Technical Study Summaries: Water Quality Programs and Data for the Sabine River

Sabine River Basin Summary Report by Sabine River Authority

The purpose of the Basin Summary Report (BSR) is to outline water quality issues confronting the entire basin as well as individual streams and lakes. These issues are complied based on public and stakeholder committee input as well as technical analysis of historical and current trends in water quality. This work is performed in accordance with TCEQ guidance, which specifies a range of parameters to be examined to achieve a comprehensive assessment. Significant findings of the basin summary report are listed below.

Segment 0502 (Sabine River Above Tidal)
The Nichols Creek Subwatershed was added to the Draft 303(d) List in 2000 for low dissolved oxygen and high fecal coliform bacteria levels. The sampling site for the Nichols Creek Subwatershed is located in an isolated area away from human activities that would impact water quality. The data characterize the natural swamp conditions typical of the relatively flat East Texas bottomlands. Although the results indicate the waterbody is not supporting a high aquatic life use designation, the conditions appear to be natural with no human impacts. The data indicate the habitat supports the expected biological community.

Although some Ambient Toxicity results from the Caney Creek Subwatershed indicate possible toxic conditions, the remaining data indicate a healthy aquatic community exists in the waterbody. The occasional low dissolved oxygen levels and occasional elevated bacterial counts are typical natural conditions of small East Texas streams. The tests on Caney Creek were conducted above and below a municipal outfall discharging treated wastewater. The results were similar at both sites, indicating no significant impact from the treatment plant.

Segment 0502 Recommendations
Although the water quality in some small tributaries were less than optimum, Segment 0502 has excellent water quality overall with little threat from human activity. Water quality sampling will continue at the representative sampling sites.

Segment 0503 (Sabine River Above Caney Creek)
Water quality conditions in Segment 0503 are excellent overall with no areas of concern. The rural nature of this portion of the Sabine Basin contributes to the lack of impact to water quality. The potential for development in Segment 0503 in the near future remains low.

Segment 0503 Recommendations
Water quality sampling will continue in Segment 0503 at the representative sampling sites.

Full report:
http://www.sratx.org/srwmp/tcrp/state_of_the_basin/summary_reports/2003/2003SummaryFinal.pdf

Total Maximum Daily Load Program – How it works

The Total Maximum Daily Load Program works to improve water quality in impaired or threatened water bodies in Texas. The program is authorized by and created to fulfill the requirements of Section 303(d) of the federal Clean Water Act.

The goal of a TMDL is to restore the full use of a water body that has limited quality in relation to one or more of its uses. The TMDL defines an environmental target and, based on that target, the state develops an implementation plan to mitigate anthropogenic (human-caused) sources of pollution within the watershed and restore full use of the water body.

Implementation of TMDL

An implementation plan usually puts the TMDL into action by outlining the steps necessary to reduce pollutant loads through regulatory and voluntary activities. In some instances, TMDLs are implemented through watershed protection plans.

Implementation could include adjustment of an effluent limitation in a wastewater permit, a schedule for the elimination of a certain pollutant source, identification of any non-point source discharge that would be regulated as a point source, a limitation or prohibition for authorizing a point source under a general permit, or a required modification to a storm water management program and pollution prevention plan.

Full report: http://www.tceq.state.tx.us/implementation/water/tmdl/index.html

Surface Water Quality Monitoring Program

The Surface Water Quality Monitoring (SWQM) Program monitors the quality of surface water to evaluate physical, chemical, and biological characteristics of aquatic systems with reference to human health concerns, ecological condition, and designated uses. Program data provide a basis for effective policies that promote the protection, restoration, and wise use of surface water in Texas.

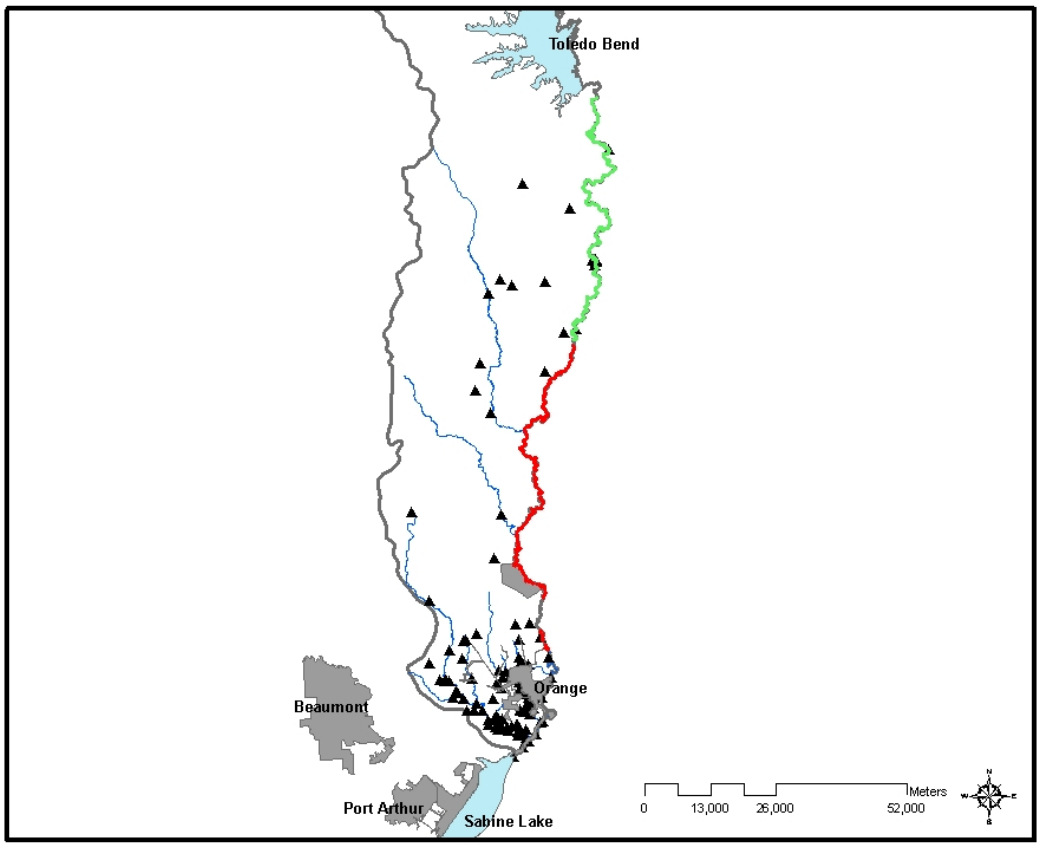
Uses of Water Quality Data

- identify water quality issues
- set water quality standards for water bodies
- provide baseline data to support TMDL studies & Watershed Protection Plans
- enhance science behind wastewater permitting decisions through the Texas Pollution Discharge Elimination System (TPDES)

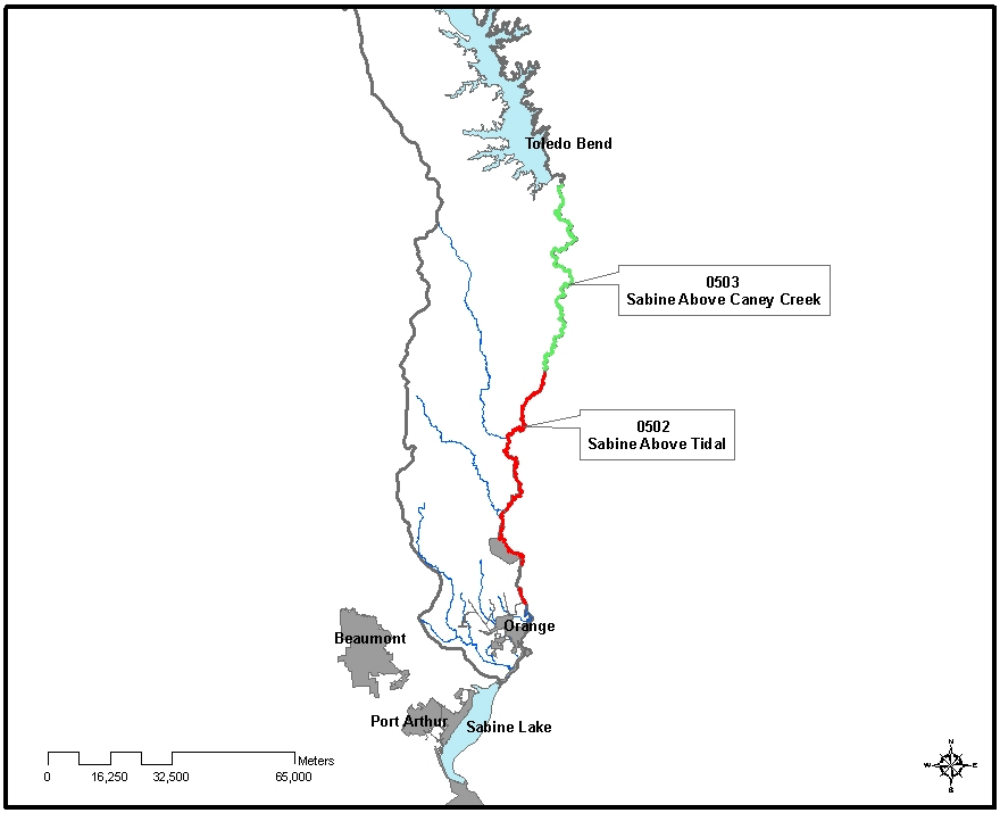
http://www.tceq.state.tx.us/permitting/water_quality/wastewater/pretreatment/tpdes_definition.html

How to obtain Water Quality Data

- Phone 512-239-DATA
- Online at http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wdma/dmrg_index.html



SWQM monitoring stations in the Sabine Basin below Toledo Bend



Classified Segments on the Sabine River below Toledo Bend

Seg No.	Segment Name	Uses			Criteria						
		Recreation	Aq Life	Domestic Water Supply	Cl	SO	TDS	DO	pH	indicator bac	Temp
0502	Sabine Above Tidal	Contact Recreation	High Aquatic Life Use	Public Supply	50	50	200	5	6.0-8.5	126/200	91 F
0503	Sabine Above Caney Creek	Contact Recreation	High Aquatic Life Use	Public Supply	50	50	200	5	6.0-8.5	126/200	91 F

WQ Standards **http://www.tceq.state.tx.us/nav/eq/eq_swqs.html**

Criteria http://www.epa.gov/waterscience/standards/wqslibrary/tx/tx-wqs.pdf

High Aquatic Life Use

Aq Life Subcategory	Dissolved Oxygen	Aquatic Life Attributes					
	Freshwater mean/min	Habitat	Species Assemblage	Sensitive Species	Diversity	Species Rich	Trophic Structure
High	5.0/3.0	Highly diverse	usual association of regionally expected species	Present	High	High	Balanced - slightly imbalanced

Texas Water Quality Inventory and 303(d) List

http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/305_303.html

These reports describe the status of Texas waters based on historical data on surface-water and groundwater quality (the Inventory) and identify water bodies that are not meeting standards set for their use (the List). The reports satisfy the requirements of the federal Clean Water Act for both Section 305(b) water-quality reports and Section 303(d) lists. The Inventory and List are produced every two years in even-numbered years, as required by law. A List must be approved by the EPA before it is considered final.

Segments in the Sabine River Basin below Toledo Bend Reservoir currently listed on the 303(d) list:

Sabine River below Toledo Bend

SegID: 0502A Nichols Creek (unclassified water body)
bacteria
depressed dissolved oxygen
toxicity in water

SegID: 0502B Caney Creek (unclassified water body)
bacteria

Full report:
http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/wqm/mtr/swqm.html

Clean Rivers Program

The Texas Clean Rivers Program is a state fee–funded program for water quality monitoring, assessment, and public outreach. The program is a collaboration of 15 partner agencies (ex. SARA, BRA, etc.) and the TCEQ. The program provides the opportunity to approach water quality issues within a watershed or river basin locally and regionally through coordinated efforts among diverse organizations.

http://www.tceq.state.tx.us/compliance/monitoring/crp/

Water Quality Indicators
Sabine River

Water Quality Objective

- Maintain/improve the water quality for the benefit of biological communities and human needs

Water Quality Indicators

Water quality data are used to describe the condition of a water body, to help understand why that condition exists, and to provide some clues as to how it may be improved. Water quality indicators include chemical measurements as well as certain physical and biological measurements. Some of the most common are listed here, with an explanation of why they are important to the health of a water body.

Category	Indicator	Explanation
Nutrients	Nitrogen Organic Nitrate plus nitrite Ammonia Total Phosphorus Filterable reactive Total	The nutrients nitrogen and phosphorus are essential for plant growth. High concentrations indicate potential for excessive weed and algal growth. Total nutrients are made up of a dissolved component (e.g. nitrate plus nitrite, ammonia and filterable reactive phosphorus) and an organic component, which is bound to carbon (e.g. organic nitrogen). Nutrients in the dissolved state can be readily used by plants.
Oxygen	Dissolved oxygen	Oxygen is essential for both plants and animals. There is often a relationship between discharge and dissolved oxygen concentrations. Decreased dissolved oxygen can be harmful to fish and other aquatic organisms. Nonpoint-source pollution as well as the decomposition of leaf litter, grass clippings, sewage, and runoff from feedlots can decrease the amount of dissolved oxygen in water.. Dissolved oxygen is measured in milligrams per liter (mg/L). Expected levels: 4.0 to 12.0 mg/L
Temperature	Temperature	Aquatic organisms are dependent on certain temperature ranges for optimal health. Temperature affects many water parameters, including the amount of dissolved oxygen available, the types of plants and animals present, and the susceptibility of organisms to parasites, pollution, and disease. Causes of water temperature changes include weather conditions, shade, and discharges into the water from urban sources or groundwater inflows. Temperature is measured in degrees Celsius (°C). Seasonal trends: May to October: 22 to 35°C, November to April: 2 to 27°C. Low flow conditions can also have an influence on temperature.
pH	pH	A measure of the acidity or alkalinity of the water. Changes to pH can be caused by a range of potential water quality problems (e.g. low values due to acid sulfate runoff). Extremes of pH (less than 6.5 or greater than 9) can be toxic to aquatic organisms.

Water clarity	Suspended solids Turbidity Secchi depth	Small particles (soil, plankton, organic debris) suspended in water. High concentrations of suspended solids limit light penetration through water, and cause silting of the benthic (bottom) environment. A measure of light scattering by suspended particles in the water column, provides an indirect indication of light penetration. The depth to which the black and white markings on a Secchi disc can be clearly seen from the surface of the water provides an indication of light penetration.
Salinity	Conductivity	A measure of the amount of dissolved salts in the water, and therefore an indicator of salinity. In fresh water, low conductivity indicates suitability for agricultural use. In salt waters low conductivity indicates of freshwater inflows such as stormwater runoff.
Microalgal growth	Chlorophyll-a	An indicator of algal biomass in the water. An increase in chlorophyll-a indicates potential eutrophication of the system. Consistently high or variable chlorophyll-a concentrations indicate the occurrence of algal blooms, which can be harmful to other aquatic organisms.
Recreational health	Bacteria	*E. coli* and Enterococci bacteria are measured to determine the relative risk of swimming (contact recreation), depending on whether the water body is fresh or marine. These bacteria originate from the wastes of warm-blooded animals. The presence of these bacteria indicates that associated pathogens from these wastes may be reaching a body of water. Sources may include inadequately treated sewage, improperly managed animal waste from livestock, pets in urban areas, aquatic birds and mammals, or failing septic systems.
Metals	Concentration of Metals in Water	High concentrations of metals such as cadmium, mercury, and lead pose a threat to drinking water supplies and human health. Eating fish contaminated with metals can cause these toxic substances to accumulate in human tissue, posing a significant health threat. Metals also pose a threat to livestock and aquatic life. Potentially dangerous levels of metals and other toxic substances are identified through chemical analysis of water, sediment, and fish tissue.
Organics	Concentration of Organics in Water	Toxic substances from pesticides and industrial chemicals, called organics, pose the same concerns as metals. Polychlorinated biphenyls (PCBs), for example, are industrial chemicals that are toxic and probably carcinogenic. Although banned in the United States in 1977, PCBs remain in the environment, and accumulate in fish and human tissues when consumed.

Biological	Benthic Invertebrates	Macroinvertebrates are aquatic insects and other aquatic invertebrates associated with the substrates of waterbodies (including, but not limited to, streams and rivers). Macroinvertebrates can be useful indicators of water quality because these communities respond to integrated stresses over time which reflect fluctuating environmental conditions. Community responses to various pollutants (e.g. organic, toxic, and sediment) maybe assessed through interpretation of diversity, known organism tolerances, and in some cases, relative abundances and feeding types. Examples of Pollution Intolerant Bugs: Mayfly, Caddisfly, Water Penny, Planarian, Dobson Fly, Stonefly Examples of Pollution tolerant bugs: Crayfish, Dragonfly, Damselfly, Clam, Leech, Midge, Aquatic Worm, Black Fly
	Fish	Fish diversity, species richness, species pollutant tolerance, disease prevalence, and other metrics are used to evaluate the aquatic health of water bodies as compared to a regional reference condition. Using fish as a water quality indicator is widely regarded as one of the more reliable methods for assessing human caused ecological impacts. For lists of tolerance groups of species in Texas, see Texas Parks and Wildlife Department River Studies Report No. 14. *Classification of Texas Freshwater Fishes Into Trophic and Tolerance Groups* (which can be found as Appendix J in River Studies Report No. 17 located at: http://www.tpwd.state.tx.us/publications/pwdpubs/media/pwd_rp_t3200_1086.pdf
Fish consumption advisories and closures	Fish Tissue Analysis	The Texas Department of State Health Services conducts chemical testing of fish tissue to determine whether there is a risk to human health from consuming fish or shellfish caught in Texas streams, lakes, and bays. Fish seldom contain levels of contaminants high enough to cause an imminent threat to human health, even to someone who eats fish regularly. However, risk increases for people who regularly consume larger fish and predatory fish from the same area of contaminated water over a long period of time. To reduce health risks in areas of contamination, people should eat smaller fish from a variety of water bodies. When a fish consumption advisory is issued, a person may legally take fish or shellfish from the water body under advisory, but it is not recommended. When a fish consumption closure is issued for a water body, the taking of fish or shellfish is legally prohibited.