to livestock and humans.

Chinese privet (*Ligustrum sinense*) is used in landscaping because it is fast growing and creates thick hedges. That is why it can easily spread out of control. It is semi-evergreen with dark green leaves that are about 1-2 inches long. Privet produces a dark blue-black fruit that is classified as a "drupe."



Both Chinese privet and Chinese tallow outcompete native riparian plant communities for space, sunlight and nutrients.

Both Chinese privet and Chinese tallow outcompete native riparian plant communities for space, sunlight and nutrients.



Giant salvinia (*Salvinia molesta*) is an aquatic species that poses threats across many areas in. It is a rootless, floating

fern. Dense mats of salvinia shade out native aquatic species, and decaying leaves can reduce dissolved oxygen levels in the water.



Water hyacinth (*Eichhornia crassipes*) is another invasive aquatic plant common in Texas. It has purple flowers. It can spread quickly on

the surface of waterways and dominate native submerged vegetation. These large aquatic mats inhibit light and oxygen diffusion into the water and impede water movement, leading to low dissolved oxygen levels. The low dissolved oxygen concentration can kill native populations of fish .

Alligatorweed (*Alternanthera philoxeroides*) grows in wet areas typically along the shoreline. It has pink stems, green leaves, and small white flowers.



This plant grows into thick mats which make it difficult for wildlife to reach the edge of the water. It can out-compete aquatic and terrestrial native vegetation and reduce the recreational quality of waterways. Alligator weed is also associated with low dissolved oxygen concentrations.

These aquatic invasive species increase the rate of evapotranspiration (water that is given off by plant leaves plus all evaporation) and reduce the amount of water retained in the bayous.

Photo credits: Chris Evans, James R. Allison, Keith Bradley, Wendy VanDyk Evans; Bugwood.org

For more information: <https://texasinvasives.org>

Distribution of *The Texas Water Source* is provided free of charge to forest landowners of Chambers and Liberty counties. This publication is funded by the Texas State Soil and Water Conservation Board through a Clean Water Act §319(h) grant from the U.S. Environmental Protection Agency. PLEASE ADVISE US IF YOU WISH YOUR NAME TO BE REMOVED FROM OUR MAILING LIST.

Texas A&M Forest Service
offices serving you:

Donna Work—Water Resources
Biologist, East Texas

(936) 639-8191
dwork@tfs.tamu.edu

Matt Garrison- District Forester
Chambers, Liberty, Polk, San
Jacinto Counties
(936) 327-4832



Texas A&M Forest Service
Water Resources
P. O. Box 310
Lufkin, TX 75902-0310

Watershed Partnership

The **Double Bayou Watershed Partnership** is made up of the following agencies and organizations:

- ◆ Texas State Soil and Water Conservation Board (TSSWCB) - www.tsswcb.texas.gov
- ◆ Texas Commission on Environmental Quality (TCEQ) - <https://www.tceq.texas.gov>
- ◆ Galveston Bay Estuary Program - www.gbep.state.tx.us
- ◆ Houston Advanced Research Center (HARC) - www.harcresearch.org
- ◆ United States Geological Survey (USGS) - www.usgs.gov
- ◆ United States Environmental Protection Agency (EPA) - www.epa.gov

Email: dwork@tfs.tamu.edu

*Texas A&M Forest Service is an Affirmative
Action/Equal Opportunity Employer
committed to Excellence Through Diversity.*