LAVACA BASIN

SUMMARY REPORT

July, 2002

Lavaca-Navidad River Authority

PO Box 429
Edna, Texas 77957

Paul Price Associates, Inc.

3006 Bee Caves Road, Suite D-230
Austin, Texas 78746

Prepared in cooperation with the Texas Natural Resource Conservation Commission under the authorization of the Clean Rivers Act

LAVACA BASIN
SUMMARY REPORT
EXECUTIVE SUMMARY

Introduction:

In 1991 the Texas Legislature passed the Clean Rivers Act (Senate Bill 818) which requires water quality assessments for each river basin in Texas. In accordance with this Act, water resource issues are pursued in an integrated, systematic manner, and from a watershed or basin management perspective. The Texas Natural Resource Conservation Commission (TNRCC) administers the Clean Rivers Program (CRP) in partnership with river authorities, municipal water authorities, councils of government, and other regional entities. The Lavaca-Navidad River Authority (LNRA) gathers water quality data for the Lavaca Basin, and is an active partner with TNRCC in the Clean Rivers Program.

Water quality data gathered for the CRP enables examination of current water quality, potential water quality concerns, and the assessment of possible causes of any impairments. Examination of long-term data allows comparison between current and historical water quality data, and statistical analysis can indicate any trends in improvement or deterioration of water quality parameters.

All the water quality data employed in this report is contained in the TNRCC Regulatory Activity and Compliance System (TRACS), an electronic database of state water quality data. All the information on this database has been collected, analyzed, and managed using a statewide set of uniform procedures specified ahead of time in a Quality Assurance Project Plan (QAPP) to assure comparability of results over time and among river basins. An electronic copy of the quality assured data set for the Lavaca Basin for the study period (1996-2001) was obtained from TNRCC and summarized to provide an overview of water quality in the five Segments of the Basin.

For the evaluation of trends over time, water quality data from prior years available in TRACS was also employed. For a given station and parameter these criteria required at least 20 measurements in a six year period with at least three measurements per year for five of the six years. Some of the qualifying data sets extend back to 1991.

The data was sorted into Segment sets and tabulated by station and parameter to create the basic data set on which subsequent manipulations and statistical analyses were performed (Appendix A). Data sets were screened using the linear regression tool and best fit regression line capabilities of Excel 2000 software. To screen the data for trends, TNRCC staff requested that we employ a 10% significance level to identify potential change. Additional examination of the data includes use of the Runs Test and the Shapiro-Wilk Test (Statistix7) to evaluate the assumption of random errors in the data, and the use of transformations to make data sets better conform to the assumption of randomness, to make the relationship between variables linear, or to scale one or more variables so the regression procedure can distinguish the relationship. Assessment of normality of the data with the Runs and Shapiro-Wilk tests was based on a probability level of 5% ($p=0.05$).

This Basin Summary Report also incorporates the findings of the 2002 305(b) Assessment (See Appendix B for Review). Section 305(b) of the federal Clean Water Act requires states to produce a periodic inventory comparing water quality conditions to established standards. The 305(b) water quality report is a preliminary tool for assessing water quality conditions and categorizing the quality of Texas surface waters. To conduct the assessment, the most recent five years of water quality data is assembled and evaluated by the TNRCC using the methodology described in the Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data. Data sets are reviewed prior to assessment to ensure that the data is not biased towards unusual conditions (flow, storm or agricultural runoff, or season). There are three major categories by which water bodies can be assessed: use support, use concerns (primary concerns), and secondary concerns.

Overview of Lavaca Basin:

The Lavaca Basin is comprised of 188 stream miles and a drainage area of approximately 2,318 square miles encompassing all or portions of six counties: Colorado, DeWitt, Fayette, Jackson, Lavaca and Wharton. The population of the Basin was 41,75l in 1990 and has been projected by the Texas Water Development Board (TWDB) to reach 63,289 by the year 2040. Major population centers located within the Basin are Edna, Ganado, Hallettsville, Moulton, Shiner, Schulenburg, and Yoakum.

The Lavaca Basin actually encompasses both the Lavaca River watershed in the western portion and the Navidad River watershed in the eastern portion of the Basin. About 40 percent of the Basin is drained by the Lavaca River watershed while the remaining area is drained by the Navidad River watershed including the principal tributaries of Sandy and East and West Mustang Creeks.

Headwaters of the Navidad River rise in the East and West forks at an elevation of 440 feet in southern Fayette County. These forks join near Oakland at an elevation of 201 feet and flow southward to Lake Texana. Lake Texana has a firm yield of 79,000 acre-feet/year and was constructed by the U.S. Bureau of Reclamation for municipal, industrial, fish and wildlife, and recreational benefits.

The Lavaca River originates at an elevation of 470 feet in the northwestern portion of the Basin above Moulton and flows southeast into Lavaca Bay. The confluence of the Lavaca and Navidad Rivers is about two miles east of Vanderbilt in Jackson County. The Lavaca Basin is part of the West Gulf Coast Section of the Coastal Plain Physiographic Province and includes the Blackland Prairie, Claypan, and Coastal Prairie land-resource areas.

For water quality management purposes the Basin has been divided into five stream segments:

Segment 1601 is the tidal portion of the Lavaca River from the mouth of the Lavaca Bay upstream to a point 8.6 kilometers (5.3 miles) downstream of US 59 in Jackson County. Several small tributaries, the Menefee Lakes, Redfish Lake, Swan Lake, Redfish Bayou, and Catfish Bayou are included in this segment. Redfish and Swan Lakes are important nursery grounds for marine organisms.

Segment 1602 is the upper Lavaca River above tidal portion. The predominant land use in the watershed is agricultural, with some forested land. Wastewater effluents from the cities of Edna, Yoakum, Shiner, Moulton and Hallettsville enter either directly into the Lavaca or into tributaries leading to the Lavaca River. Recent improvements and upgrades to Wastewater Treatment Plants (WWTP's) serving these communities have improved water quality in this segment.

Segment 1603 is the Navidad River from the confluence of the Lavaca and Navidad Rivers up to the Lake Texana spillway. The east and west drains along the east and west dikes of Lake Texana drain water into this segment. The east drain has continuous flow year-round due primarily to seepage from shallow groundwater sources. The west drain has intermittent flow resulting from agricultural land drainage. Water releases from Lake Texana flow through this segment to the Lavaca River and then into Lavaca Bay.

Segment 1604 is Lake Texana. Drainage areas feeding the Lake include the Sandy Creek, Mustang Creek, Navidad River, and numerous county drains. Sandy Creek is an intermittent creek draining a large portion of the Basin through Jackson, Wharton, Lavaca and Colorado Counties. Flow is mostly return irrigation from rice fields. The Mustang Creek branches off to the East, West and Middle Mustang and drains a portion of the Basin from the Garwood Irrigation Company service area to Lake Texana. Wastewater effluent from Ganado drains into Lake Texana, and the wastewater effluent from the Louise community drains into East Mustang Creek. Two sites in the upper reaches of Lake Texana, the main body just south of US Hwy 59 and the Mustang Creek Arm, are 303d listed for occasional low dissolved oxygen concentrations in the hot summer months in an earlier assessment period. LNRA is currently conducting 24-hour dissolved oxygen monitoring at these sites, and will submit 2 years of this data for de-listing consideration during the 2004 305b assessment.

Segment 1605 is the Navidad River from above the backwaters of Lake Texana up to its origin in Fayette County. Many tributaries drain into this segment, and the wastewater effluent from Schulenburg enters this segment via an unnamed tributary in the northern portion of the Basin. Land use is farming and ranching.

Water quality in the Lavaca Basin remains in a relatively high state due to:

- Low density of human population

- Investments in wastewater treatment improvements by municipalities and industry
- High priority placed on watershed protection to preserve the integrity of Basin water resources for municipal, industrial, agricultural, recreational, and fish and wildlife purposes
- Public involvement and cooperation

Basin Steering Committee and Public Outreach:

LNRA works with a CRP Steering Committee to set priorities for the water quality monitoring and assessment of the Basin. Membership of the Committee is open to diverse representation from state and local government, private landowners, representatives of industry and agriculture, and concerned citizens. There is an annual Basin Steering Committee meeting held each summer to report water quality status, to discuss current water quality issues, and to gather input from Basin stakeholders.

Public outreach efforts by LNRA include education and assistance in water conservation and drought contingency planning, news releases, public meetings, attendance at water quality issues meetings, providing water education material to elementary schools throughout the Basin, presentations to groups, and support of the Texas Watch Program.

Water Quality Monitoring:

LNRA gathers water quality data in the Lavaca Basin and submits this data three times annually to TNRCC for inclusion in the state water quality database, TRACS. After acceptance and approval by TNRCC, the data is made available via the LNRA website for public access.

The Lavaca-Navidad River Authority (LNRA) water quality monitoring schedule for FY 2002 includes monthly field monitoring at 18 sites. Field parameters include:

- pH
- Temperature
- Specific conductance
- Salinity (at tidally influenced stations)
- Dissolved oxygen
- Secchi disk (to measure water transparency, i.e. turbidity)
- Flow
- *E.coli* monitoring

Temperature in the upper reaches of the Lavaca River in Segment 1602 is monitored constantly via a real time remote access sensor, and this data is read at the LNRA offices and submitted monthly to TNRCC. This segment had been 303-d listed in years past for temperature exceedences above the 91°F criteria. LNRA has been receiving data from

this sensor since installation in July of 2001. The temperature has not exceeded the criteria during this time period. There is a high confidence that two full years of data will result in de-listing of this segment for temperature.

LNRA also samples quarterly at 15 sites for conventional parameters including:

- Total alkalinity
- Chloride
- Ammonia
- Total organic carbon
- Orthophosphorus
- Total phosphorus
- Turbidity
- Total hardness
- Sulfate
- Nitrate + nitrite
- Total suspended solids

LNRA has recently added three new sites:

- Lavaca River at SH 111
- Navidad River at the Speaks bridge
- 12-month targeted flow monitoring at Big Brushy Creek in Yoakum

In addition to the above monitoring, LNRA contracts with the United States Geological Survey (USGS) to monitor for metals and organics in Lake Texana and its inflows.

Significant Findings:

Segment 1602 (Lavaca River above tidal influence):

- Significant declines in total and volatile suspended solids, total organic carbon, nutrients, and fecal coliforms. At the same time there were significant declines in dissolved oxygen deficits. There is also an increase in pH consistent with higher photosynthesis and dissolved oxygen. These trends suggest the changes in water quality occurred as a result of decreases in organic loading, and they correlate in time with improvements to the area wastewater treatment plants.
- Lack of sufficient data, low recent dissolved oxygen concentrations, and the presence of concentrated animal feeding operations (CAFO's) in the upper regions of the Lavaca suggest the need for additional monitoring in the area.

Segment 1601 and 1603 (tidally influenced reaches of Lavaca and Navidad Rivers):

- Small improvements in dissolved oxygen concentrations in the fringing marsh channels along the lower Lavaca River

Segments 1605 and 1604 (Lake Texana Watershed):

- Mustang Creek is the major source of nutrient loading
- General trend to improving dissolved oxygen concentrations in Lake Texana
- Nutrient levels (nitrogen and phosphorous) are high in the Lake, but these nutrients do not appear to be creating problems, and there is no trend of increase in nutrients.
- Higher ammonia concentrations in East Mustang correlate to problems during same time period with upstream wastewater treatment plant ammonia content in effluent.
- In Sandy Creek the proportion of groundwater and produced water appears to have decreased in correlation with changes in land use and agricultural practice.

Recommendations:

Segment 1602 (Lavaca River above tidal influence):

- LNRA has applied to the TNRCC Clean Rivers Program for funding to conduct additional monitoring for flow, field data and 24-hour dissolved oxygen concentrations in the upper reaches of the Lavaca River.
- Continue routine monitoring at sites below Hallettsville for the purpose of tracking water quality changes over time.
- Continue monitoring of temperature in pursuit of de-listing of segment for thermal modifications in 2004

Segment 1601 and 1603 (tidally influenced reaches of Lavaca and Navidad Rivers):

- Continue routine monitoring in these segments to verify there is no degradation of water quality.

Segments 1605 and 1604 (Lake Texana Watershed):

- The riparian areas fringing the East and West Mustang Creeks have been virtually cleared and put into agricultural production, thereby reducing buffer zones that can assimilate the nutrient and sediment loads carried by the creek. LNRA plans to implement a Buffer Zone Demonstration Project on Lake Texana to analyze the effectiveness of vegetative plantings to filter nutrients and sediment from surface runoff. LNRA will continue to work with agricultural interests in the Basin to implement Best Management Practices in their operations.
- Continue routine monitoring of nutrients in both Lake Texana and its inflows to determine any increasing or decreasing trends
- Continue the two-year 24-hour dissolved oxygen study currently being conducted at two sites in the upper portion of Lake Texana to determine whether the upper portion of the Lake meets the new assessment criteria referencing the Texas Surface Water Quality Standards minimum and average measurement over 24-hour periods.