

# LAVACA BASIN

## 2003 Basin Highlights Report



**LAVACA-NAVIDAD RIVER AUTHORITY**  
Prepared with the cooperation of the Texas Commission on Environmental Quality  
Clean Rivers Program

# LAVACA BASIN HIGHLIGHTS REPORT 2003

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**On the cover:**

**Lavaca-Navidad River Authority employee Chad Kinsfather measures stream flow in the Lavaca River near Hallettsville, one of the water quality sites monitored by the Authority.**

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## **Summary of This Year's Highlights:**

A review of recent water quality data reveals the Lavaca Basin to be in good condition. Dissolved oxygen levels in Lake Texana, its inflows, and in the Lavaca River below the confluence with the Navidad are normally measured at adequately high levels to sustain aquatic life. Investments in wastewater treatment improvements by area municipalities and industry over recent years have improved water quality conditions in receiving waters.

During the past year rainfall approached more normal levels than in recent years, and the additional precipitation helped to flush and revitalize area streams. Currently, a potential impact to water quality is the organic debris carried in runoff from surrounding agricultural and grazing operations when heavy rains occasionally occur in the Basin. This organic loading can cause temporary spikes in bacteria and drops in dissolved oxygen concentrations. However, water bodies in the Basin assimilate these loads and recover in a relatively short period of time, usually within a few weeks.

The Lavaca-Navidad River Authority (LNRA) continues to monitor water quality conditions in Lavaca Basin. This last year LNRA conducted routine monitoring in Lake Texana, the Lavaca River, the Navidad River, the mouth of Lavaca Bay, and in Sandy and East and West Mustang Creeks. In addition LNRA continued its contract with the United States Geological Survey (USGS) to conduct additional monitoring in Lake Texana and its inflows. USGS monitors to detect any presence of metals and organics (including pesticides).

During the last year LNRA also conducted special monitoring including flow and dissolved oxygen studies in the upper Lavaca River, targeted monitoring in Big Brushy Creek in support of Yoakum's wastewater treatment plant permit renewal, and 24-hour dissolved oxygen studies in the upper parts of Lake Texana.

Figure 1 on the following page is a map of Lavaca Basin illustrating streams and rivers, Lake Texana, population centers, known Confined Animal Feeding Operations (CAFOs), Wastewater Treatment Plants (WWTPs), and current (FY2003) LNRA water quality monitoring sites.

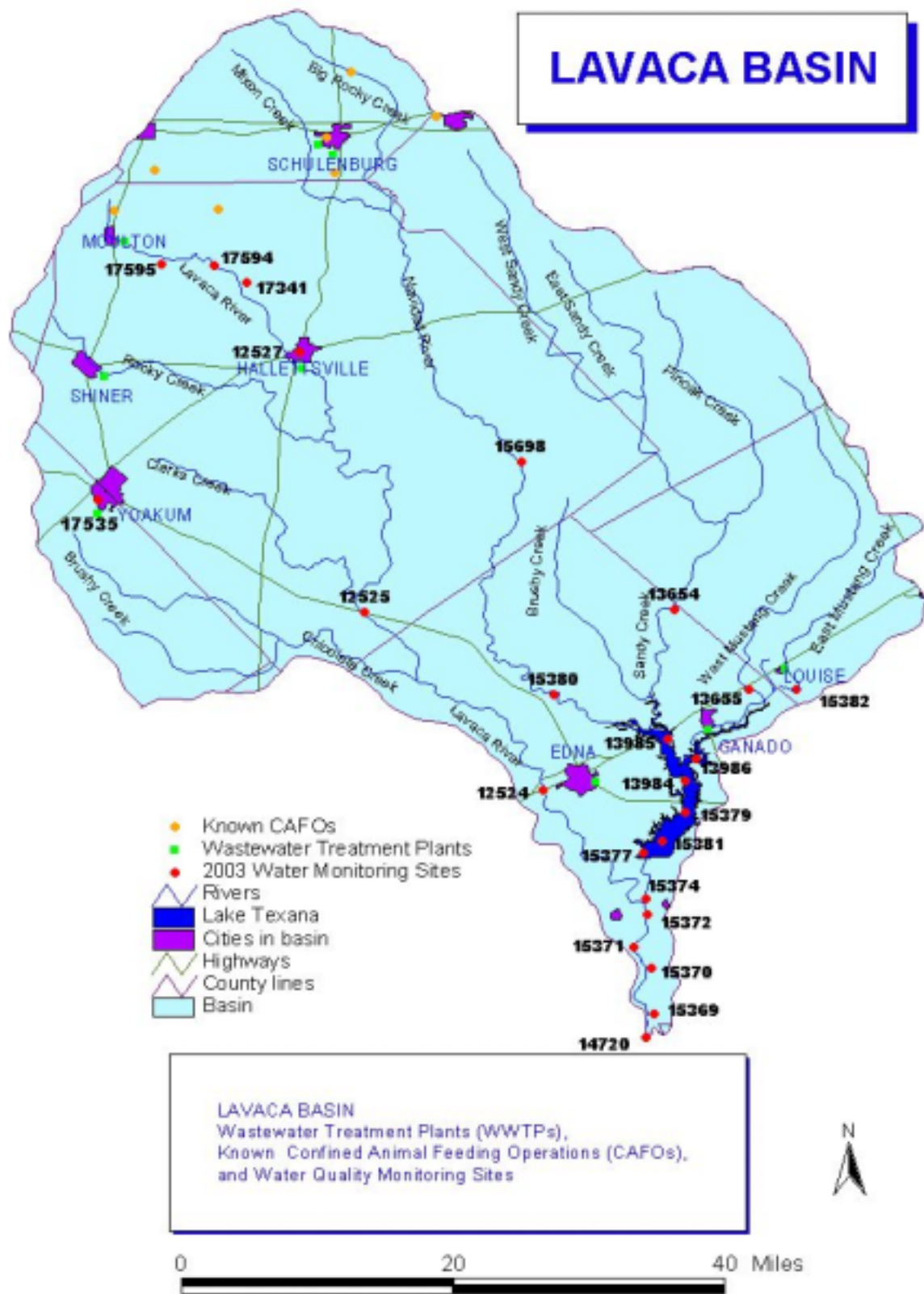


Figure 1

## Overview of Lavaca Basin water quality monitoring activities:

This report has been prepared to give an overview of the water quality monitoring activities conducted by the Lavaca-Navidad River Authority in years 2001, 2002, and 2003. Table 1 on the following page depicts the LNRA monitoring schedule for FY 2003. The numbers shown under the Conventional (Conv.), Bacteria (Bact), Flow, and Field columns indicate the number of times annually this monitoring is performed. Table 2 lists the parameters covered by both field monitoring and conventional water sampling.

During this period the Authority undertook the following monitoring activities:

- ❖ Routine monthly water quality monitoring of field data at 18 sites located in the Lavaca River, Navidad River, Sandy Creek, East and West Mustang Creeks, Lake Texana, and Lavaca Bay.
- ❖ Routine quarterly conventional water sampling at 15 sites located throughout Lavaca Basin.
- ❖ Monthly field data collection and flow monitoring at Big Brushy Creek in Yoakum in support of that city's wastewater treatment plant permit.
- ❖ An ongoing special study in the upper reaches of the Lavaca River (Segment 1602) includes flow, field, and 24-hour dissolved oxygen studies.
- ❖ Dissolved oxygen 24-hour studies at 2 sites in upper Lake Texana (Segment 1604)
- ❖ Constant remote temperature sensing in the upper Lavaca River (Segment 1602) with monthly reporting to TCEQ. Monthly data is shown in Figure 2 below.

Figure 2

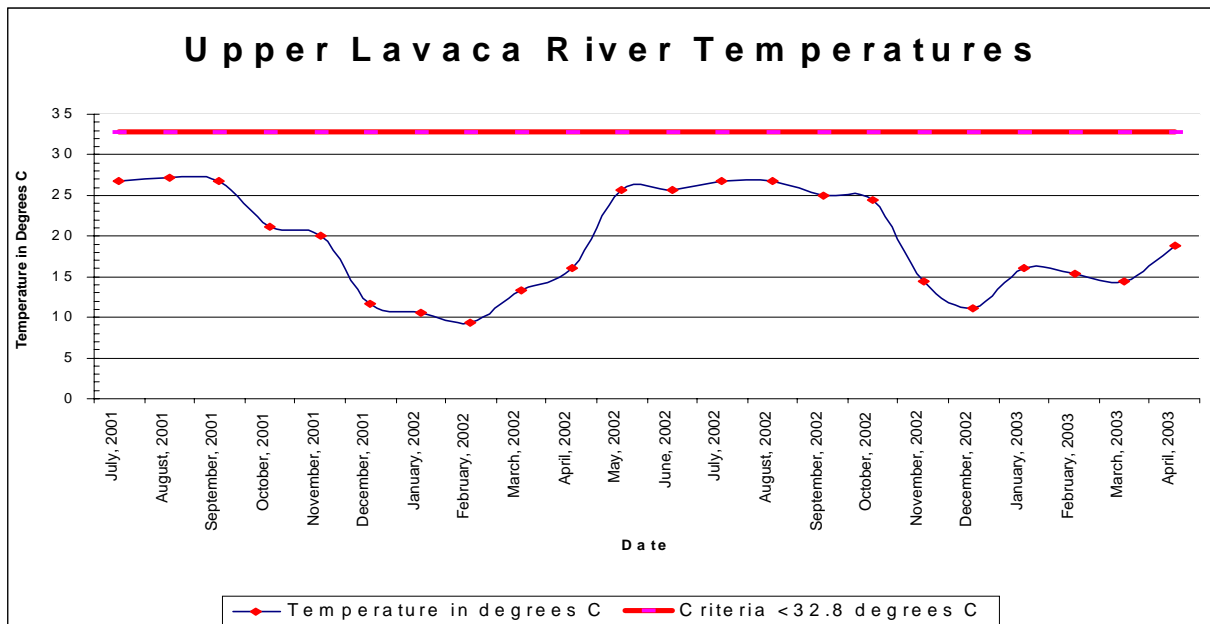




Table 2

**Lavaca-Navidad River Authority  
Data Collection Parameters**

<b>Field Data:</b>
Temperature
Specific Conductance
Salinity
Dissolved Oxygen
pH
Secchi Disk Transparency (a measure of water clarity)
Flow
<b>Conventional parameters:</b>
Total Alkalinity
Chloride
Ammonia
Total Organic Carbon
Orthophosphate
Turbidity
Total hardness
Sulfate
Nitrate+Nitrite
Total Suspended Solids
Total Phosphorus
<b>Bacteria:</b>
<i>E. coli</i> bacteria

**Water Quality Data Review:**

Nutrient levels have remained fairly constant from the last reporting period. At certain times of the year, both nitrogen and phosphorus are elevated within Lake Texana. Since nutrient concentrations show seasonality with higher numbers associated with wetter months, it is likely that the primary contributor of nutrients is overland runoff from crop and pasture land. Dissolved oxygen (DO) concentrations in the basin over the same period remained above criteria limits. *E. coli* is very seldom an issue in the basin. This past year, due to large rain events on the Lavaca watershed, *E. coli* levels were sometimes elevated as shown in Table 3 below:

**Table 3**

***E.coli* Results from the Lavaca River at Highways 59 (site #12524) and 111 (#12525)**  
 Criteria <126 cfu/100 mL for long-term geo average (\*mpn = most probable number cfu/100 mL)  
 <394 cfu/100 mL for single sample

Highway 59	#12524	
Date	Results	Comment
	*mpn	
5/15/01	<4	
7/24/01	74	

Highway 111	#12525	
Date	Results	Comment
	*mpn	
5/14/01	<4	
7/24/01	48	

CHANGED DETECTION METHOD TO IDEXX COLILERT					
10/30/01	148.3		10/30/01	122.2	
1/22/02	269		1/22/02	238	
4/24/02	88		4/24/02	102	
7/24/02		No sample due to flooding	7/24/02	261	
10/23/02	2419	Heavy rains	10/23/02		No sample due to flooding
1/22/03	308		1/22/03	219	

This watershed has a large drainage area, is sparsely populated, and is used extensively for cattle grazing and other agriculture-based operations. Figure 3 on the following page illustrates land use in the Lavaca Basin. These agricultural operations are the likely contributor to the spikes in *E.coli* levels. There were no other identified water quality issues in the basin.

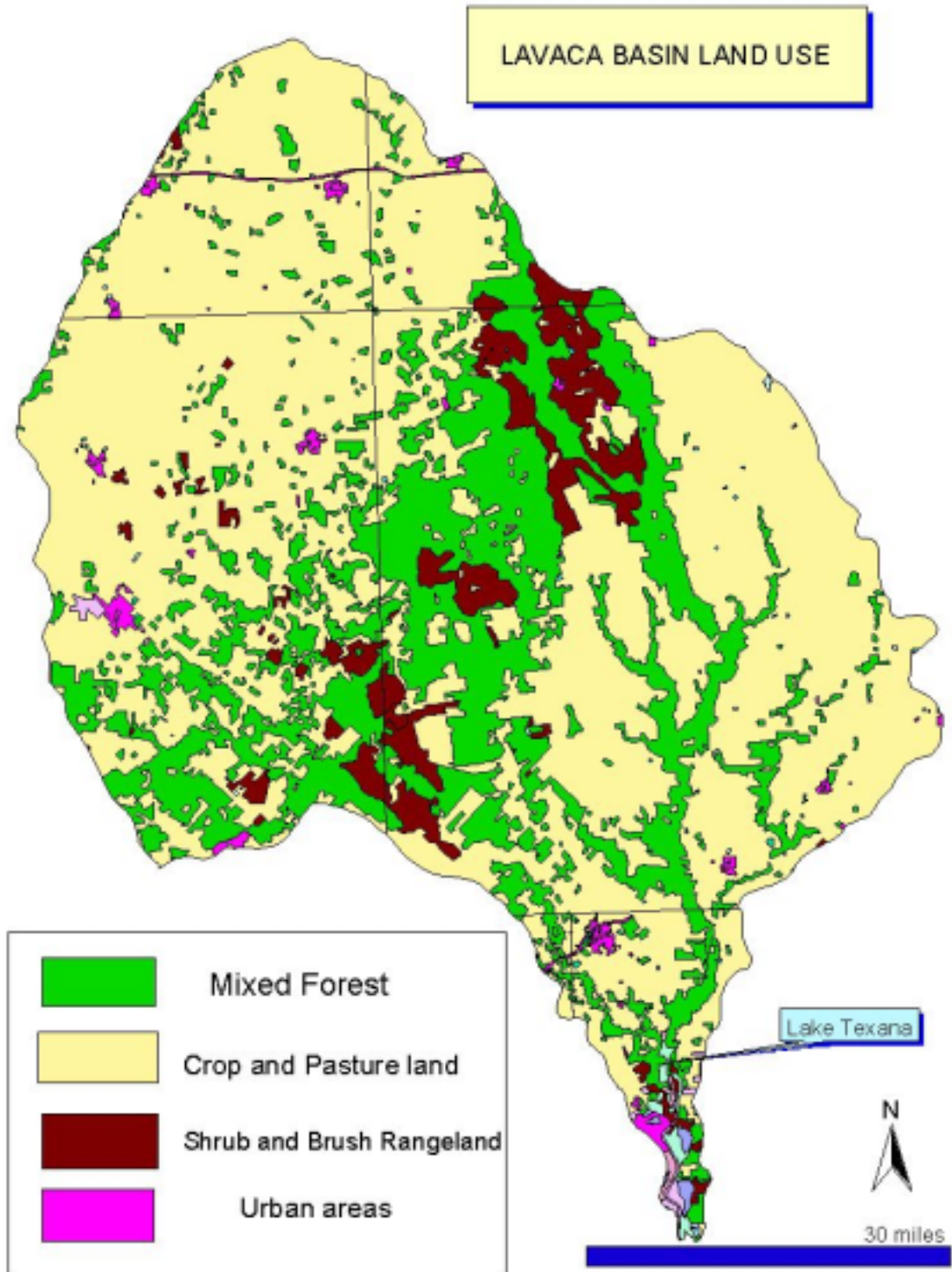
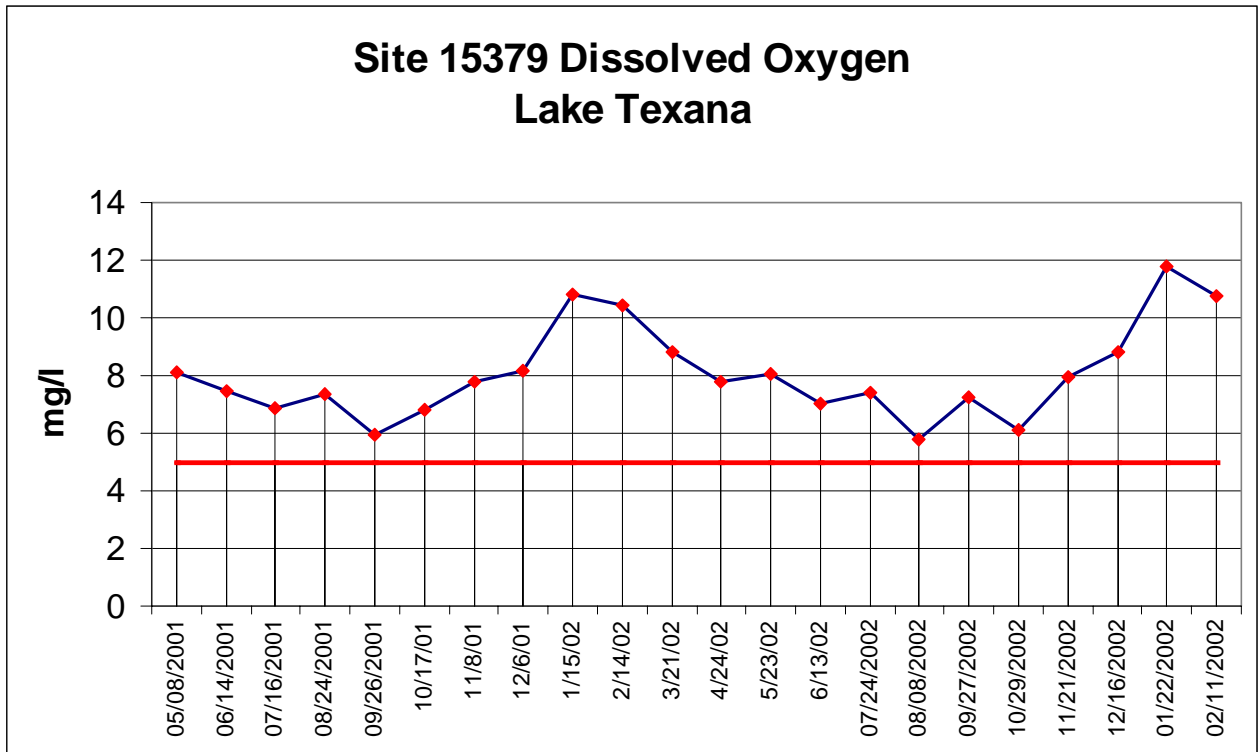


Figure 3

A special study for dissolved oxygen (discussion page 12-14) is being conducted in the Navidad River/Sandy Creek and Mustang Creek arms of the reservoir. However, in the main body of the lake, as shown by the instantaneous readings graphed in Figure 4 below, dissolved oxygen is being sustained at a healthy level well above the 24-hour DO criteria of 5mg/L (criteria line shown on graph).

Figure 4



Currently, Lavaca-Navidad River Authority has a contract with the United States Geological Survey (USGS) to monitor Lake Texana and its tributaries including Mustang and Sandy Creeks and the Navidad River. Current monitoring parameters include pesticides (both dissolved and sediment-bound), major ions, trace metals, oil and grease.

### Activities and Findings of Special Studies:

During 2001-2003 the Lavaca-Navidad River Authority (LNRA) has conducted the following special studies within the Lavaca Basin:

- Dissolved oxygen 24-hour studies in the upper reaches of Lake Texana (Segment 1604)
- Flow, field and 24-hour dissolved oxygen studies at 3 sites (South Moulton, Komensky, and Hallettsville) in the upper reaches of the Lavaca River, and temperature monitoring near Breslau (Segment 1602)
- Flow and field data at Big Brushy Creek near the city of Yoakum in support of that community's wastewater treatment plant permit renewal.

Location of Special Study monitoring stations is depicted in Figure 6 on the following page.

### Segment 1604

The 1998 303d List of Impaired Waters included Lake Texana (Segment 1604) for occasional exceedences of the dissolved oxygen criteria to support aquatic life at two sites in the upstream sections of the Lake. In an effort to remove it from the list, LNRA began 24-hour dissolved oxygen studies in 2001. Locations of the two sites are shown on the map below (**Figure 5**).

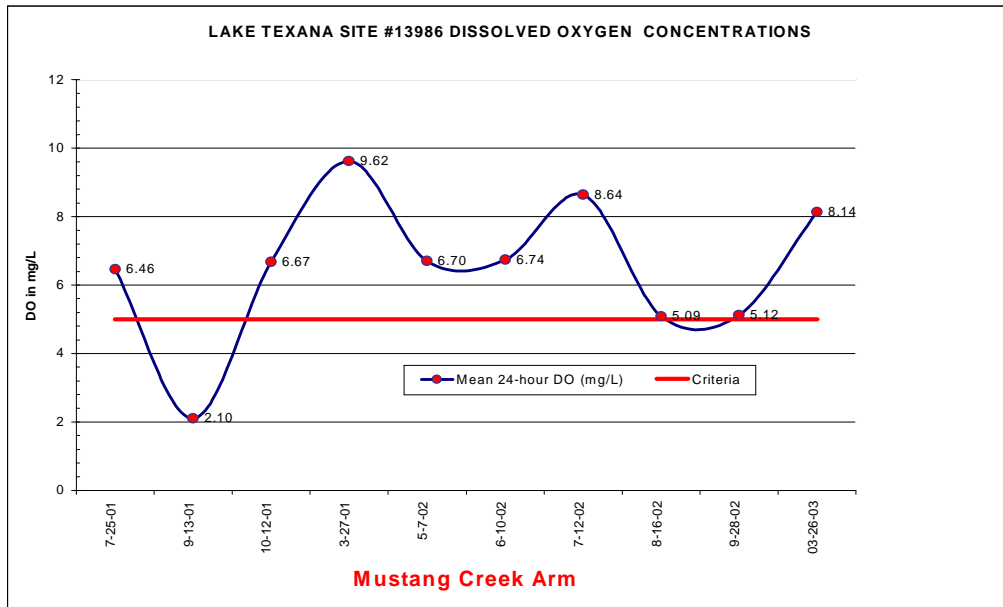




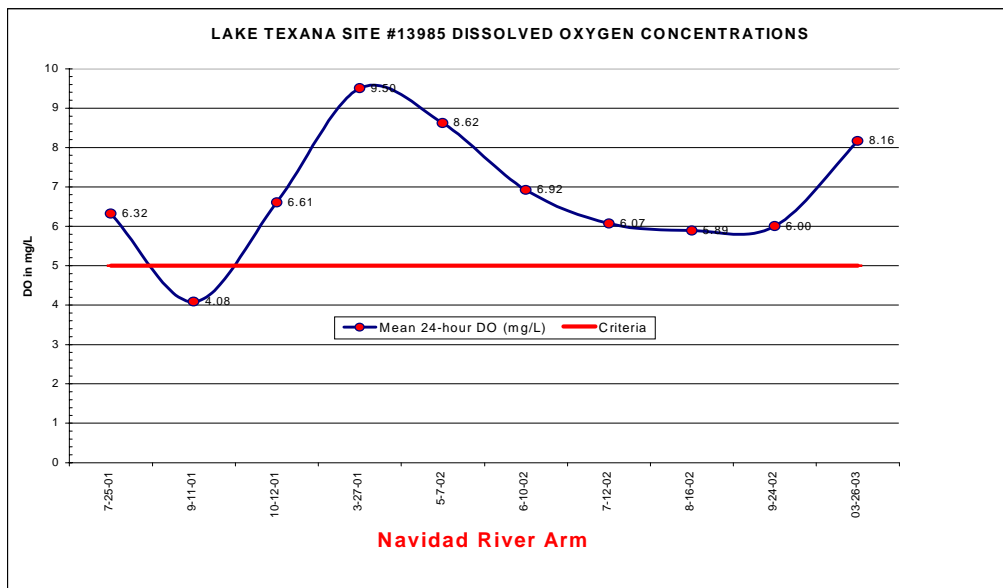
Figure 6

To date, ten independent 24-hour DO studies have been completed during the Index (March 15-October 15) and Critical (July 1-September 30) Periods. One out of the ten sampling events yielded dissolved oxygen values below the 24-hour mean and minimum DO criteria of 5mg/L and 3mg/L respectively. This event occurred in September 2001 when the reservoir level had been low. Over 16 inches of rain fell in the watershed during a period of only a few days. Resulting runoff carried heavy organic debris loads into Lake Texana. The sharp decline in dissolved oxygen levels may indicate that bacterial decomposition of these organic loads consumed oxygen in the water column. By the next month dissolved oxygen levels had recovered in the reservoir. The charts below (Figures 7 and 8) display mean concentrations of dissolved oxygen measured at the two sampling sites in upper Lake Texana.

**Figure 7**



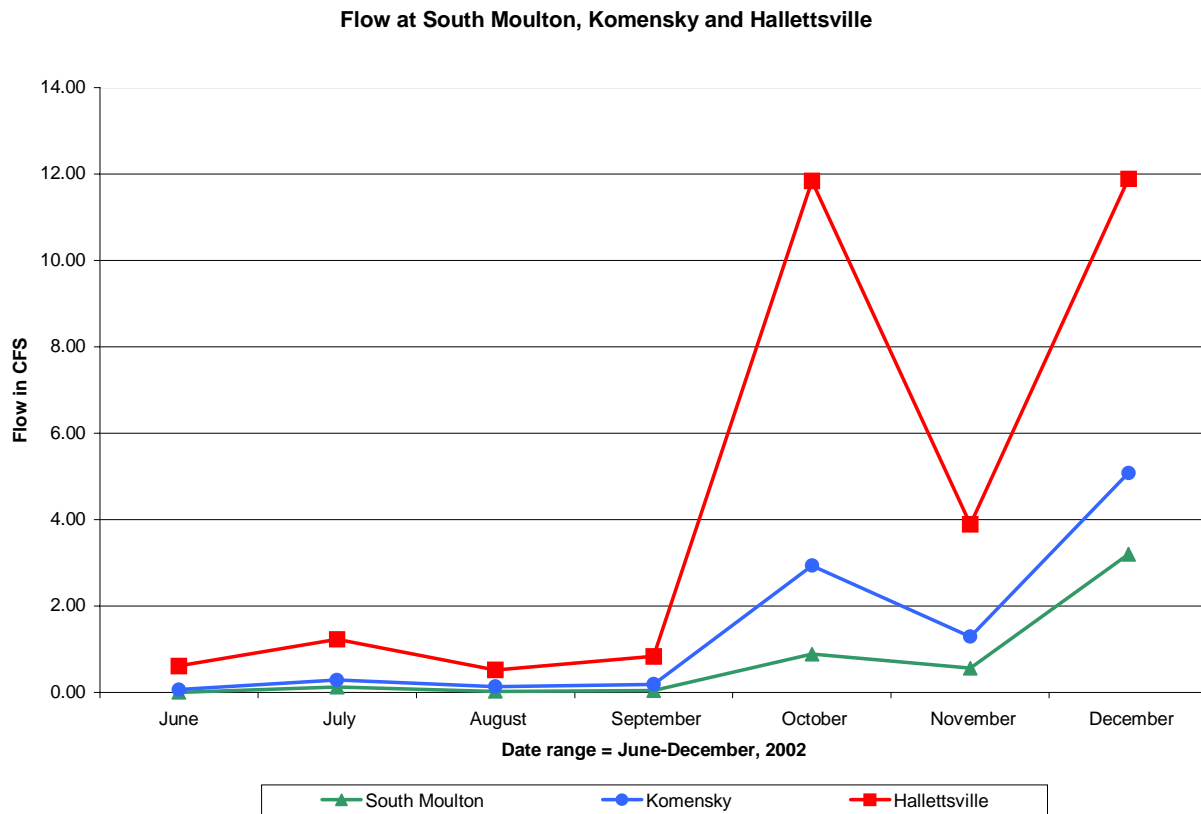
**Figure 8**



### Segment 1602

LNRA is currently conducting a special study in the upper reaches of the Lavaca River as part of a contract amendment with the Clean Rivers Program. In the past there has been very little study in this area, but data have indicated intermittent flow to be the cause of low dissolved oxygen concentrations. Monthly flow studies are being conducted at three sites: South Moulton site #17595, Komensky site #17594 and Hallettsville site #12527. Flows in this area are very low except during rain events. The dynamic nature of these flows can be seen in the graph of the preliminary data below:

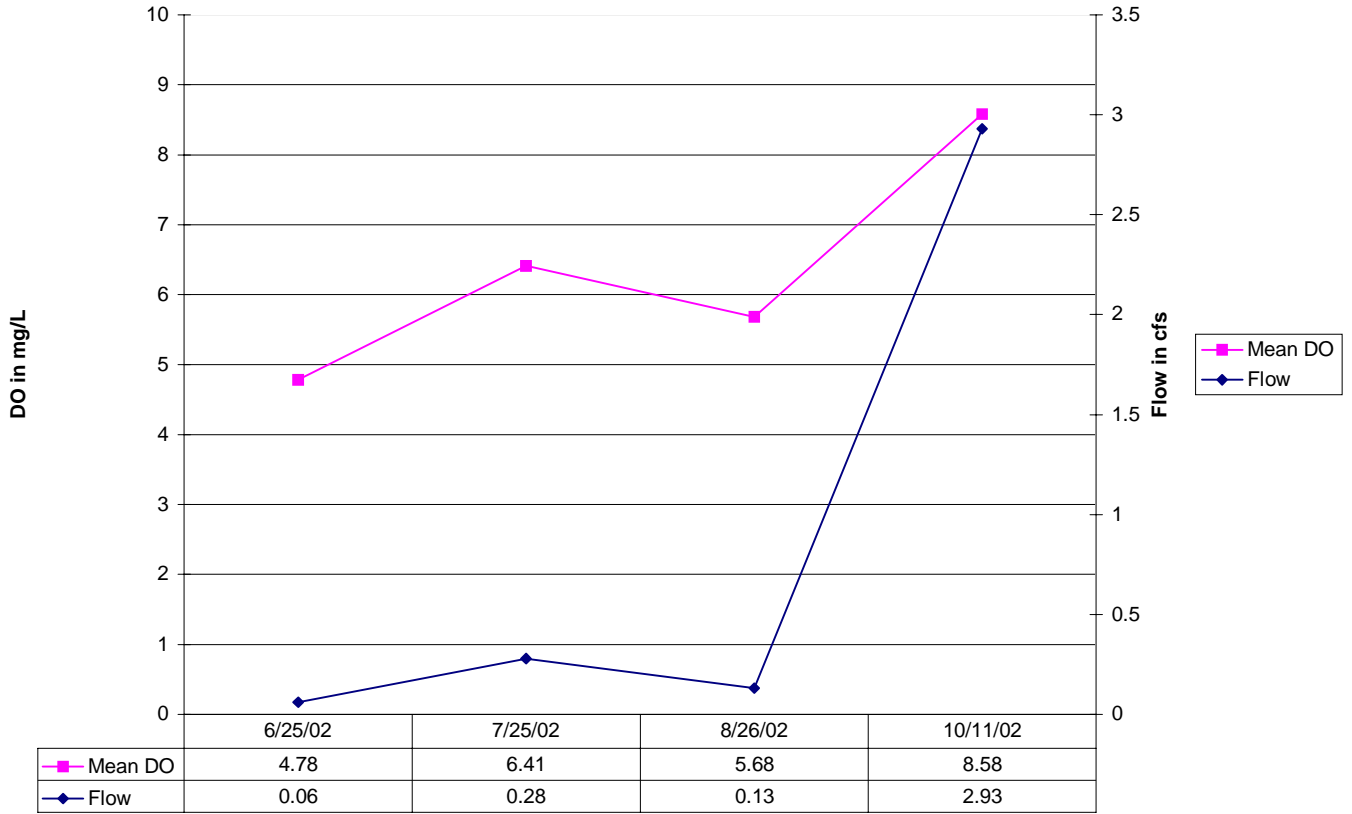
**Figure 9**



Ten twenty-four hour dissolved oxygen studies are being conducted during the Index and Critical Periods at the Komensky site. Four of these 24-hour events have been completed. Preliminary data show a strong correlation at this site between dissolved oxygen and flow, i.e. dissolved oxygen increases with higher flow. This data is shown in Figure 10 on the following page.

**Figure 10**

**Komensky 24-hour DO**



**Big Brushy Creek**

This same correlation of dissolved oxygen and flow has not been observed at the Yoakum study site (#17535) at Big Brushy Creek. Monthly flow and instantaneous field data are being collected for at least twelve (12) consecutive months in support of that city’s wastewater treatment plant (WWTP) permit renewal. Field and flow measurements are collected upstream of the outfall of the Yoakum WWTP. On the following page are Figures 11 and 12 comparing the dissolved oxygen concentrations both with flow and temperature. One might expect an increase in dissolved oxygen with higher flows and/or with lower water temperatures. However, this relationship is not consistently observed at this site.

During one sampling event on May 20, 2002, DO was measured to be 10.67 mg/L during low flow conditions. Abundant green algae could be a contributing factor to the high DO concentration. More data is needed to explain the variation in dissolved oxygen.

Figure 11

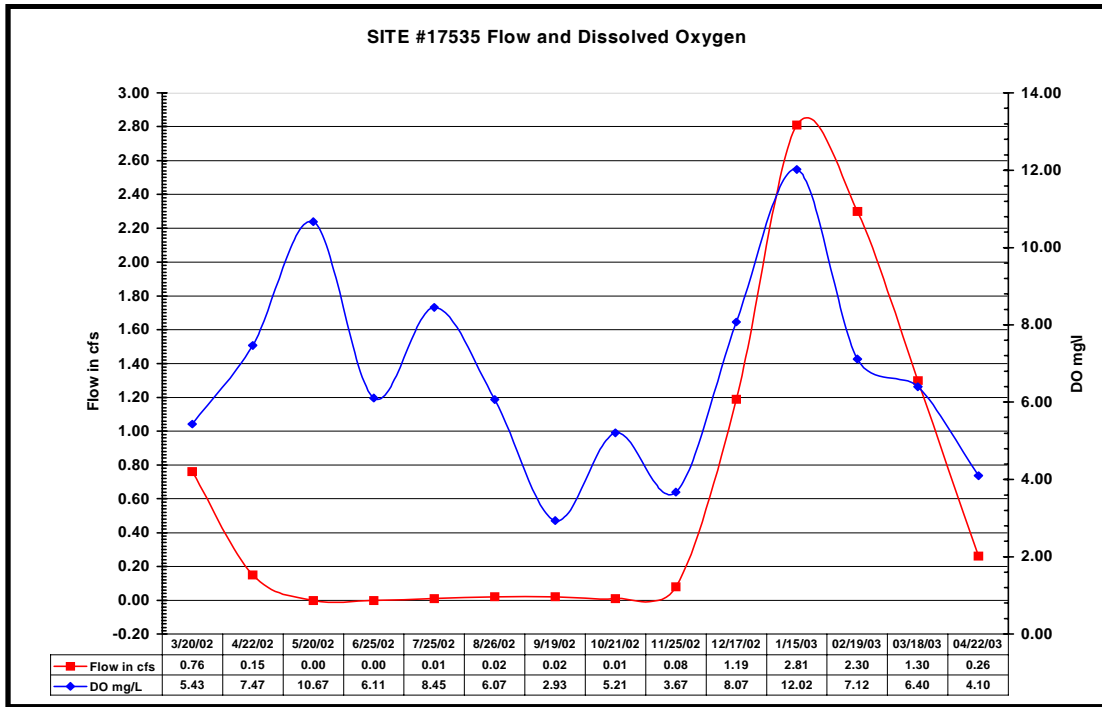
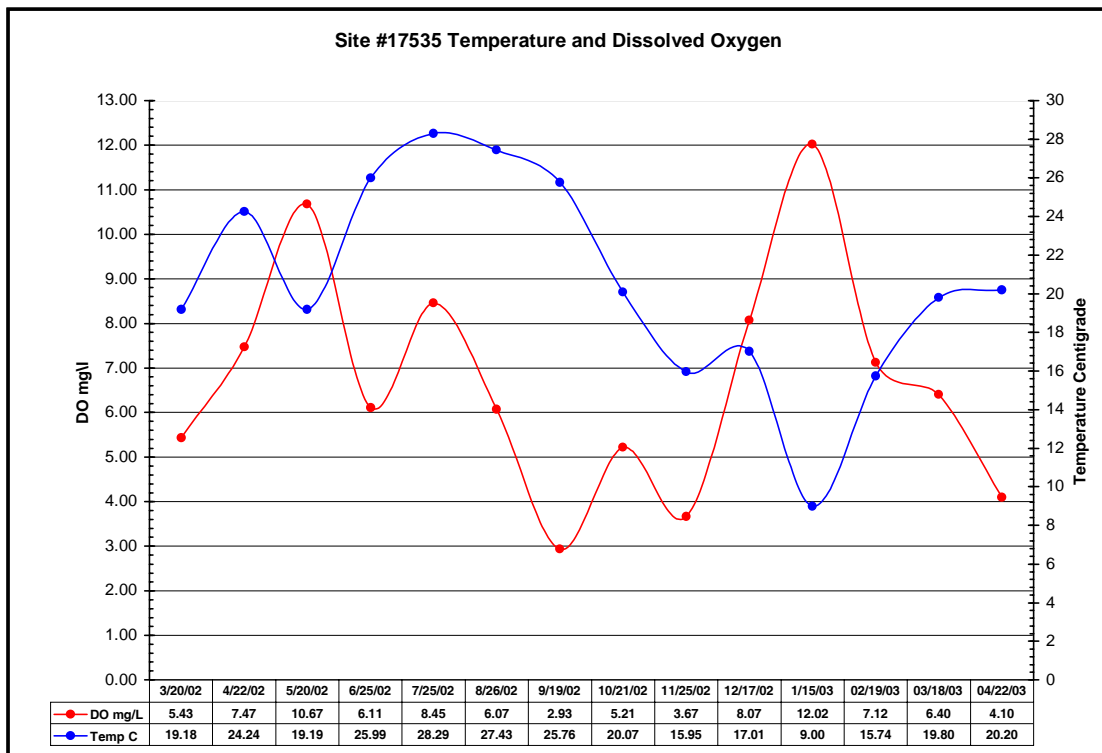


Figure 12



### **Volunteer water quality monitoring and public outreach:**

Public outreach efforts by LNRA include seeking guidance for water quality issues and activities from the Lavaca Basin Steering Committee, education and assistance in water conservation and drought contingency planning, news releases, public meetings, attendance at water quality issues meetings, providing water education materials to elementary schools throughout the Basin, presentations to groups, and support of the Texas Watch volunteer water quality monitoring program. LNRA staff are available to answer questions or give assistance with water quality information to Basin students, stakeholders, and the public.



Texas Watch volunteer Ken Barton conducts water quality monitoring at Simons boat dock on Lake Texana with his children and students in his Middle School science class.

LNRA staff are available to respond to calls from concerned citizens. LNRA staff investigate information provided by citizens and contact the appropriate regulatory agency to address the issue. This cooperation between citizens, LNRA, and regulatory agencies has resulted in effective response to potential water quality problems in the Basin.

LNRA provides support to the Texas Watch volunteer water quality monitoring program by providing equipment, monitoring supplies and reagents, quality assurance, and environmental data to the volunteers. The Texas Watch Program is a statewide network of concerned volunteers, partners, and institutions collaborating to promote a healthy and safe environment through environmental education, data collection, and community action.

Anyone wishing to become involved with Texas Watch monitoring may contact Sylvia Balentine at LNRA or contact Texas Watch directly by calling toll-free 1-877-506-1401, or by visiting the LNRA Web site [www.LNRA.org](http://www.LNRA.org) and clicking on the Texas Watch link, or by visiting the Texas Watch Web site at [www.texaswatch.geo.swt.edu](http://www.texaswatch.geo.swt.edu).

## **Lavaca Basin Steering Committee:**

LNRA works with the Clean Rivers Program (CRP) Steering Committee to seek public input, disseminate water quality information, and set priorities for water quality monitoring in the Lavaca Basin. Membership in the Committee is open to staff from state and local governments, private landowners, representatives of industry and agriculture, and concerned citizens. Anyone interested in participating as a member of the Steering Committee may contact the offices of LNRA and speak to General Manager, Patrick Brzozowski or Water Quality personnel, Sylvia Balentine or Chad Kinsfather. **Contact information** follows:

Lavaca-Navidad River Authority  
PO Box 429  
Edna, Texas 77957

Telephone: 361-782-5229  
Fax: 361-782-5310

E-mail addresses:

General Manager Patrick Brzozowski      [pbrzozowski@LNRA.org](mailto:pbrzozowski@LNRA.org)

Water Quality Department:

Sylvia Balentine      [sbalentine@LNRA.org](mailto:sbalentine@LNRA.org)  
Chad Kinsfather      [chadk@LNRA.org](mailto:chadk@LNRA.org)

The Lavaca Basin Steering Committee provides guidance on the use of resources from the Clean Rivers Program. The Steering Committee allows LNRA to gain insight from local stakeholders and expertise from such members as Texas Parks and Wildlife (TPWD), Texas Commission on Environmental Quality (TCEQ), United States Geological Survey (USGS), Natural Resources Conservation Service (NRCS), and the County Agricultural Extension Service. Input from the Committee allows LNRA to prioritize water quality issues and to determine the most effective water quality monitoring program.

Meetings are held annually each summer at LNRA facilities. Meeting notices are mailed out three weeks in advance to Committee members and notices of the meetings are posted on the LNRA Web site at [www.LNRA.org](http://www.LNRA.org). From the home page one can click on “Public Information” and then click on “Calendar of Events” for meeting notices.

## **Major Rivers Water Education:**

The Lavaca-Navidad River Authority offers a water education program “Major Rivers” to fourth grade classes in the Lavaca Basin. Students are introduced to water concepts by “Major Rivers” and his trusty horse, “Aquifer”. Major Rivers focuses on the water cycle, water supply, water distribution, water quality, water use, and water conservation. Teachers consistently express approval of the program and students enjoy learning with the provided materials.

This year the program is being revised and updated with additional activities and learning opportunities to better correlate with Texas Essential Knowledge and Skills (TEKS) and Texas Assessment of Knowledge and Skills (TAKS) standards.

Currently the program is being revised with help from the Lower Colorado River Authority (who originally developed the program), Texas Water Development Board, and other Texas entities to make it available to the entire State. It is anticipated that the program will be printed and ready for distribution by the Fall of 2003. LNRA will purchase and deliver these materials to Lavaca Basin schools when the program is ready.

### **Lavaca-Navidad River Authority Web site:**

Extensive water quality information for the Lavaca Basin is available via the Lavaca-Navidad Web site at [www.LNRA.org](http://www.LNRA.org). The LNRA home page provides links to information about the Clean Rivers Program. Postings under the “Water Quality” icon on the right of the home page include:

- ❖ 2002 Basin Summary Executive Summary
- ❖ Current Basin Highlights Report
- ❖ Current Water Quality monitoring schedule and a map of monitoring sites
- ❖ Current Texas Water Quality Assessment and List of Impaired Waters
- ❖ Quality Assurance Project Plan (QAPP) Summary
- ❖ Information on Special Studies

The “Water Quality Data” link connects to a dedicated server storing all state-approved water quality data for the Lavaca Basin, both historical and recent. The data may be accessed by county, by segment, or by a Texas Surface Water Quality Monitoring (SWQM) site number. These site numbers are available by looking first under “County” where the sites are described and numbers are given. These numbers are also available from the LNRA water quality monitoring schedule or site map posted at the “Water Quality” site.

Water quality data can be displayed either graphically, as an HTML page, or as an ASCII delimited text file that can be imported into a spreadsheet or database. Once a sampling site (also called “station”) is chosen, data can be retrieved either by sampling date or by parameter storet codes—both of which are displayed in pull-down menus. Water quality parameters, e.g. dissolved oxygen, pH, salinity, etc. are posted via a storet code, but the names of the parameters gathered in Lavaca Basin are listed on the pull-down menu to the right of the page. Once a parameter is chosen, a date range should be entered, as instructed. This is an excellent tool for students or anyone needing to access historical or current water quality information for the Lavaca Basin.