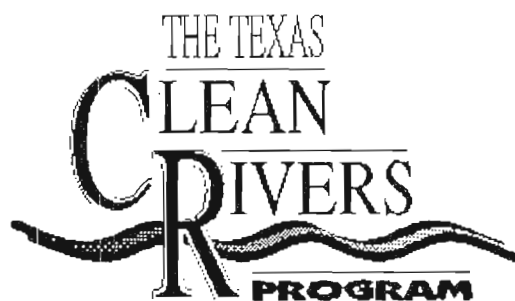




BASIN HIGHLIGHTS REPORT

2001

***LOWER NECHES RIVER and
NECHES-TRINITY COASTAL BASINS***



LOWER NECHES VALLEY AUTHORITY

MUNICIPAL • INDUSTRIAL • AGRICULTURAL WATER

MEMORANDUM

To: Lower Neches Basin & Neches Trinity Coastal Basin
Steering Committee Members and Interested Parties

From: Andrew Bruno
Environmental Coordinator *AB*

Subject: 2001 Basin Highlights Report

Date: June 6, 2001

Enclosed is the 2001 Basin Highlights Report for the Lower Neches Basin and the Neches-Trinity Coastal Basin. This report provides an annual update of the Texas Clean Rivers Program in the Lower Neches Valley Authority assessment area. The report is available online at: <http://www.lnva.dst.tx.us>.

Please contact me with any questions and/or comments at (409) 892-4011 or andrewb@pernet.net.

ADB/bb

enclosure

The Basin Highlight Report provides an update of activities in the Lower Neches River Basin and Neches-Trinity Coastal Basin for 2001. This report was prepared by Lower Neches Valley Authority (LNVA) in cooperation with the Texas Natural Resource Conservation Commission (TNRCC) under the State of Texas Clean Rivers Program (CRP).

BASIN OVERVIEW

The LNVA has responsibility under the CRP for assessing water quality for the Lower Neches River Basin and the entire Neches - Trinity Coastal Basin. Covering approximately 3,000 square miles, the Lower Neches River Basin includes all of Hardin County and portions of Tyler, Jefferson, Liberty, Polk and Orange Counties. Urbanized areas include Port Neches, Jasper, Silsbee, Kountze, Lumberton, Sour Lake and the northern section of Beaumont. Non-urban regions including pastures, marsh, cropland and the East Texas region referred to as the "Piney Woods" account for a major portion of the assessment area.

The approximately 769 square mile Neches-Trinity Coastal Basin lies southwest of the Lower Neches River Basin and southeast of the Trinity River Basin, reaching into Jefferson, Chambers and Liberty Counties. This watershed includes the cities of Port Arthur, Groves, Nederland, Winnie and most of Beaumont. The economy of this area is centered on petrochemical and related industries, shipping and rice farming.

MONITORING PROGRAMS OVERVIEW

The CRP Water Quality Monitoring Program in the Lower Neches River Basin and Neches-Trinity Coastal Basin has been a cooperative effort between LNVA and the TNRCC. Surface water quality monitoring is an effort to obtain information on the biological, chemical and physical characteristics of water. Monitoring activities are conducted in accordance with an approved Quality Assurance Project Plan (QAPP). All activities are reviewed annually to evaluate program effectiveness, new cooperative efforts, and emerging priorities. LNVA's monitoring activities can be categorized into the following four types: fixed station (routine), targeted, systematic watershed, and special studies.

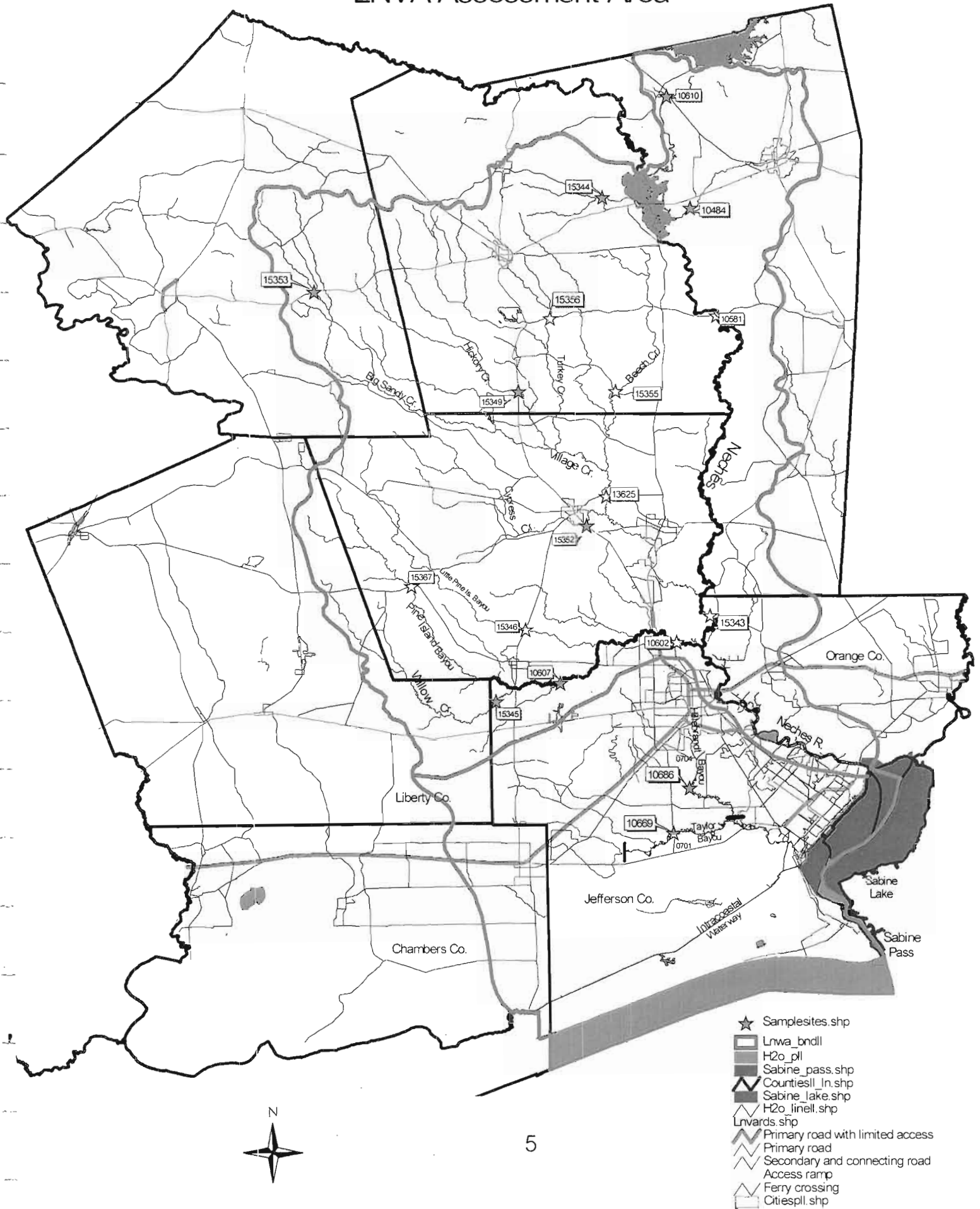
FIXED STATION MONITORING PROGRAM

LNVA's fixed station monitoring program complements existing TNRCC coverage of the Lower Neches River Basin and Neches-Trinity Coastal Basin. LNVA's fixed station monitoring program provides long-term collection of physicochemical, biological and hydrologic data on 19 fixed locations bimonthly, or 6 visits per year. These locations were identified by LNVA to maximize coverage in the assessment area and reduce duplication of effort. Annually, LNVA's Clean Rivers Program Steering Committee is provided with the upcoming year's monitoring activities for approval. The parameters for the fixed-station monitoring include the following: water temperature, pH, dissolved oxygen (DO), % saturation of DO, conductivity, total dissolved solids, weather and stream observations, ammonia-nitrogen, nitrite+nitrate-nitrogen, total and ortho-phosphorous, total alkalinity, chloride, total hardness, fecal coliform and turbidity. Table 1 lists the fixed station monitoring sites and segment numbers. For LNVA's Assessment Area Map see Figure 1.

Table 1

Segment	Station Id	Description	Lat./Long.	County
0602	10581	Neches River at FM 1013 near Spurger, Texas	30 40 45/94 05 24	Jasper
	15343	Neches River near Lakeview Community	30 13 00/94 06 00	Orange
0603	10484	Sandy Creek at FM 777 near Beech Grove Community	30 52 00/94 06 50	Jasper
	15344	Wolf Creek at FM 256 near Emille, Texas	30 51 46/94 16 09	Tyler
0607	15346	Little Pine Island Bayou at FM 326 north of Sour Lake, Texas	30 11 23/94 23 23	Hardin
	15367	Pine Island Bayou at FM 770 near Batson, Texas	30 15 27/94 34 07	Hardin
	15345	Willow Creek at unnamed rd. near Nome, Texas	30 03 42/94 26 09	Jefferson
	10599	Pine Island Bayou at LNVA Neches 1 st Lift, Bmt.	30 10 15/94 09 16	Jefferson
	10607	Pine Island Bayou at Old Sour Lake Road south of Sour Lake	30 06 21/94 20 04	Jefferson
	10602	Pine Island Bayou at US 69/96	30 10 43/94 11 09	Hardin
0608	15355	Big Sandy Creek at US 190 at Alabama Coushatta Indian Reservation	30 43 00/94 43 00	Polk
	15349	Hickory Creek at US 69, south of Warren, Texas	30 33 38/94 24 04	Tyler
	15346	Turkey Creek at FM 1013 near Hillister, Texas	30 40 34/94 20 56	Tyler
	15355	Beech Creek at FM 1943 near Fred, Texas	30 33 42/94 14 58	Tyler
	13625	Village Creek at FM 418 near Kountze, Texas	30 23 54/94 15 45	Hardin
	15352	Cypress Creek at US 69 at Kountze, Texas	30 21.04/94 17 32	Hardin
0609	10610	Angelina River at SH 63, northwest of Jasper, TX	31 00 48/94 09 42	Jasper
0701	10699	Taylor Bayou at LaBelle Rd., LaBelle, TX	29 52 28/94 09 37	Jefferson
0704	10686	Hillebrandt Bayou at Humble Rd., near Fannet, TX	29 56 40/94 08 05	Jefferson

Figure 1
LNVA Assessment Area



TARGETED MONITORING PROGRAM

LNVA's targeted monitoring program is a data collection effort used to support TNRCC's permitting process. During FY 00-01, LNVA has collected flow measurements, total hardness, alkalinity and total suspended solids at the following locations; 16710-Pevitot Gully at Industrial Road, and 16711-Willow Marsh Bayou at Old Sour Lake Road. The objective of targeted monitoring allows TNRCC to set permit limits based on scientific data.

SYSTEMATIC SUB-WATERSHED MONITORING PROGRAM

Task 3.2-Systematic Sub-watershed monitoring for fecal coliform in the Village Creek watershed was initiated in FY 2000 due to concern derived from data screening in the 1999 Basin Summary Report – Lower Neches River Basin and subsequent 303(d) listing of several tributaries because bacteria levels exceeded the criterion established to assure the safety of contact recreation. The objective of the current systematic monitoring was to determine the prevailing conditions when elevated levels of bacteria occur. Data analysis for the 1999 Basin Summary Report indicated high fecal coliform densities could be correlated with high flow conditions. Therefore, the strategy developed for FY 00-01 was to monitor tributaries of Village Creek during low and high flow at the established fixed sites and additional locations isolated from permitted discharges and areas concentrated with septic tanks. To satisfy the monitoring objective 10 sites were required to provide the coverage needed. See Figure 2 for Village Creek sub-watershed map with locations.

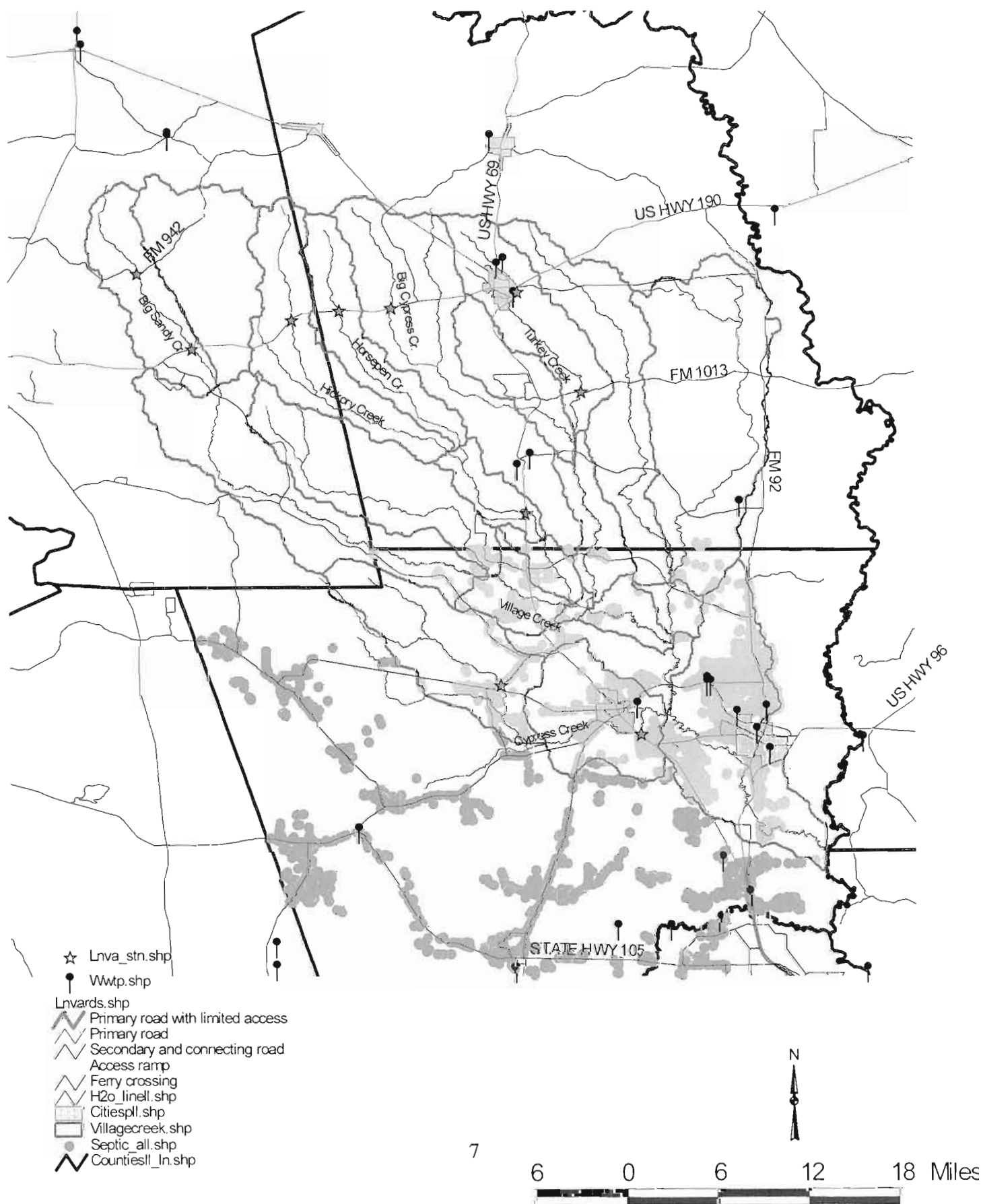
FY 2000

15349-Hickory Cr. at US 69
15353-Big Sandy Cr. at US 190
15354-Big Sandy Cr. at FM 942
16729-Woods Cr. at US 190
16727-Horsepen Cr. at US 190

FY 2001

15356-Turkey Cr. at FM 1013
14138-Turkey Cr. at Willow Rd.
15352-Cypress Cr. at US 69
16728-Cypress Cr. at FM 1003
16726- Big Cypress Cr. at US 190

Figure 2
Segment 0608
Village Creek Sub-watershed Map



DATA SUMMARY FOR SYSTEMATIC MONITORING

Five sites were sampled from October 1999 through August 2000. The remaining five locations are currently being monitored through August 2001. Thus far a total of fifteen sampling events monitoring fecal coliform (FC) and estimating stream discharge was conducted during wet and dry weather conditions. Additional samples were collected for fecal streptococcus (FS) analysis and used to calculate the FC/FS ratio. Many of these FC/FS ratios were less than the 0.77 maximum indicative of animal waste. However, results were inconclusive for determining the origin of the bacteria as either human or animal. Figures 3 and 4 show correlation of rainfall events and elevated fecal coliform densities. Several estimated flow measurements could not be made due to very low velocities, especially at Big Sandy Creek at FM 942 and Horsepen Creek at US 190, and were assigned a value of 0.1 cfs for graphing purposes. Generally, correlation of elevated bacteria and estimated flow was good, except at Hickory Creek and Woods Creek, see Figures 5 and 6. Hickory Creek is the furthest most downstream location and runoff from a rain event would arrive after a sampling event that caught the runoff from sites upstream. On the other hand, the elevated fecal coliform densities found at Woods Creek were not necessarily due to rainfall runoff. High fecal coliform densities were present during low and high flow regimes due to the proximal influence of pastureland.

The data indicates that during dry weather bacteria levels are very low and these levels peak during rainfall events. As mentioned earlier an exception is Woods Creek, which during dry weather bacteria levels were near the screening criteria of 400 colonies per 100 mL. The correlation of bacteria with flow on Hickory Creek was not obvious as with other sites. However, bacteria levels did peak on Hickory Creek after rainfall events separated by dry periods. After one year of monitoring fecal coliform in Segment 0608 it is apparent the elevated levels of bacteria are due to rainfall and subsequent flushing into the streams.

Figure 3
Fecal Coliform and Rainfall Trend

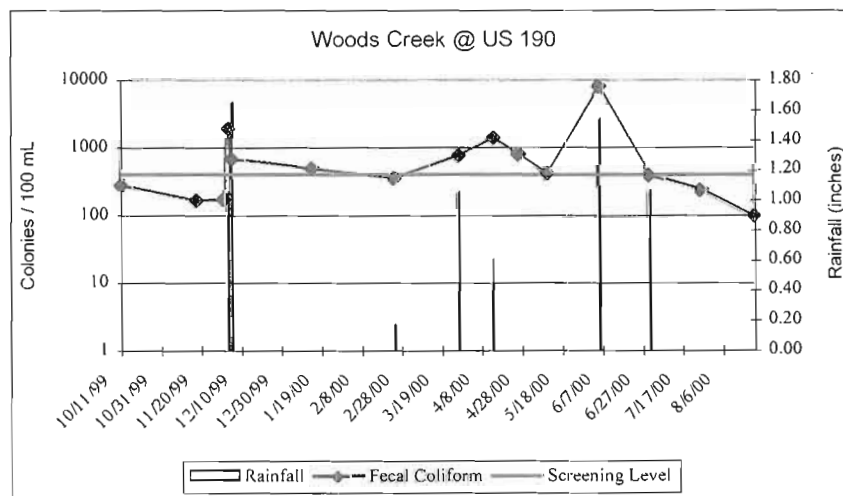
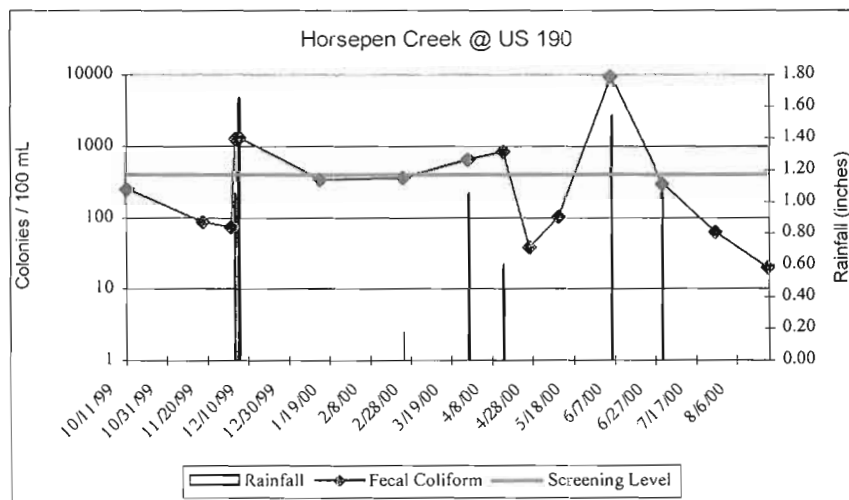
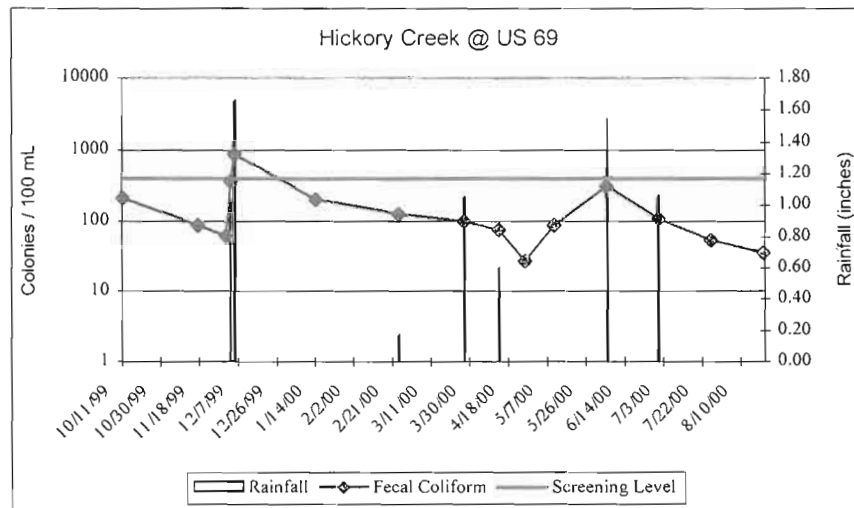


Figure 4
Fecal Coliform and Rainfall Trend

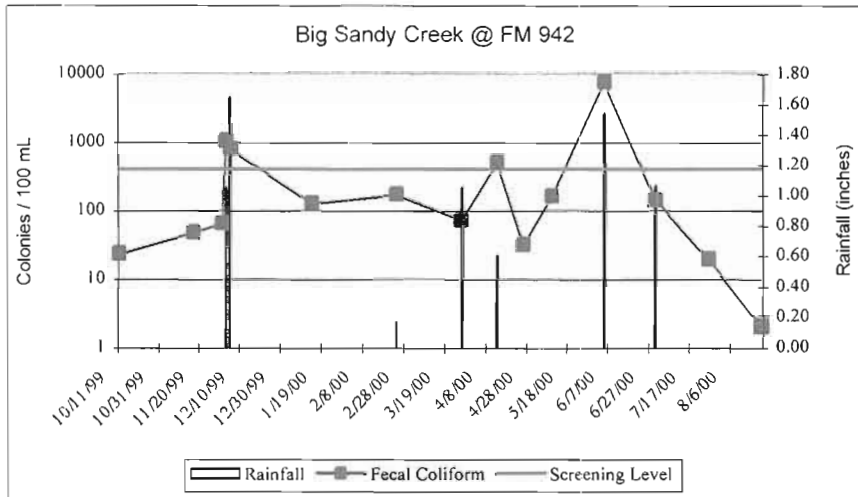
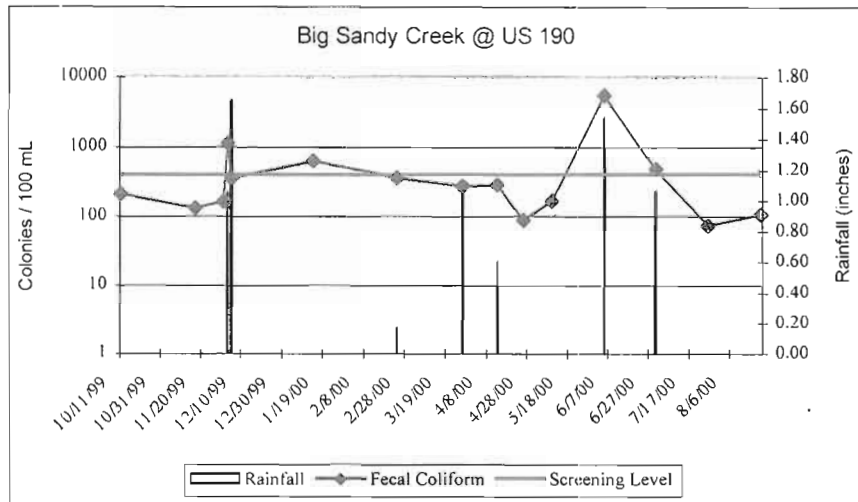


Figure 5
Fecal Coliform and Flow Correlation

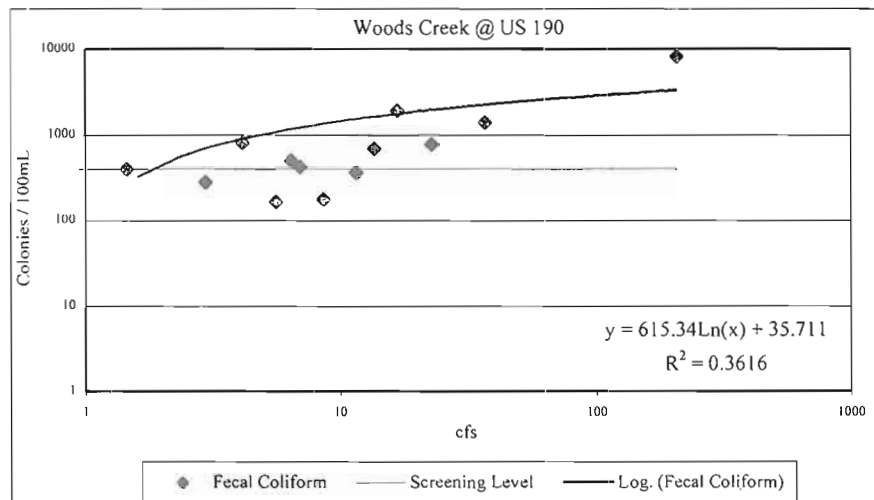
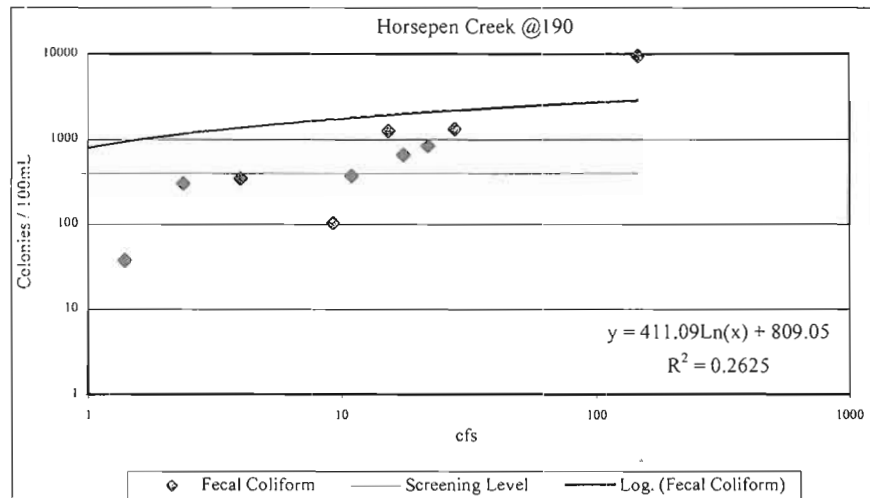
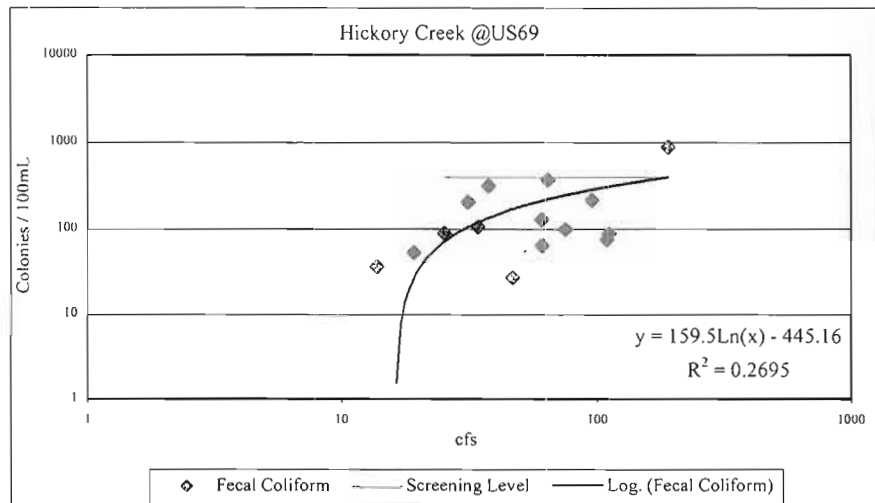
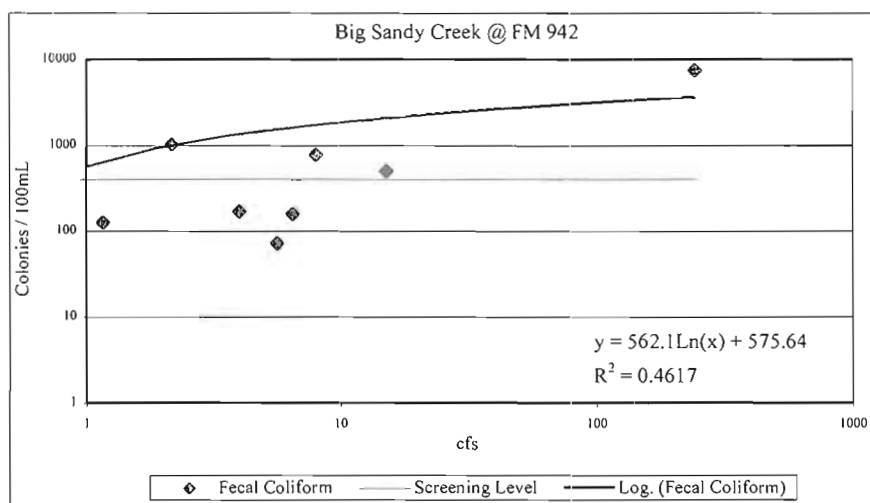
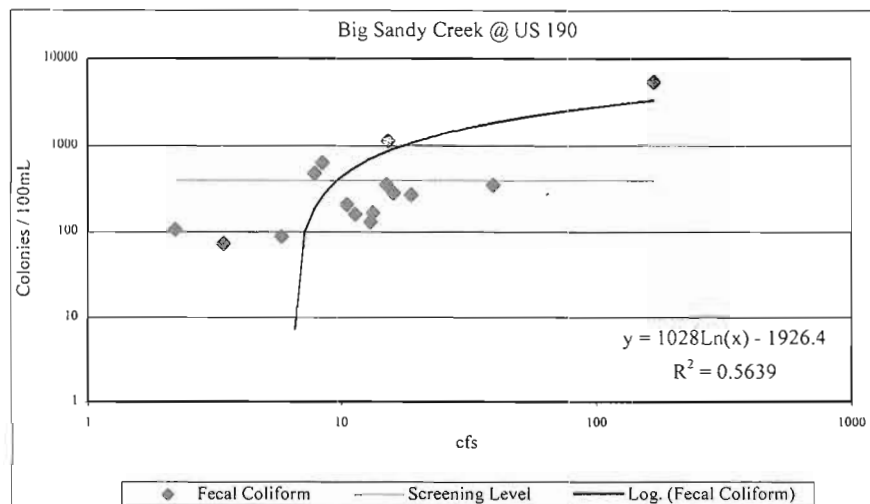


Figure 6
Fecal Coliform and Flow Correlation



SPECIAL STUDIES MONITORING PROGRAM

TAYLOR AND HILLEBRANDT BAYOUS

LNVA has selected Taylor Bayou (Segment 0701) and Hillebrandt Bayou (Segment 0704) as top priority for its special studies monitoring program. Each segment is included on the 1998 303(d) List for dissolved oxygen concentrations occasionally lower than its stream standard established to assure optimum conditions for aquatic life. The objective is to collect data that will determine if these waterbodies need to be de-listed for aquatic life. LNVA is in the process of collecting diurnal dissolved oxygen measurements at two fixed station sites monthly for one year. To supplement, LNVA also monitors the same two sites for the fixed station monitoring program to provide additional data.

CITY OF BEAUMONT

In addition to LNVA's monitoring on these bayous, the City of Beaumont and Jefferson County Drainage District # 6 (DD6) began sampling their storm water runoff in September 1999 as part of their Storm Water Management Program. Four monitoring locations completely within the Hillebrandt sub-watershed were chosen. Each of the four sites are situated just downstream of areas representing distinct types of landuse. Under the LNVA QAPP, grab samples will be used to monitor oil & grease, nutrients, total hardness, and fecal coliform concentrations. Along with grab samples field measurements for pH, DO, temperature and flow are collected. Upon completion of the data collection portion of this study a comprehensive model of constituent loading will be provided by the City of Beaumont and DD6 to LNVA and TNRCC.

It is anticipated that this joint study will be mutually beneficial in several ways.

- The CRP will have access to digital land use maps and drainage system sub-watershed delineation maps of Hillebrandt Bayou.
- Data collection activities will verify if potential impacts are non-point source related.
- Combined analyses of data for nutrients, and oxygen demand, land use and weather related flow data will aid in identifying the source of dissolved oxygen impairment.
- CRP will be provided a preliminary model of constituent loading.

- The permittees will benefit from the CRP data collected for routine monitoring, which will be used to evaluate the effectiveness of BMP's. Evaluation of this special study should ultimately be reflected in the water conditions of the receiving water itself.
- This study and monitoring activities are conducted under LNVA's QAPP ensuring compatibility of data

DATA SUMMARY FOR SPECIAL STUDIES

CITY OF BEAUMONT

The City of Beaumont has collected and submitted results of representative monitoring samples to LNVA for 5 storm events collected in the first year of the special study. The results of these analyses will be utilized in the development of static event mean concentration and estimated load concentration to Hillebrandt Bayou. This data will then be incorporated into a model that will be used in the determination of the influence of storm water runoff on water quality in the watershed. The model, coupled with surface water quality data collected by the LNVA, will be used to determine the relative response of the stream to storm water loading. Land use delineation and sub-watershed storm water runoff monitoring are necessary to estimate the loading from each land use category. The results of these analyses will be provided with the final model and study report.

Presently, delineation of sub-watersheds for the headwaters of Hillebrandt Bayou and land use is complete. These maps have been provided to LNVA and TNRCC and will serve as a source of spatial analysis for model data generation.

The LNVA and the City of Beaumont will cooperate in the final model production and generation of the special study final report at the end of FY 2001. The City will provide special analysis data, water quality data, and model structure to the LNVA for interpretation and comment. The LNVA will coordinate with the City and TNRCC in determination of future monitoring requirements for the purpose of completing and calibrating the model.

HILLEBRANDT BAYOU

Diurnal dissolved oxygen monitoring began September 1999 on Taylor and Hillebrandt Bayous. Initially the in-situ measurements were collected using a modified collection method of four (4)

samples taken at equally spaced time intervals from pre-dawn to post-dusk. This method was an alternative means to determine minimum and maximum dissolved oxygen concentrations. Beginning May 2000, 24 true one-hour interval diurnal measurements were initiated.

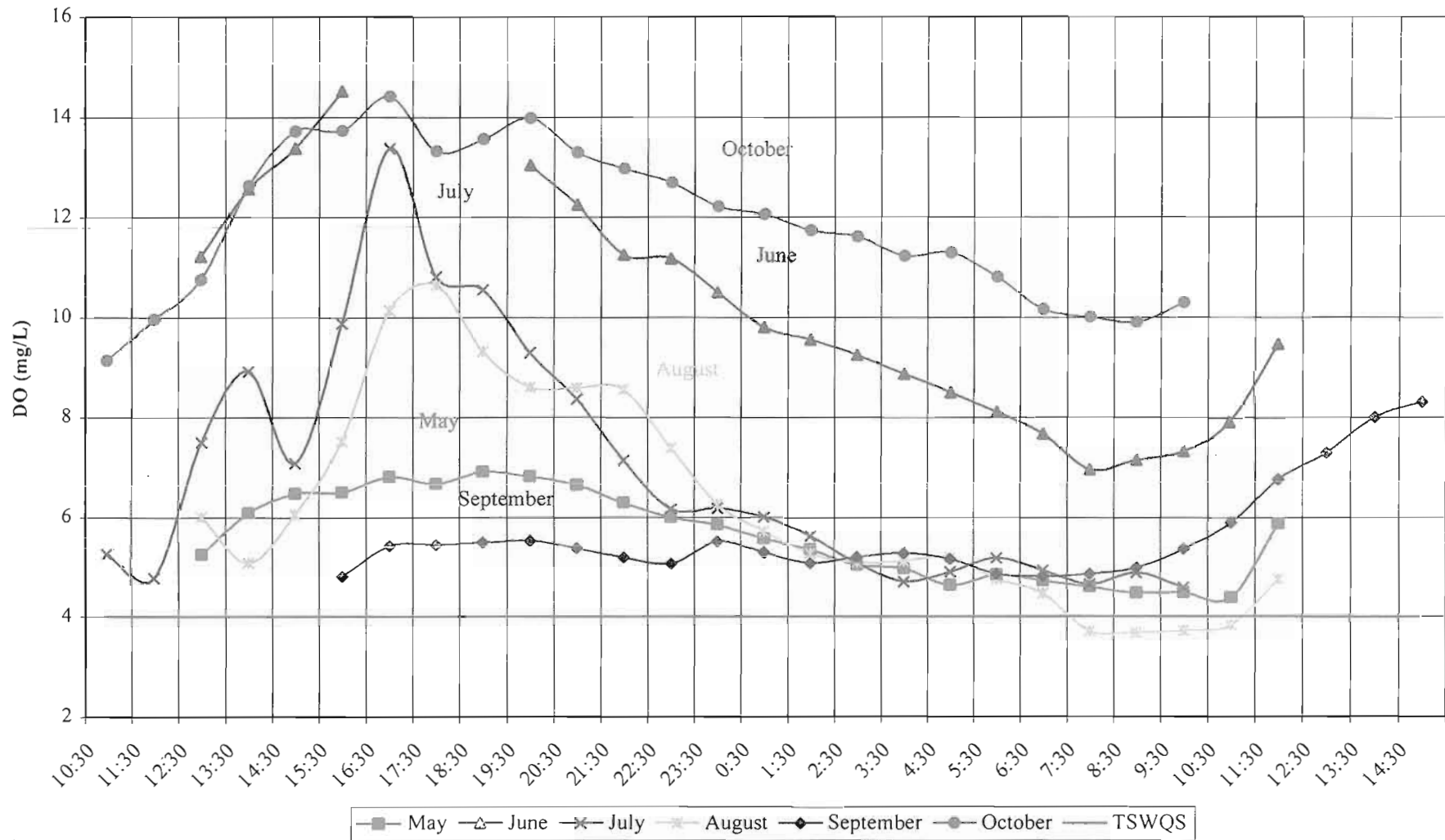
During the months of May 2000 through October 2000 maximum DO concentrations in Hillebrandt occurred by 4:30 pm and minimum concentrations around 8:00 am. As indicated in Figure 7, the minimum DO concentrations occur from 6:00 am to 10:30 am and correspond to when data had been collected for fixed station monitoring, hence the low values submitted thus far.

Hillebrandt Bayou, the major tributary to Taylor Bayou, experiences sluggish streamflow and is near stagnant most of the year due to tidal influences and a saltwater barrier located near the mouth of Taylor Bayou. Hillebrandt Bayou meanders southward from its headwaters in the western portion of the City of Beaumont through developed lands extending westward to its confluence with Taylor Bayou immediately west of the City of Port Arthur. Hillebrandt Bayou serves as a storm drainage system within Beaumont and is channelized for this purpose. The physical dynamics are conducive for algal blooms in summer yielding extreme swings in dissolved oxygen concentrations, as illustrated in Figure 7. Data presented in Table 2 are diurnal means and extremes on Hillebrandt Bayou from May 2000 through October 2000. The data indicate that the waterbody supports its intermediate aquatic life use, and should be removed from the State of Texas 303(d) List.

Table 2
Hillebrandt Bayou Diurnal Means and Extremes

<i>Date</i>	<i>Minimum DO</i>	<i>Maximum DO</i>	<i>Average DO</i>
5/24-25/00	4.38	6.91	5.64
6/22-23/00	6.96	14.52	10.03
7/19-20/00	4.59	13.39	6.92
8/22-23/00	3.68	10.65	6.23
9/25-26/00	4.81	8.32	5.63
10/17-18/00	9.15	14.42	11.90

Figure 7
LOWER NECHES VALLEY AUTHORITY
24-hour_DO - Hillebrandt Bayou



PUBLIC PARTICIPATION

LNVA has continued to encourage public involvement in Clean Rivers through a number of educational programs and public events. Public awareness is given a high priority at LNVA, and there have been several opportunities to enhance this effort.

One program that has become a valuable educational tool is the Major Rivers Program. LNVA purchases and delivers Major Rivers educational materials to area elementary schools. This program gives the fourth (4th) grade students the opportunity to learn about water and its cycle in an entertaining manner. For the 2000 – 2001 school year LNVA delivered 61 class sets and 46 students sets to 34 area schools. Approximately 2700 4th grade students will benefit from the Major Rivers this year.

Another educational effort LNVA supports through CRP is Forest Awareness Day. Forest Awareness Day is an event sponsored by the Texas Forest Service, with cooperation from LNVA and other state agencies, for area middle schools that gives students the opportunity to learn about water quality and other aspects of the environment as well. LNVA's part in this event is to show how water is monitored, why monitoring is so important, and what the students can do to help preserve water resources.

LNVA staff are involved as judges at science fairs at local schools. Science fair events give staff the chance to interact with students in 6th, 7th, and 8th grades. LNVA staff also judged the district fair were all the winners from the previous science fairs attended.

An event that involved people of all ages was the Neches River Clean-Up. This event was an effort to not only remove trash from the Neches River, but to get the public involved as well. If enough people take part in a program like this, the hope is that those same people will help keep the river and surrounding area clean.

These programs and events have not only been a valuable learning experience for the public, but for LNVA as well. A continuing effort will be made to improve and expand upon all of the public participation and education programs in the future. Information on the LNVA Clean Rivers Program can be found at <http://www.lnva.dst.tx.us>.