2013 BASIN HIGHLIGHTS REPORT

Lower Neches River Basin
Neches-Trinity Coastal Basin

Lower Neches Valley Authority

THE TEXAS CLEAN RIVERS PROGRAM

Prepared in cooperation with the
Texas Commission on Environmental Quality
under the authorization of the
Texas Clean Rivers Act

Lower Neches Basin Highlights

LNVA Receives $25,000 Grant to Monitor Additional Nutrients

The Lower Neches Valley Authority (LNVA) received a Clean Water Act (CWA) Section 106 Grant through the Clean Rivers Program (CRP) to fund the collection and analysis of additional nutrient parameters. These parameters include Total Kjeldahl Nitrogen (TKN) and Chlorophyll–a which are needed to support the development of nutrient surface water quality standards in Texas. All sampling and laboratory analysis methods are specified in a Quality Assurance Project Plan (QAPP) that was approved by the Texas Commission on Environmental Quality (TCEQ) and U.S. Environmental Protection Agency (EPA).

During Fiscal Years 2012-2013, approximately 196 nutrient samples will be collected by LNVA environmental staff and analyzed by Eastex Environmental Laboratory located in Coldspring, Texas. These samples are collected on a quarterly basis at LNVA's routine monitoring stations to complement the existing monitoring efforts in the Lower Neches River Basin and the Neches-Trinity Coastal Basin.

The nutrient data and related water quality constituents collected through this effort are needed by the TCEQ to analyze correlations between parameters to evaluate how nutrients influence aquatic vegetation, pH, and dissolved oxygen concentrations. In addition, the information is needed to evaluate the overall variability of nutrients in streams and reservoirs of Texas.

The following 25 surface water quality monitoring (SWQM) stations are included in the CRP Nutrients Project. Maps of these stations are available on the following pages.

 # 10484: Sandy Creek at FM 777

 # 15344: Wolf Creek at FM 256

 # 10610: Angelina River at SH 63

 # 10581: Neches River at FM 1013

 # 15343: Neches River near Lakeview

 # 20774: Neches River at LNVA Salinity Station Y

 # 10599: Pine Island Bayou at LNVA Lower Pump Station

 # 10602: Pine Island Bayou at US 69/96/287

 # 10607: Pine Island Bayou at Old Sour Lake Road

 # 15367: Pine Island Bayou at SH 105/FM 770 near Batson

 # 15346: Little Pine Island Bayou at SH 326

 # 15347: Little Pine Island Bayou at FM 770

 # 15345: Willow Creek near SH 326

 # 13625: Village Creek at FM 418

 # 20314: Village Creek at McNeely Road

 # 20315: Village Creek at Neches River confluence

 # 15355: Beech Creek at FM 1943

 # 15352: Cypress Creek at US 69/287

 # 15349: Hickory Creek at US 69

 # 15356: Turkey Creek at FM 1013

 # 15350: Turkey Creek at Gore Store Road

 # 15353: Big Sandy Creek at US 190

 # 20316: Big Sandy Creek at FM 1276

 # 10669: Taylor Bayou at Labelle Road

 # 10687: Hillebrandt Bayou at SH 124

Stakeholder Participation & Public Outreach

LNVA's Clean Rivers Program Steering Committee brings together basin stakeholders from government agencies, industry, agricultural interests, universities, and a tribal nation to discuss water quality issues. The primary objectives of the basin Steering Committee are to assist LNVA with the development of realistic water quality goals, review and develop work plans, share resources, and establish monitoring priorities.

The Steering Committee meets annually to discuss a wide range of topics and meeting agendas are developed with their input. Additional information about LNVA's Steering Committee is available on the Clean Rivers Program section of the LNVA website. This information includes how to get involved in the basin stakeholder process, and Steering Committee meeting agendas and meeting summaries.

LNVA supplies the Major Rivers Water Education Program to many 4th & 5th grade classrooms in the basin. The Major Rivers' curriculum is designed to help students learn about Texas' major water resources, how water is treated and delivered to our homes and schools, and how to care for our precious water resources and use them wisely. During the 2012-2013 school year, LNVA supported 990 students through this water education program.

The LNVA website has a Clean Rivers Program web page for easy public access. The Clean Rivers page provides an overview of the program, Steering Committee meeting information, basin water quality reports, QAPPs, basin monitoring schedule with maps, work plan summary, long-term plan, access to the SWQM data, statewide coordinated monitoring schedule (CMS), volunteer monitoring programs, and Major Rivers website. Please visit our website at http://www.lnva.dst.tx.us/ to learn more about LNVA and the Clean Rivers Programs.

Water Quality Monitoring Programs

LNVA FY 2013 Monitoring Program

LNVA's current FY 2013 monitoring schedule includes 30 routine stations in the Lower Neches River and Neches-Trinity Coastal Basins, or Basins 6 and 7, respectively. Quarterly monitoring provides important water quality data used to identify long-term trends and assess the overall water quality conditions in the two basins. Routine water quality monitoring parameters include the following:

Alkalinity measures carbonate/bicarbonate ions to determine the buffering or neutralizing capacity of water. Low alkalinity (<20 mg/L) water has a limited ability to resist changes in pH, therefore it's more susceptible to acidification and low pH.

Total Hardness measures calcium and magnesium ions as calcium carbonate ($CaCO_3$). It's important when determining the toxicity of heavy metals on aquatic biota. Generally, the higher the hardness in water, the lower the toxicity.

Nitrogen occurs in natural waters in various forms, including nitrate (NO_3), nitrite (NO_2), and ammonia (NH_3).

Nitrate (NO_3) generally occurs in trace quantities in surface water. It is the essential nutrient for many photosynthetic autotrophs and has been identified as the growth limit nutrient. When nitrate concentrations become excessive, however eutrophication and associated algal blooms can be become a problem.

Nitrite (NO_2) is extremely toxic to aquatic life, however it is usually present only in trace amounts in most natural freshwater systems because it is rapidly oxidized to nitrate. In sewage treatment plants using nitrification process to convert ammonia to nitrate, the process may be impeded, causing discharge of nitrite at elevated concentrations into receiving waters.

Ammonia (NH_3) is one of the most important pollutants in the aquatic environment because of its relatively highly toxic nature and its ubiquity in surface water systems. It is discharged in large quantities in industrial, municipal and agricultural wastewaters.

Organic nitrogen and ammonia can be determined together and are referred to as *Total Kjeldahl Nitrogen (TKN)*, a term that reflects the technique used in their determination. Organic nitrogen is the byproduct of living organisms. It includes such natural materials as proteins and peptides, nucleic acids and urea, and numerous synthetic organic materials. Typical organic nitrogen concentrations vary from a few hundred micrograms per liter in some lakes to more than 20 mg/L in raw sewage (19th edition, Standard Methods, 1995).

Phosphorus is often the limiting nutrient for plant growth, meaning it is in short supply relative to nitrogen. Phosphorus usually occurs in nature as phosphate. Phosphate that is bound to plant or animal tissue is known as organic phosphate. Phosphate that is not associated with organic material is known as inorganic phosphate. Both forms are present in aquatic systems and may be either dissolved in water or suspended. Testing for total phosphorous (both inorganic and organic phosphate) provides a more complete measure of all the phosphorus that is actually in the water.

Pine Island Bayou at the LNVA Lower Pump Station

Turbidity measures the cloudiness of water. Cloudiness is caused by suspended solids (mainly soil particles) and plankton (microscopic plants and animals) that are suspended in the water column. Moderately low levels of turbidity may indicate a healthy, well-functioning ecosystem, with moderate amounts of plankton present to fuel the food chain.

Sulfate can be dissolved in any natural waters. Concentrations of this ion usually vary greatly from one watershed to another due to the natural availability in rocks and soils. Sulfate results (annual averages) are compared to the general use criteria of the surface water quality standards which are segment specific. Excessive amounts of sulfate can cause taste and odor problems in water treatment, and scaling in boilers and heat exchangers used for industrial purposes.

Chloride is found in all watersheds to some degree. Concentrations can vary naturally, usually increasing as the mineral content increases. Chlorides can be introduced by sewage effluent and discharge from oil field activity. Small amounts of chloride are required for normal cell function in plant and animal life, however, high levels of chlorides can corrode metals and affect the taste of food products. Therefore, water that is used in industry or proc-

Water Quality Monitoring Programs

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essed for any use has a recommended maximum chloride level. Chloride surface water quality standards are segment specific and based on the annual average.

Conductivity is a measure of how well water can pass an electrical current. It is an indirect measure of the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, phosphate, sodium, magnesium, calcium, iron and aluminum. The presence of these substances increases the conductivity of a body of water.

Inorganic *Total Dissolved Solids (TDS)* are essential ingredients for aquatic life. They regulate the flow of water in and out of organisms' cells and are building blocks of the molecules necessary for life. A high concentration of total dissolved solids, however, can cause water balance problems for aquatic organisms and decrease dissolved oxygen levels. TDS water quality standards are segment specific and based on the annual average.

Dissolved Oxygen (DO) in water is expressed as a concentration. The DO concentration in a stream is the mass of the oxygen gas present, in milligrams per liter of water. Milligrams per liter (mg/L) can also be expressed as parts per million (ppm).

The concentration of dissolved oxygen in a stream is affected by many factors:

Temperature: Oxygen is more easily dissolved in cold water.

Flow: Oxygen concentrations vary with the volume and velocity of water flowing in a stream. Faster flowing white water areas tend to be more oxygen rich because more oxygen enters the water from the atmosphere in those areas than in slower, stagnant areas.

Aquatic Plants: The presence of aquatic plants in a stream affects the dissolved oxygen concentration. Green plants release oxygen into the water during photosynthesis. Photosynthesis occurs during the day when the sun is out and ceases at night. Thus in streams with significant populations of algae and other aquatic plants, the dissolved oxygen concentration may fluctuate daily, reaching its highest levels in the late afternoon. Because plants, like animals, also take in oxygen, dissolved oxygen levels may drop significantly by early morning.

Altitude: Oxygen is more easily dissolved into water at low altitudes than at high altitudes.

Dissolved or suspended solids: Oxygen is also more easily dissolved into water with low levels of dissolved or suspended solids.

Human Activities Affecting DO: Removal of riparian vegetation may lower oxygen concentrations due to increased water temperature resulting from a lack of canopy shade and increased suspended solids resulting from erosion of bare soil.

Typical urban human activities may lower oxygen concentrations. Runoff from impervious surfaces bearing salts, sediments and other pollutants increases the amount of suspended and dissolved solids in stream water.

Organic wastes and other nutrient inputs from sewage and industrial discharges, septic tanks, and agricultural and urban runoff can result in decreased oxygen levels. Nutrient input often leads to excessive algal growth. When the algae die, the organic matter is decomposed by bacteria. Bacterial decomposition consumes a great deal of oxygen.

In streams that have been impacted by any of the above factors, summer is usually the most crucial time for dissolved oxygen levels because stream flows tend to lessen and water temperatures tend to increase. In general, DO levels less than 3 mg/L are stressful to most aquatic organisms. Most fish die at 1-2 mg/L. However, fish can move away from low DO areas. Water with low DO from 2 – 0.5 mg/L are considered hypoxic; waters with less than 0.5 mg/L are anoxic.

Freshwater streams with high DO concentrations (> 5 mg/L) are considered healthy streams. They are able to support a greater diversity of aquatic organisms. In Texas, freshwater streams and reservoirs with high aquatic life use standards (24-hour average) must be ≥ 5.0 mg/L and tidal streams must be ≥ 4.0 mg/L. However, all streams and reservoirs must be ≥ 3.0 mg/L for the entire 24-hour period.

pH is an important limiting chemical factor for aquatic life. If the water in a stream is too acidic or basic, the H+ or OH- ion activity may disrupt aquatic organisms biochemical reactions by either harming or killing the stream organisms.

pH is expressed in a scale with ranges from 1 to 14. A solution with a pH less than 7 has more H+ activity than OH-, and is considered acidic. A solution with a pH value greater than 7 has more OH- activity than H+, and is considered basic. The pH scale is logarithmic, meaning that as you go up and down the scale, the values change in factors of ten. A one-point pH change indicates the strength of the acid or base has increased or decreased tenfold.

Streams generally have pH values ranging between 6 and 9, depending upon the presence of dissolved substances that come from bedrock, soils and other materials in the watershed.

Changes in pH can change the aspects of water chemistry. For example, as pH increases, smaller amounts of ammonia are needed to reach a level that is toxic to fish. As pH decreases, the concentration of metal may increase because higher acidity increases their ability to be dissolved from sediments into the water.

E. coli in freshwater and *Enterococci* in saltwater are indicator bacteria that are not usually disease-causing agents themselves. However, high concentrations suggest the presence of disease-causing organisms. *E. coli* and Enterococci sample results indicate the probability of finding pathogenic organisms in a stream or reservoir. The primary contact recreation use criteria is based on the geometric mean for *E. coli* (126/100mL) and Enterococci (35/100mL).

Water Quality Monitoring Programs

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Chlorophyll is the photosynthetic, green pigment found in most plants, algae, and cyanobacteria. The concentration of chlorophyll *a* is used to estimate phytoplankton biomass in surface water. In aquatic environments, enhanced growth of choking aquatic vegetation or phytoplankton (e.g. algal blooms) disrupts normal functioning of the ecosystem, causing a variety of problems such as a lack of oxygen in the water.

The effects of *metals in water* and wastewater range from beneficial through troublesome to dangerously toxic. Some metals are essential, others may adversely affect water consumers, wastewater treatment systems, and receiving waters. Some metals may be either beneficial or toxic, depending on the concentration (19th Edition, Standard Methods, 1995).

Not all metals are acutely toxic in small concentrations. The "heavy metals" include copper (Cu), iron (Fe), cadmium (Cd), zinc (Zn), mercury (Hg), and lead (Pb) which are the most toxic to aquatic organisms. Some water quality characteristics which affect metal toxicity include temperature, pH, hardness, alkalinity, suspended solids, redox potential and dissolved organic carbon. Metals can bind to many organic and inorganic compounds which reduces the toxicity of the metal.

Mercury is found in the environment as a result of natural and human activities. The amount of mercury that cycles in the environment has increased since the industrial age. The main source of mercury is air emissions from power generation and other industrial and waste disposal activities. During its movement among the atmosphere, land, and water, mercury undergoes a series of complex chemical transformations. One of the products of these transformations is an organic form called methylmercury.

Methylmercury is easily absorbed into the living tissue of aquatic organisms and is not easily eliminated. Therefore, it accumulates in predators. The degree to which mercury is transformed into methylmercury and transferred up the food chain through bioaccumulation depends on many site-specific factors (such as water chemistry and the complexity of the food web) through processes that are not completely understood (U.S. EPA Human Health Criteria - Methylmercury Fish Tissue Fact Sheet, Jan. 2001).

TCEQ FY 2013 Monitoring Program

During FY 2013, the TCEQ Regional Offices in Beaumont (Region 10) and Houston (Region 12) are monitoring 20 stations in the Lower Neches River Basin (6) & Neches-Trinity Coastal Basin (7). Any changes to the FY 2013 schedule were discussed at the Neches River Basin Coordinated Monitoring Meeting (CMM) hosted by LNVA in April 2012.

In Segment 0601: Neches River Tidal, fish tissue sampling was removed from the CMS by Region 10 at Stations 10570 and 10575. However, metals in sediment will be collected at five stations and organics in water at two stations (see Segment 0601 map/table on page 12).

In Segment 0701D: Shallow Prong Lake, metals in water is collected quarterly at Station 10642 (see Segment 0701 map/table on page 21). A special study to collect ambient toxicity in water, ambient toxicity in sediment, and metals in sediment will continue at Stations 10643 and 14411 in Segment 0702A: Alligator Bayou (see Segment 0702 map/table on page 22) to address aquatic life use impairments due to water acute toxicity and sediment toxicity. Also, in Segment 0702: Intracoastal Waterway Tidal, TCEQ Region 12 is collecting benthics, metals in sediment, bacteria, and conventional parameters at Station 15233 for the Galveston Bay System Dioxin & PCBs Survey.

For additional information on the FY 2013 basin-wide monitoring schedule, please visit the statewide CMS website at the following address: https://cms.lcra.org/.

TCEQ Screening Levels for Nutrient Parameters

Water Body Type	Nutrients	Screening Levels
Freshwater Stream	Ammonia-Nitrogen	0.33 mg/L
	Nitrate-Nitrogen	1.95 mg/L
	Ortho-Phosphate	0.37 mg/L
	Total Phosphorus	0.69 mg/L
	Chlorophyll a	14.1 µg/L
Reservoir	NH3-N	0.11 mg/L
	NO3-N	0.37 mg/L
	OP	0.05 mg/L
	TP	0.20 mg/L
	Chl a	26.7 µg/L
Tidal Stream	NH3-N	0.46 mg/L
	NO3-N	1.10 mg/L
	OP	0.46 mg/L
	TP	0.66 mg/L
	Chl a	21.0 µg/L
Estuary	NH3-N	0.10 mg/L
	NO3-N	0.17 mg/L
	OP	0.19 mg/L
	TP	0.21 mg/L
	Chl a	11.6 µg/L

Summary of Water Quality Conditions

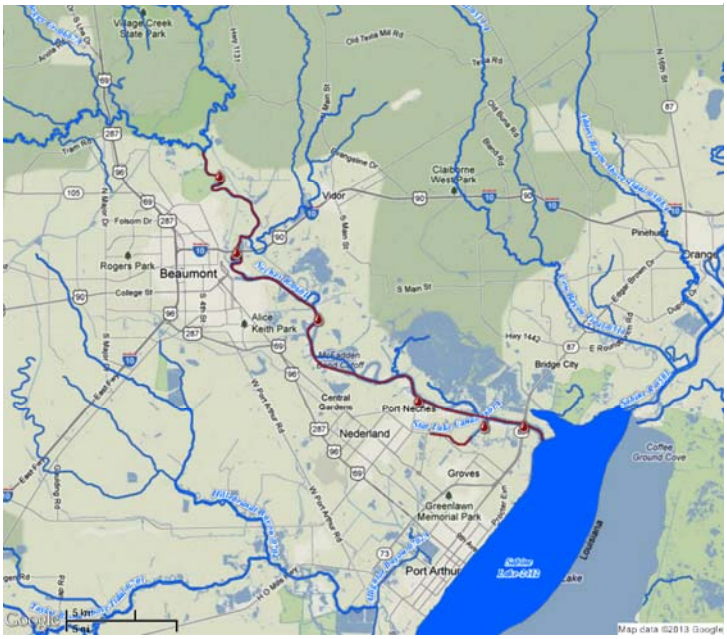
The *Texas Integrated Report of Surface Water Quality* describes the status of the state's waters, as required by Sections 305(b) and 303(d) of the federal Clean Water Act. It summarizes the condition of the state's surface waters, including concerns for public health, fitness for use by aquatic species and other wildlife, and specific pollutants and their possible sources. The Integrated Report consists of the Texas Water Quality Inventory and 303(d) List of impaired water bodies based on historical water quality data.

State water quality assessment reports are completed every two years, in even numbered years, and must be approved by the EPA. For 2012, TCEQ included data collected during the most recent seven-year period (December 1, 2003 to November 30, 2010). If needed, up to ten years of data were included to attain a minimum number of samples for assessment.

The Draft 2012 Texas Integrated Report was approved for submission by the TCEQ on Feb. 13, 2013. EPA approved the 2012 Texas 303(d) List on May 9, 2013. Water bodies included on the 2012 303(d) List are not meeting current water quality standards and therefore do not support their designated uses. Water bodies may also have concerns for use attainment and established screening levels which are part of the *2012 Texas Water Quality Inventory*. Additional information from TCEQ, including the *Draft 2012 Texas Integrated Report*, is available on-line at the following address: http://www.tceq.texas.gov/waterquality/assessment/waterquality/assessment/12twqi/twqi12

A summary of the water quality impairments and concerns are listed below in the bullets for each segment located in the Lower Neches River and Neches-Trinity Coastal Basins. A list of special projects designed to address any impairments and/or concerns is provided for each basin. Additional information on special projects is available online at: https://cms.lcra.org/special.aspx

SEGMENT 0601: Neches River Tidal Map



Segment 0601: Neches River Tidal

The Neches River Tidal, Segment 0601, is defined in the *Texas Surface Water Quality Standards* (TSWQS) as a river segment from the confluence with Sabine Lake in Orange County to the Neches River Saltwater Barrier, which is at a point 0.8 kilometers (0.5 miles) downstream of the confluence of Pine Island Bayou, [a point 11.3 kilometers (7.0 miles) upstream of IH 10] in Orange County. The segment boundary is 27 miles long. A tributary or unclassified segment called Star Lake Canal (0601A) is three miles in length.

The Neches River Tidal segment, below the Interstate 10 bridge crossing in Beaumont, is highly industrialized, consisting primarily of a navigation channel from the mouth of the river to the Port of Beaumont, which is maintained by the U.S. Army Corps of Engineers. This navigation channel has been dredged to 40 feet deep and widened to 400 feet in order to accommodate marine traffic and large vessels.

Segment 0601 is classified as a tidal stream segment with intermediate aquatic life use and primary contact recreation use designations. Located on the most southerly end of the Neches River, hydrologic influences on this segment include tidal exchange and freshwater inflows. This segment is where Level IV Ecoregions Northern Humid Gulf Coastal Prairies (34a) and Texas-Louisiana Coastal Marshes (34g) converge.

The area has sandy, silt, and clayey substrates, and consists of low, flat plains with some of the area being tidal marshes with bayous. Land use is primarily oil and gas production, along with marshland, wildlife and waterfowl habitat, cropland, and urban and industrial uses. High population cities located along Segment 0601 include Beaumont, Nederland, and Port Neches/Groves.

The LNVA and TCEQ monitor water quality at 6 routine stations on this segment (see page 12). Historical water quality concerns and impairments include elevated bacteria, nutrients, depressed dissolved oxygen and organics in water.

- Not supporting contact recreation use due to bacteria in the Neches River Tidal
- Not supporting fish consumption use due to PCBs in edible tissue (entire segment)
- Concern for bacteria in the lower assessment unit (AU_01)

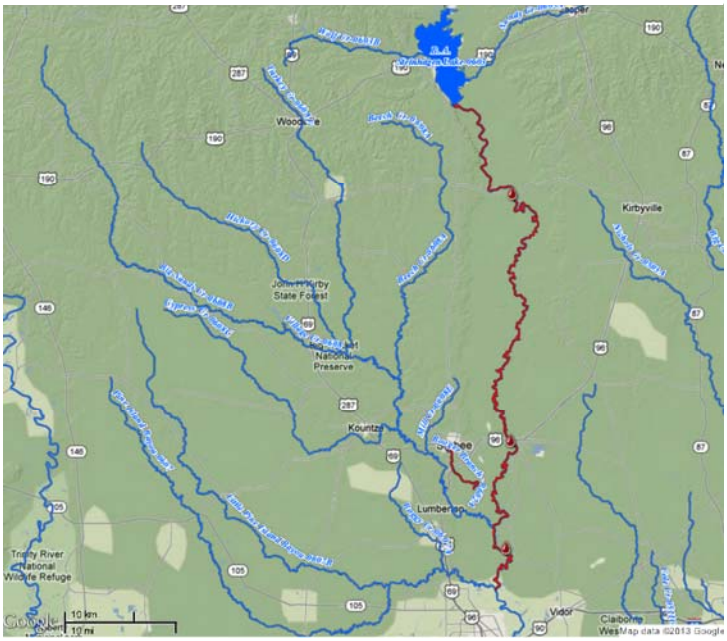
Segment 0601A: Star Lake Canal

Star Lake Canal (0601A) is a tidally influenced, dredged canal that receives industrial wastewater/stormwater and discharges into the Neches River Tidal. The canal was constructed in 1948 as an industrial outfall, and is currently used by local industry and manufacturing facilities. The primary flow in Star Lake Canal is due to tidal fluctuations and local discharges.

- Not supporting contact recreation use due to bacteria
- Concern for depressed dissolved oxygen in Star Lake Canal

Summary of Water Quality Conditions

SEGMENT 0602: Neches River below B.A. Steinhagen Lake Map



Segment 0602: Neches River below B.A. Steinhagen Lake

The Neches River below B.A. Steinhagen Lake, Segment 0602, is a river segment from the Neches River Saltwater Barrier, which is at a point 0.8 kilometers (0.5 miles) downstream of the confluence of Pine Island Bayou, [a point 11.3 kilometers (7.0 miles) upstream of IH 10] in Orange County to Town Bluff Dam in Jasper/Tyler County. Situated in a broad flood plain, the segment is 84 miles long. Major tributaries include Village Creek and Pine Island Bayou. Neches River flows are regulated by Dam "B" at Town Bluff and LNVA's Neches River Saltwater Barrier in the lower segment.

Segment 0602 is situated in the Level III Ecoregion known as South Central Plains, also termed the "piney woods". Soils are sandy loams, acidic sands, and some silty substrates, with poorly drained soils in the floodplains, flatwoods, and low terraces. Land use includes livestock agriculture, hunting leases, timber production, pasture production, recreation, wildlife habitat, oil and gas production, and some public land (Big Thicket National Preserve). Land cover includes mixed forest, evergreen forest, deciduous forest, pine plantations, and forested wetlands.

Public Boat Ramps at the Neches River Saltwater Barrier

Segment 0602 is designated for high aquatic life use, primary contact recreation use, and public water supply. Three routine SWQM stations are monitored quarterly by the LNVA and TCEQ (see page 13).

In March 2010, the Texas Dept. of State Health Services (DSHS) issued a fish consumption advisory for portions of the Neches River. This new advisory warns the public to limit their consumption of flathead catfish, freshwater drum, gar, largemouth bass, spotted bass, and white bass due to elevated levels of mercury in fish tissue samples taken from these six species. The advisory area includes the Neches River and all contiguous waters from the SH 7 bridge west of Lufkin downstream to the U.S. Hwy. 96 bridge near Evadale which is located in Segment 0602. The most likely source of elevated mercury in fish tissue affecting water bodies in East Texas is atmospheric deposition from coal burning power plants.

Additional Information on the fish consumption advisories in Texas can be found on the DSHS website at the following address: http://www.dshs.state.tx.us/seafood/survey.shtm#info.

- Not supporting fish consumption use due to mercury in edible tissue
- Concern for depressed dissolved oxygen
- Concern for mercury in edible tissue

Segment 0603: B.A. Steinhagen Lake

B.A. Steinhagen is a reservoir managed by the U.S. Army Corps of Engineers (USACE) and covers approximately 13,000 surface acres. It is situated in the piney woods area located along U.S. Hwy. 190 between Woodville and Jasper where it impounds the Neches River near the confluence with the Angelina River.

Along with Sam Rayburn Reservoir, it provides flood control for the lower Neches River Basin and generates hydroelectric power at the USACE Town Bluff Dam or "Dam B" which supplies freshwater downstream to LNVA and other users along the Neches River.

Soils in the segment are acidic and sandy which supports upland longleaf pine woodlands, longleaf pine savannas, and hardwood slope forests. Segment 0603 is largely represented by Level IV Ecoregion 35e called Southern Tertiary Uplands, which is more hilly than the Flatwoods to the south. Land use is primarily for timber production, public lands, pasture and livestock production, recreation and wildlife habitat. The land is covered by mixed forest, evergreen forest, deciduous forest, and pine plantations.

Summary of Water Quality Conditions

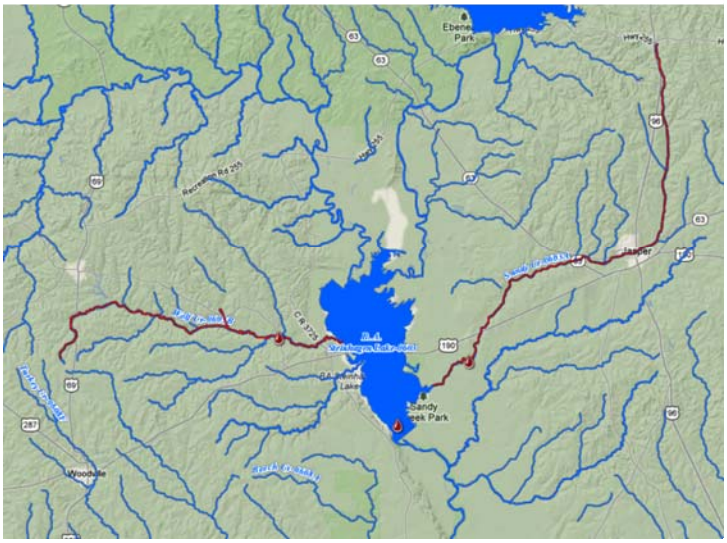
One station is monitored by TCEQ on Segment 0603 near the dam and LNVA performs routine water quality monitoring on Sandy Creek and Wolf Creek (see page 14).

The TDSHS (formerly Texas Department of Health) issued a fish consumption advisory in 1995 after elevated levels of mercury were found in largemouth bass, freshwater drum, white bass and hybrid/striped bass. Segment 0603 is listed on the 303(d) List as a category 5c water body for a Total Maximum Daily Load (TMDL) due to mercury in fish tissue; therefore, additional data and information will be collected before a TMDL is scheduled.

Mercury in edible fish tissue is a concern at the main pool by the dam and also in the remainder of the reservoir. The issue of mercury in fish tissue is regional, encompassing other water bodies in East Texas in addition to B.A. Steinhagen Lake and Sam Rayburn

B.A. Steinhagen Lake at Town Bluff Dam

SEGMENT 0603: B.A. Steinhagen Lake Map



Reservoir. The level of mercury contamination in fish tissue is the result of bioaccumulation, and there are no risks to the public in other recreational activities.

- Not supporting fish consumption use due to mercury in edible tissue

Tributaries in the segment include Wolf Creek and Sandy Creek. Wolf Creek drains areas of pine forest and pastureland, while Sandy Creek is a forested sub-watershed with pasturelands and its upper reaches drain the City of Jasper. Sandy Creek and Wolf Creek historically have elevated bacteria levels.

<u>Segment 0603A: Sandy Creek</u>

- Not supporting contact recreation use due to bacteria

<u>Segment 0603B: Wolf Creek</u>

- Not supporting contact recreation use due to bacteria

Segment 0607: Pine Island Bayou

Pine Island Bayou, Segment 0607, is from the confluence with the Neches River in Hardin/Jefferson County to FM 787 in Hardin County and is 81 miles in length. Major tributaries include Little Pine Island Bayou (0607B) and Willow Creek (0607C).

Pine Island Bayou has a large drainage area of 657 square miles. The segment is a natural streambed with sand and clay substrate from its headwaters to its confluence with the Neches River. Streams are low gradient and sluggish in this segment with sandy, silty substrates. Land use is timber production, pastureland, cattle production, and oil and gas production.

Soils are acidic and poorly drain after high rainfall events. The Level IV ecoregion is Flatwoods (35f), and physiography consists of flat plains, irregular plains, small, undrained depressions, and a

SEGMENT 0607: Pine Island Bayou Map

Summary of Water Quality Conditions

few surface mounds from salt domes. Seven SWQM stations are monitored by LNVA on a quarterly basis (see page 15).

In June 2008, TCEQ installed a Continuous Water Quality Monitoring Network (CWQMN) station on Pine Island Bayou near the Hwy. 69 bridge at LNVA's BI canal pump station. LNVA proposed the site in 2006 to address water quality issues in Pine Island Bayou. LNVA operates and maintains the station (CAMS 749) which uses YSI instruments equipped with multiple probes including optical DO and Turbidity. The station collects and transmits real-time data for the following parameters: dissolved oxygen, pH, water temperature, conductivity, TDS, turbidity, and water depth.

Historically, low DO measurements have been collected in the watershed and the segment has remained on the 303(d) List of impaired water bodies. Persistent low DO levels in the watershed are likely due to natural causes which are influenced by high ambient summer temperatures, low flow conditions, and decaying organic material.

- Not supporting aquatic life use due to depressed dissolved oxygen
- Not supporting contact recreation use due to bacteria
- Concern for depressed dissolved oxygen (screening level)

Segment 0607A: Boggy Creek

- Not supporting aquatic life use due to depressed dissolved oxygen
- Concern for impaired habitat in Boggy Creek
- Concern for depressed dissolved oxygen (screening level)

Segment 0607B: Little Pine Island Bayou

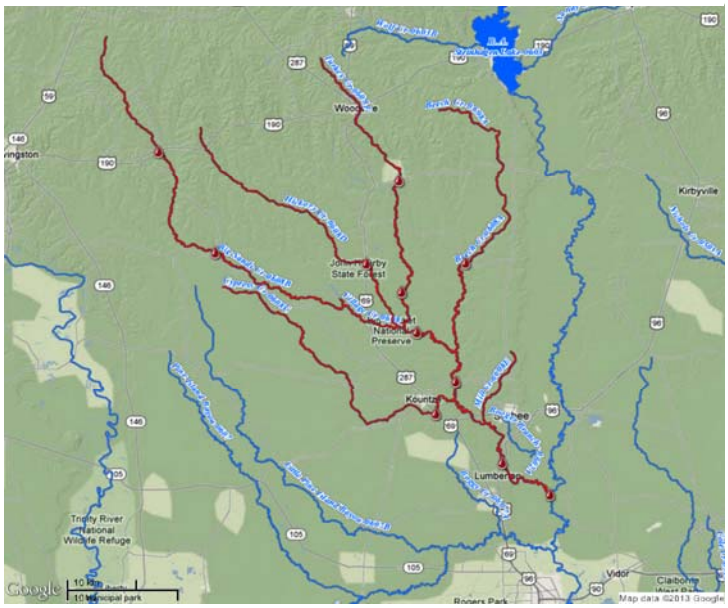
- Not supporting aquatic life use due to depressed dissolved oxygen
- Concern for depressed dissolved oxygen (screening level)

Segment 0607C: Willow Creek

Collecting In-stream Flow Measurements at Willow Creek

- Not supporting aquatic life use due to depressed dissolved oxygen
- Concern for depressed dissolved oxygen (screening level)

SEGMENT 0608: Village Creek Map



Segment 0608: Village Creek

The Village Creek classified stream segment is from the confluence with the Neches River in Hardin County to the confluence of Lake Kimball Dam in Hardin County. This segment is broad and covers over 200 miles in stream length. The Village Creek watershed has many tributaries draining approximately 1,113 square miles as it flows southeasterly to its confluence with the Neches River. Segment 0608 includes the following tributaries or unclassified segments: Beech Creek (0608A), Big Sandy Creek (0608B), Cypress Creek (0608C), Mill Creek (0608E), Turkey Creek (0608F), and Lake Kimball (0608G).

The Village Creek watershed lies entirely within the region of southeast Texas known as the Big Thicket. Segment 0608 is similar to Segment 0602 and 0603, in that it falls under the same South Central Plains, or "Piney Woods" ecoregion. Once thickly blanketed in pine and hardwood forests, now most of the area is covered by loblolly and shortleaf pine plantations. Village Creek State Park is located in Hardin County and covers more than 1,000 acres of thick forests. Land use is timber production, oil and gas extraction, pastureland, cattle production, recreational areas and public lands.

In this segment, LNVA monitors 10 routine SWQM stations quarterly and TCEQ monitors one station on Village Creek (see page 16).

Historical data assessments found a correlation between water quality concerns and stream flows in the segment. The pH levels

Summary of Water Quality Conditions

decreased as stream flows increased, and bacteria levels increased with stream flows. Low dissolved oxygen concentrations were correlated with low stream flows during the summer months. Decreasing pH levels with increasing stream flows indicate a flushing of backwater areas where decaying organic matter has depleted oxygen and tannic acids have lowered water pH levels.

In Sept. 2009, the Texas DSHS issued a fish consumption advisory for Village Creek. The advisory warns the public to limit their consumption of crappie, gar, and largemouth bass due to elevated levels of mercury in fish tissue samples taken from these three species. This advisory applies to the entire stream segment (0608). A fish consumption advisory was also issued in April 1999 for all fish species taken from Lake Kimball (0608G) due to high levels of mercury in fish tissue.

- Not supporting fish consumption use due to mercury in edible tissue
- Concern for mercury in edible tissue

Segment 0608A: Beech Creek

- Concern for impaired habitat and low pH

Segment 0608B: Big Sandy Creek

- Not supporting contact recreation use due to bacteria

Segment 0608C: Cypress Creek

- Not supporting aquatic life use due to depressed dissolved oxygen
- Concern for impaired habitat and low pH
- Concern for depressed dissolved oxygen (screening level)

Segment 0608E: Mill Creek

- Not supporting aquatic life use due to depressed dissolved oxygen

Segment 0608F: Turkey Creek

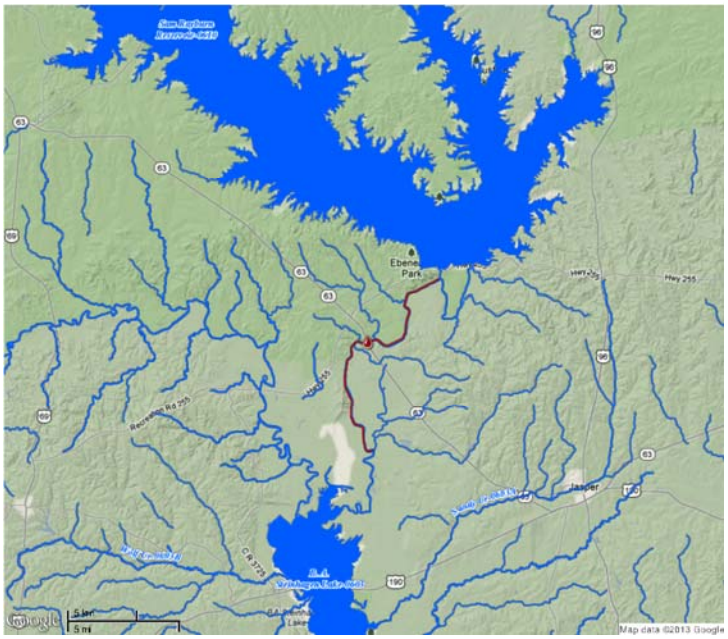
- Not supporting contact recreation use due to bacteria

Village Creek at the Neches River Confluence

Segment 0608G: Lake Kimball

- Not supporting fish consumption use due to mercury in edible tissue

SEGMENT 0609: Angelina River below Sam Rayburn Res. Map



Segment 0609: Angelina River below Sam Rayburn Reservoir

The Angelina River below Sam Rayburn Reservoir, Segment 0609, is from a point immediately upstream of its confluence with Indian Creek to the Sam Rayburn Reservoir Dam in Jasper County. The Angelina River ranges from 75-150 feet in width through this segment as it meanders through the rolling hills of the East Texas Piney Woods (Level III Ecoregion 35).

This river segment extends 13 miles from the tailrace below Sam Rayburn Dam towards the headwaters of B.A. Steinhagen Reservoir. Another 5.2 miles of old riverbed exists along the lower side of Sam Rayburn Dam upstream from the confluence with the tailrace. The drainage area is 107 square miles, with land use characterized as sparsely populated and heavily forested with minimal areas of non-irrigated cropland located in the southeast quadrant of the watershed.

The 153,000 acre Angelina National Forest borders the upper part of Segment 0609, and the land use includes recreational activities on public lands in the area. Flows are generally very high compared to other segments in the basin, especially during the almost daily water releases from the Sam Rayburn Dam. Fishing, boating, swimming and water skiing are very common in this segment. Segment 0609 is designated for primary contact recreation use, high aquatic life use, and public water supply.

Summary of Water Quality Conditions

LNVA monitors one SWQM station in this segment (see page 17).

- Fully supports all uses and no concerns are listed

Special Projects for River Basin 6

1. Pine Island Bayou Use Attainability Analysis (UAA) Project, 9/20/2005–10/1/2011; TCEQ sampling included 24hr DO, Habitat, Benthics, Nekton, Conventionals, Flow, Field
2. Aquatic Life Assessment (ALA) of Little Pine Island Bayou (0607B), 9/20/2005–10/1/2011; TCEQ sampling included 24hr DO, Habitat, Benthics, Nekton, Conventionals, Flow, and Field Parameters
3. Willow Creek, Cypress Creek, and Boggy Creek Use Attainability Analysis (UAA), 6/1/2007–10/15/2010; TCEQ performed limited sampling (24hr DO) and used the Pine Island Bayou UAA.
4. Pine Island Bayou Continuous Water Quality Monitoring (CWQM) Project, 6/10/2008–present; CWQM Station 749 is operated by LNVA. Real-time water quality parameters include Sample Depth, Surface Water Temperature, Specific Conductance, Turbidity, Total Dissolved Solids, Dissolved Oxygen, and pH. Real-time water quality data is available on-line at the following URL or web address: http://www.tceq.state.tx.us/cgi-bin/compliance/monops/water_daily_summary.pl?cams=749
5. Texas Department of State Health Services (DSHS) Quantitative Risk Characterization Project on B.A. Steinhagen Lake, 2/1/2010–8/31/11; DSHS conducted human health risk assessments on reservoirs where elevated concentrations of mercury in fish tissue have been identified by screening studies.
6. Clean Rivers Program Nutrient Monitoring Project, 10/25/2011– 8/31/2013; CWA Section 106 Grant allowed CRP to supplement the collection of additional nutrient parameters in select basins. LNVA collected total kjeldahl nitrogen (TKN) and chlorophyll-a at 25 routine stations in Basins 6 & 7.

Additional information on these special projects in River Basin 6 is available online at: https://cms.lcra.org/special.aspx

Angelina River below the Sam Rayburn Reservoir

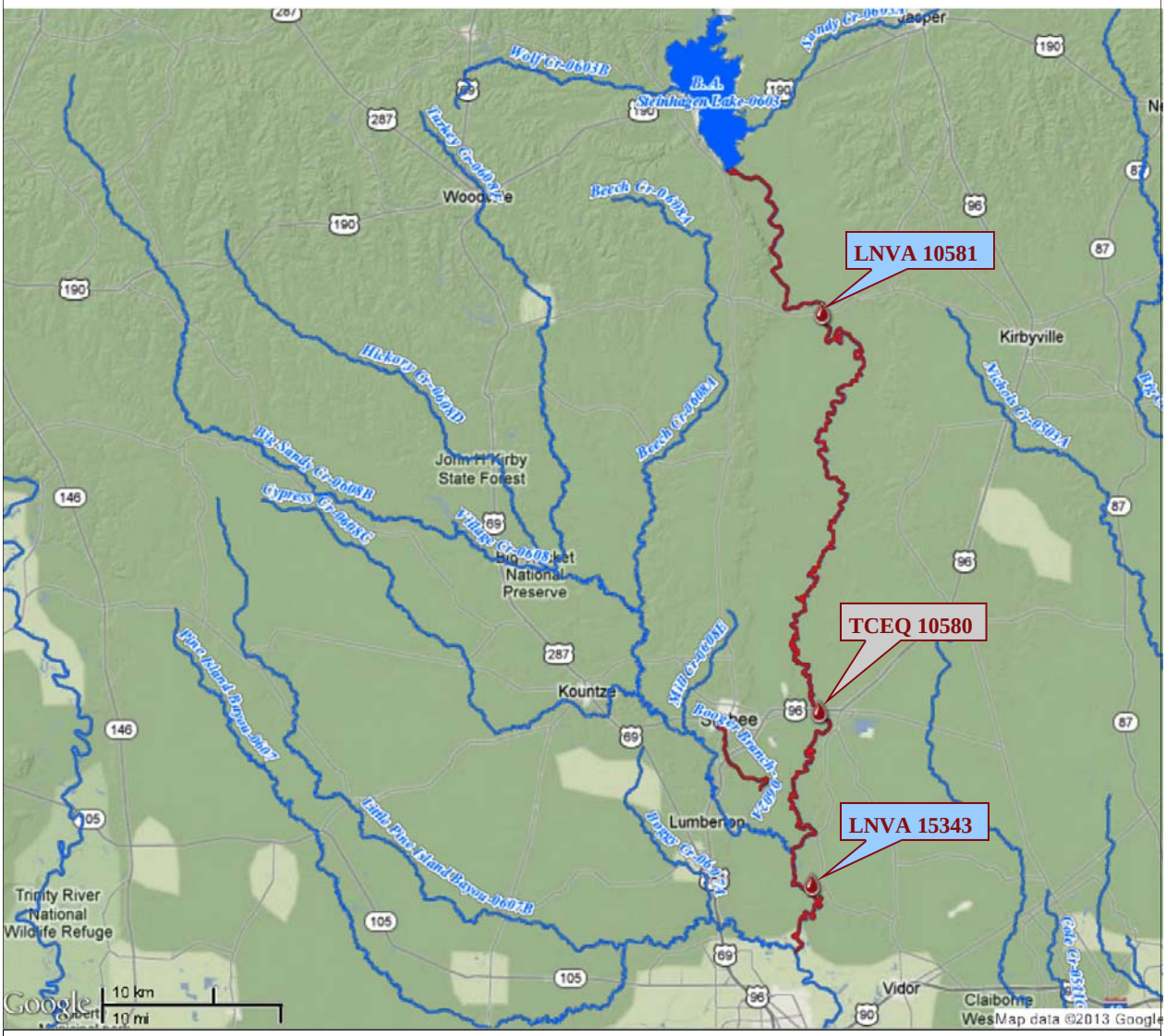
2013 Water Quality Monitoring Stations

SEGMENT: 601 Neches River Tidal

Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Flow	Organics in water	Metals in sedi-ment
NECHES RIVER 0.8 KM DOWNSTREAM OF MOBIL CANAL 9.65 KM DOWNSTREAM OF IH 10 780 M UPSTREAM OF MANSFIELD FERRY ROAD	10570	0601	6	TCEQ	4	4	4			4
NECHES RIVER AT LNVA SALINITY STATION Y 1.8 KILOMETERS DOWNSTREAM OF NECHES RIVER SALTWATER	20774	0601	6	LNVA	4	4	4	4		
NECHES RIVER AT PORT NECHES CITY PARK BOAT RAMP 117 M NORTHEAST OF MERRIMAN STREET IN BEAUMONT	10566	0601	6	TCEQ	4	4	4			4
NECHES RIVER AT SH 87 BRIDGE NORTH OF PORT ARTHUR	10563	0601	6	TCEQ	4	4	4		2	4
NECHES RIVER BRIDGE AT IH 10 NEAR BEAU-MONT 1.02 KM EAST OF US 90/IH 10 INTERSEC-TION	10575	0601	6	TCEQ	4	4	4			4
STAR LAKE CANAL 0.4 KM UPSTREAM OF THE NECHES RIVER KM UPSTREAM OF SH 87/GULFWAY DRIVE NORTH OF PORT ARTHUR	10485	0601A	6	TCEQ	4	4	4		2	4

2013 Water Quality Monitoring Stations

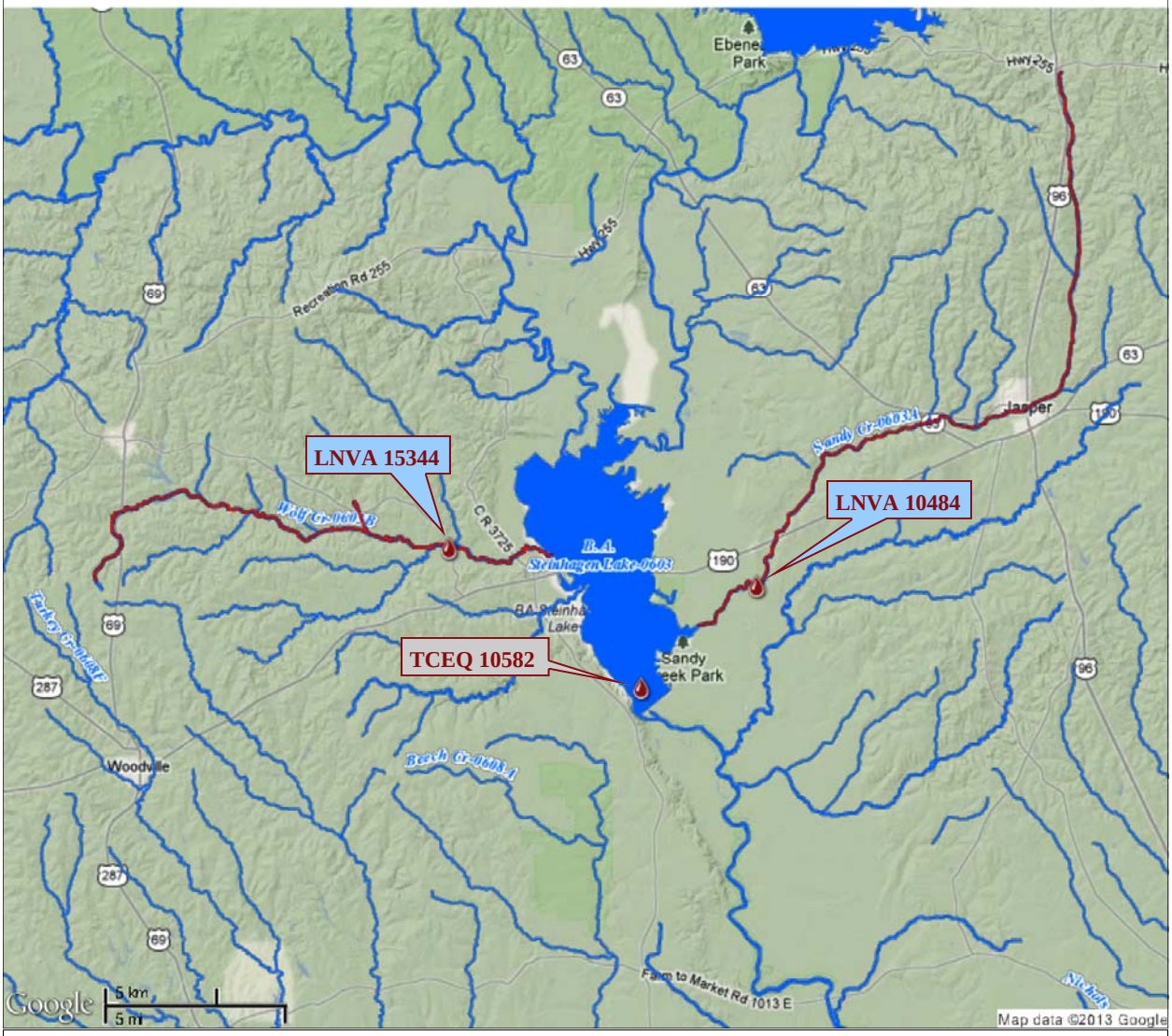
SEGMENT: 602 Neches River Below B. A. Steinhagen Lake



Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Flow
NECHES RIVER AT US 96 2.09 KM WEST OF US 96/FM 105 INTERSECTION 8.6 KM EAST OF SILSBEE	10580	0602	6	TCEQ	4	4	4	4
NECHES RIVER AT FM 1013 IN THE BIG THICKET NATIONAL PRESERVE EAST OF SPURGER IN JASPER COUNTY	10581	0602	6	LNVA	4	4	4	4
NECHES RIVER NEAR LAKEVIEW 1 KM WEST OF FM 1131 12.24 KM UPSTREAM OF PINE ISLAND BAYOU CONFLUENCE	15343	0602	6	LNVA	4	4	4	4

2013 Water Quality Monitoring Stations

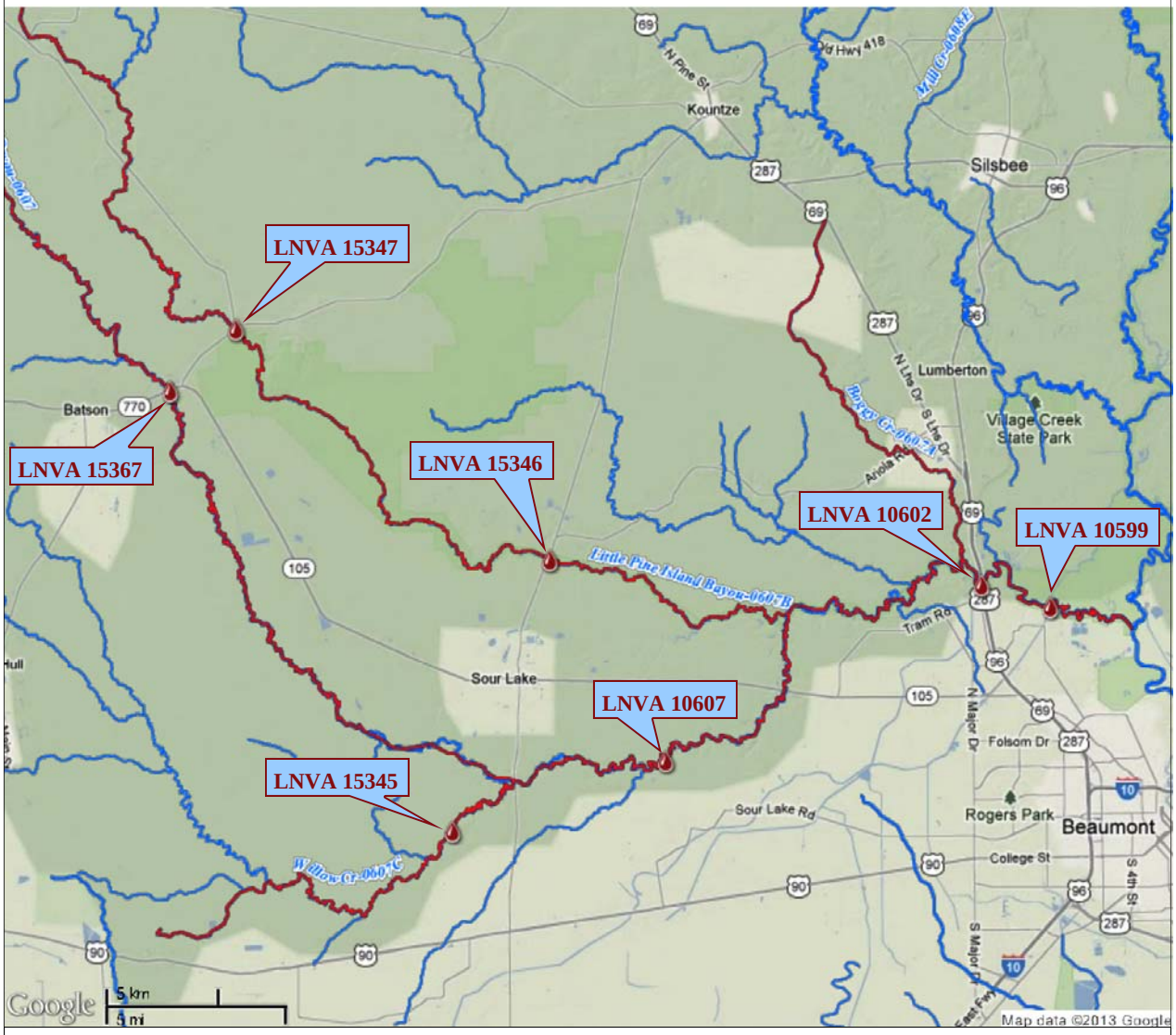
SEGMENT: 603 B. A. Steinhagen Lake



Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Flow
B A. STEINHAGEN RESERVOIR NEAR DAM 948 M NORTHWEST OF DAM FACE 2.07 KM NORTH OF FM 1746/FM 92 INTERSECTION 21.3 KM SW OF JASPER	10582	0603	6	TCEQ	4	4	4	
SANDY CREEK AT FM 777 2.15 KM SOUTHWEST OF FM 777/US 190 INTERSECTION 14.7 KM SOUTHWEST OF JASPER	10484	0603	6	LNVA	4	4	4	4
WOLF CREEK AT FM 256 5.6 KM UPSTREAM OF BA. STEINHAGEN RESERVOIR 2.3 KM NNW OF US 190/FM 256 INTERSECTION 16.8 KM NE OF WOODVILLE	15344	0603	6	LNVA	4	4	4	4

2013 Water Quality Monitoring Stations

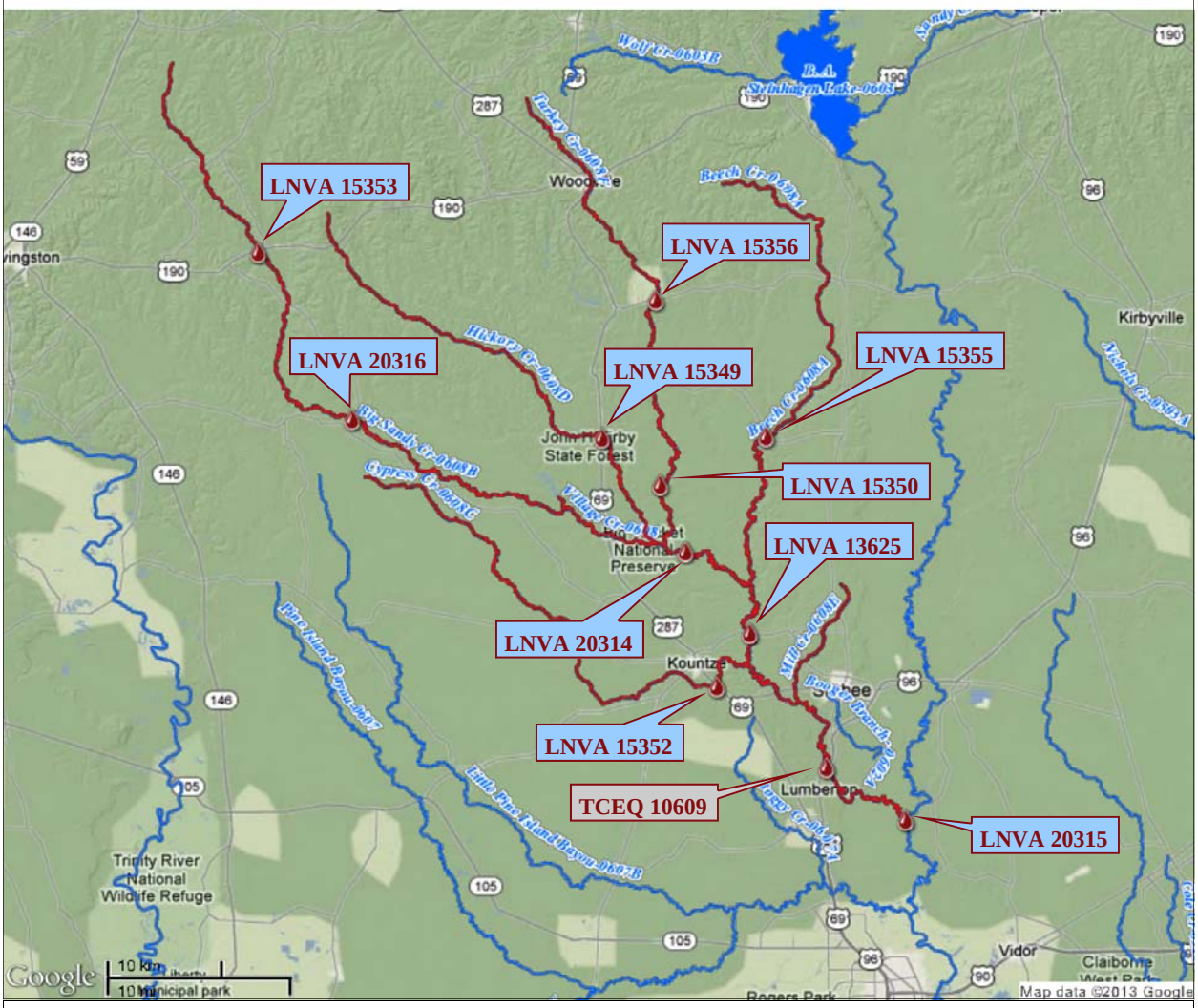
SEGMENT: 607 Pine Island Bayou



Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Flow
PINE ISLAND BAYOU AT LNVA LOWER PUMP STATION 6.62 KM UPSTREAM OF NECHES RIVER CONFLUENCE 2.86 KM EAST OF US 69	10599	0607	6	LNVA	4	4	4	4
PINE ISLAND BAYOU AT SH 105 0.65 KM SOUTHWEST OF FM 770/SH 105 INTERSECTION NEAR CITY OF BATSON	15367	0607	6	LNVA	4	4	4	4
PINE ISLAND BAYOU AT SOUR LAKE ROAD 7.5 KM SOUTHEAST OF INTERSECTION OF SH 326/SH 105 IN CITY OF SOUR LAKE	10607	0607	6	LNVA	4	4	4	4
PINE ISLAND BAYOU AT US 69 /US 96/US 287 AT VOTH	10602	0607	6	LNVA	4	4	4	4
LITTLE PINE ISLAND BAYOU AT FM 770 0.64 KM SOUTHWEST OF CITY OF SARATOGA 0.31 KM SOUTHWEST OF FM 787/FM 770 INTERSECTION	15347	0607B	6	LNVA	4	4	4	4
LITTLE PINE ISLAND BAYOU AT SH 326 5.68 KM NORTH OF CITY OF SOUR LAKE	15346	0607B	6	LNVA	4	4	4	4
WILLOW CREEK AT UNNAMED ROAD 4.87 KM NORTH NORTH-WEST OF NOME 6.78 KM UPSTREAM OF PINE ISLAND BAYOU CONFLUENCE/SH 326	15345	0607C	6	LNVA	4	4	4	4

2013 Water Quality Monitoring Stations

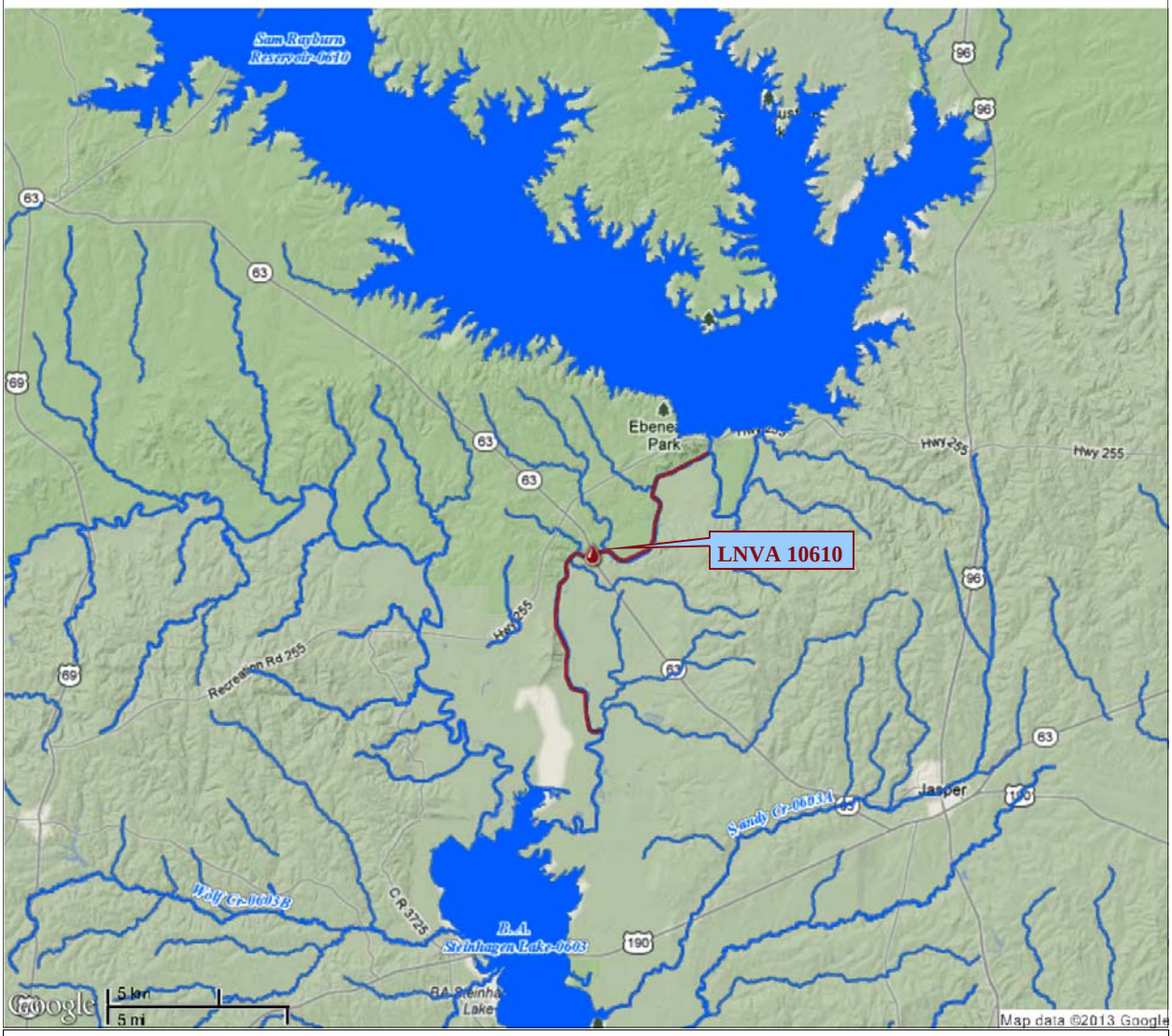
SEGMENT: 608 Village Creek



Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Flow
VILLAGE CREEK AT US 96 6.35 KM SOUTH OF SILSBEE	10609	0608	6	TCEQ	4	4	4	4
Village Creek 125 meters upstream of the Neches River confluence in Hardin County	20315	0608	6	LNVA	4	4	4	4
VILLAGE CREEK AT FM 418 5.04 KM NORTHEAST OF KOUNTZE	13625	0608	6	LNVA	4	4	4	4
Village Creek at McNeely Road, 4.0 MI East of US 69	20314	0608	6	LNVA	4	4	4	4
BEECH CREEK AT FM 1943 7 KM WEST OF FM 1943/ FM 92 INTERSECTION 7.3 KM WEST-SOUTHWEST OF CITY OF FRED	15355	0608A	6	LNVA	4	4	4	4
Big Sandy Creek at FM 1276, 3.8 MI South of Dallardsville	20316	0608B	6	LNVA	4	4	4	4
BIG SANDY CREEK AT US 190 IN ALABAMA COUSHATTA INDIAN RESERVATION 0.39 KM WEST OF US 190/FM 2500 INTERSECTION	15353	0608B	6	LNVA	4	4	4	4
CYPRESS CREEK AT US 69/US 287 3.4 KM SOUTHEAST OF KOUNTZE	15352	0608C	6	LNVA	4	4	4	4
HICKORY CREEK AT US 69 0.73 KM NORTH OF FM 2827/US 69 INTERSECTION 5.8 KM SOUTH OF WARREN	15349	0608D	6	LNVA	4	4	4	4
TURKEY CREEK AT FM 1013 3.57 KM EAST NORTHEAST OF US 287/FM 1013 INTERSECTION	15356	0608F	6	LNVA	4	4	4	4
TURKEY CREEK AT GORE STORE ROAD 6.3 KM SOUTHEAST OF FM 2827/US 69 INTERSECTION	15350	0608F	6	LNVA	4	4	4	4

2013 Water Quality Monitoring Stations

SEGMENT: 609 Angelina River Below Sam Rayburn Reservoir



Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Flow
ANGELINA RIVER AT SH 63 2.10 KM SOUTHEAST OF SH 63/REC RD 255 INTERSECTION 19.56 KM NORTH OF JASPER	10610	0609	6	LNVA	4	4	4	4

Summary of Water Quality Conditions

SEGMENT 0701: Taylor Bayou above Tidal Map

Segment 0701: Taylor Bayou above Tidal

Taylor Bayou above Tidal, Segment 0701, is from the salt water lock 7.7 kilometers (4.8 miles) downstream of SH 73 in Jefferson County to the confluence with Hillebrandt Bayou, and includes Shallow Prong Lake on Big Hill Bayou. Taylor Bayou is 34 feet long, ranges from 8 to 13 feet in depth, and is characterized as low gradient with sluggish flow. Shallow Prong Lake (0701D) is a small reservoir that is 150 surface acres.

Segment 0701 is located in the Level III ecoregion known as the Western Gulf Coastal Plain (ecoregion 34) and has a mix of two Level IV ecoregions present: the Northern Humid Gulf Coastal Prairies (34a) and the Texas-Louisiana Coastal Marshes (34g). Soils drain poorly and much of the segment stays wet for most of the year. Soils are fine textured and made up of sands, silts, and clays, and even some salt domes.

Segment 0701 is generally flat plains with most of the area covered by standing water, and tidal marshes with bayous, lakes, and canals. Land use is largely agricultural with farming of rice, grain, sorghum, cotton, and soybeans common. There is also cattle production, pastureland, urban and industrial uses, oil and gas production, waterfowl hunting, marshland, and wildlife habitat throughout Segment 0701.

The segment is designated for primary contact recreation use and intermediate aquatic life use. Irrigation return flows from rice fields, storm water runoff and municipal and industrial discharges are the principle sources of flow in the segment and its major tributary, Hillebrandt Bayou. A saltwater lock near the mouth of the bayou minimizes tidal impact and saltwater intrusion, but the segment is still highly tidally influenced.

Three SWQM stations are monitored on Taylor Bayou and one station is monitored on Shallow Prong Lake (see page 21).

- Not supporting aquatic life use due to depressed dissolved oxygen below the North Fork and South Fork confluence
- Concern for depressed dissolved oxygen (screening level)
- Concern for chlorophyll-a

Segment 0701D: Shallow Prong Lake

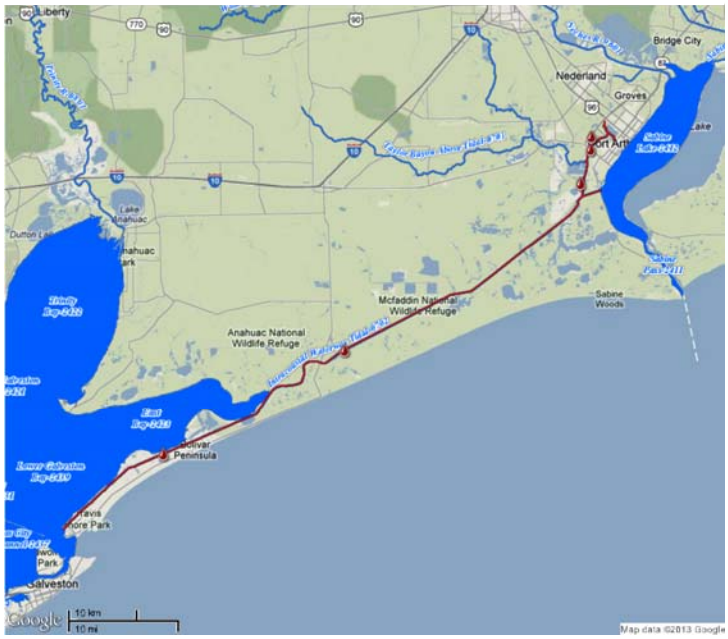
- Concern for arsenic in edible tissue

Segment 0702: Intracoastal Waterway Tidal

The Intracoastal Waterway Tidal, Segment 0702, is from the confluence with Galveston Bay at Port Bolivar in Galveston County to the confluence with the Sabine-Neches/Port Arthur Canal in Jefferson County (including Taylor Bayou Tidal from the confluence with the Intracoastal Waterway up to the saltwater lock 7.7 kilometers (4.8 miles) downstream of SH 73 in Jefferson County). This tidal segment is 63 miles long and includes the unclassified segment, Alligator Bayou (0702A).

Segment 0702 is primarily located in the Level IV Ecoregion known as Texas-Louisiana Coastal Marshes (34g). This ecoregion is 539 square miles, and is comprised of flat plains with most of the land covered in standing water, beach ridges, cheniers, canals, and tidal marshes with bayous meandering through. Elevation is anywhere from sea level to 30 feet, and soil is made up of clay and silt with some shell fragments and sand on cheniers/beach ridges. The highest point in the segment is at High Island (30 feet) which is situated atop an old salt dome. This ecoregion has many fresh-

SEGMENT 0702: Intracoastal Waterway Tidal Map



Summary of Water Quality Conditions

water and saltwater coastal marshes, and a wetter, more humid climate than Ecoregion 35 to the northeast.

Land use includes marshland, wildlife and waterfowl habitat, oil and gas production, and extensive industrial activity. The marshes in this segment provide wintering grounds for ducks and geese and breeding and rearing grounds for fish and shrimp such as brown shrimp, white shrimp, blue crab, red drum, southern flounder, and spotted sea trout. Due to the ecologically rich areas in Segment 0702, fishing is both recreationally popular as well as commercially important.

Three SWQM stations in the segment are routinely monitored by the TCEQ office in Beaumont (see page 22).

Segment 0702 is designated for primary contact recreation use and high aquatic life use. Historically, Segment 0702 has been listed on the state's 303(d) List for bacteria impairments, ambient toxicity in water, toxicity in sediment, and impaired fish community. An interim assessment of the presence and causes of ambient water and sediment toxicity in Alligator Bayou, Segment 0702A, was conducted by the TMDL program in 2001—2002.

In 2008, the Texas DSHS issued a fish consumption advisory for Galveston Bay. The advisory warns the public to limit their consumption of spotted sea trout and catfish due to elevated levels of dioxins and polychlorinated biphenyls (PCBs) in the two fish species. This advisory includes a portion of the Intracoastal Waterway Tidal from the eastern most boundary of East Bay to Port Bolivar in Segment 0702.

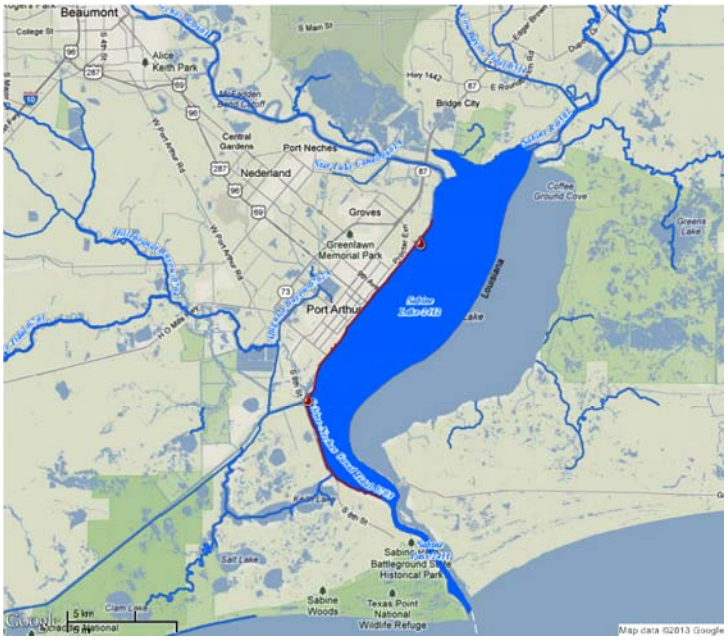
- Not supporting contact recreation use due to bacteria
- Not supporting fish consumption use due to dioxin and PCBs in edible tissue
- Concern for chlorophyll-a in Taylor Bayou tidal

<u>Segment 0702A: Alligator Bayou</u>

Alligator Bayou is a freshwater tributary of Taylor Bayou, with a watershed of approximately 40 square miles located upstream from the saltwater locks on Taylor Bayou. Discharges to the waterbody are primarily from municipal and industrial facilities, with a small amount from agriculture.

Martin Luther King Jr. bridge spans the Sabine-Neches Canal Tidal Segment in Port Arthur, Texas

SEGMENT 0703: Sabine-Neches Canal Tidal Map



- Not supporting aquatic life use due to toxicity in water and sediment
- Concern for impaired fish community and lead in sediment
- Concern for chlorophyll-a

Segment 0703: Sabine-Neches Canal Tidal

The Sabine-Neches Canal Tidal, Segment 0703, is from the confluence with Sabine Pass at the southern tip of Pleasure Island in Jefferson County to the Sabine Lake seawall at the northern tip of Pleasure Island in Jefferson County. This tidal segment is 16 miles in length. The Sabine-Neches Canal exchanges water with Sabine Lake, and a large amount of marine traffic navigates between the Port of Houston and Port Arthur, including both large vessels and smaller recreational boats.

Land use includes oil and gas production, as well as marshland, wildlife, and waterfowl habitat. The ecoregion encompassing Segment 0703 is Western Gulf Coastal Plain (34), and more specifically Ecoregion IV known as Texas Louisiana Coastal Marshes (34g). There is extensive freshwater and saltwater coastal marshes consisting of grasses, sedges, and rushes. Few trees are found in this segment, and soils consist of clay and silt, with sand and shell fragments on cheniers or beach ridges. Most of the area is covered by standing water as bayous, lakes, or canals in low lying areas.

Two SWQM station are routinely monitored by the TCEQ office in Beaumont (see page 23).

- Fully supports all uses and no concerns are listed

Summary of Water Quality Conditions

Segment 0704: Hillebrandt Bayou

Hillebrandt Bayou, Segment 0704, is defined as a freshwater stream from the confluence of Taylor Bayou in Jefferson County to a point 100 meters (110 yards) upstream of SH 124 in Jefferson County. Hillebrandt Bayou is 14 miles in length, and extends from the southern part of the South Central Plains Ecoregion (35) to the Northern Humid Gulf Coastal Prairies Ecoregion (34a). Segment 0704 tributaries or unclassified segments include Willow Marsh Bayou (0704A), Kidd Gully (0704B), Pevitot Gully (0704C), and Bayou Din (0704D).

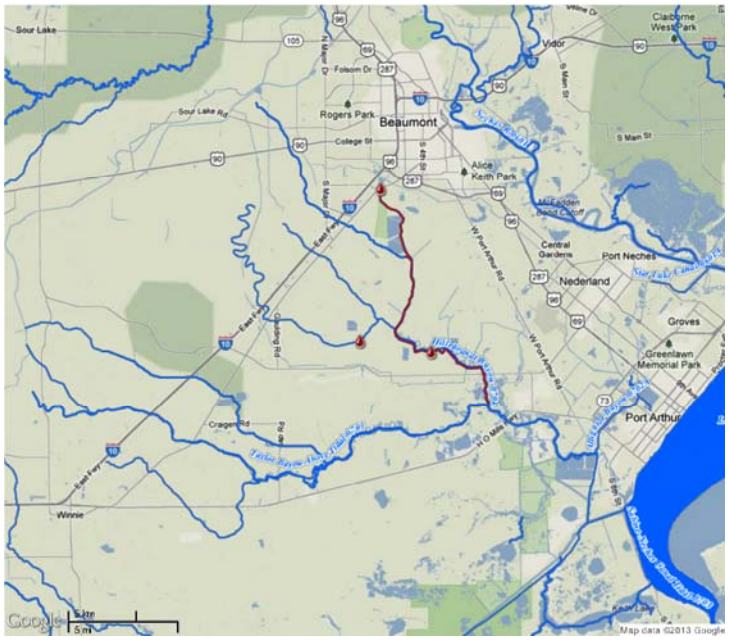
Soils consist of fine-textured sands, silt, and clayey substrates, and low gradient rivers, streams, and bayous are common. Drainage near Hillebrandt Bayou is generally poor due to the substrate types, and soils remain wet most of the year. Land use is pasture-land, cropland, urban and industrial, oil and gas production, waterfowl hunting, and golf course use.

Hillebrandt Bayou serves as the primary receiving stream for the storm water drainage system in the City of Beaumont. A wastewater discharge includes effluent which is treated in the final stages by manmade and natural wetlands south of Beaumont along Hillebrandt Bayou. These wetlands comprise over 900 acres. Willow Marsh Bayou, Kidd Gully and Pevitot Gully convey additional flows from agricultural land, and Bayou Din is located along a public golf course. In addition, flows in Hillebrandt Bayou are regulated by saltwater gates and barge locks on Taylor Bayou in Port Arthur.

Three SWQM stations are routinely monitored by the TCEQ and LNVA (see page 24). Segment 0704 is designated for primary contact recreation use and intermediate aquatic life use.

- Not supporting contact recreation use due to bacteria
- Not supporting aquatic life use due to depressed dissolved oxygen
- Concern for chlorophyll-a and ammonia-nitrogen
- Concern for depressed dissolved oxygen (screening level)

SEGMENT 0704: Hillebrandt Bayou Map



Special Projects for River Basin 7

1. Taylor Bayou Above Tidal & Hillebrandt Bayou Aquatic Life Use-Attainability Analyses (UAAs), 4/1/2009–3/31/2010; Texas Institute for Applied Environmental Research (TIAER) sampling included 24hr DO, Benthics, Nekton, and Flow
2. Galveston Bay System Dioxin & PCBs Survey, 9/1/2009-4/2/2014; TCEQ survey to characterize the extent of dioxin and PBC contamination in the Galveston Bay system which includes Segment 0702.

Additional information on these special projects in River Basin 7 is available online at the following address: https://cms.lcra.org/special.aspx.

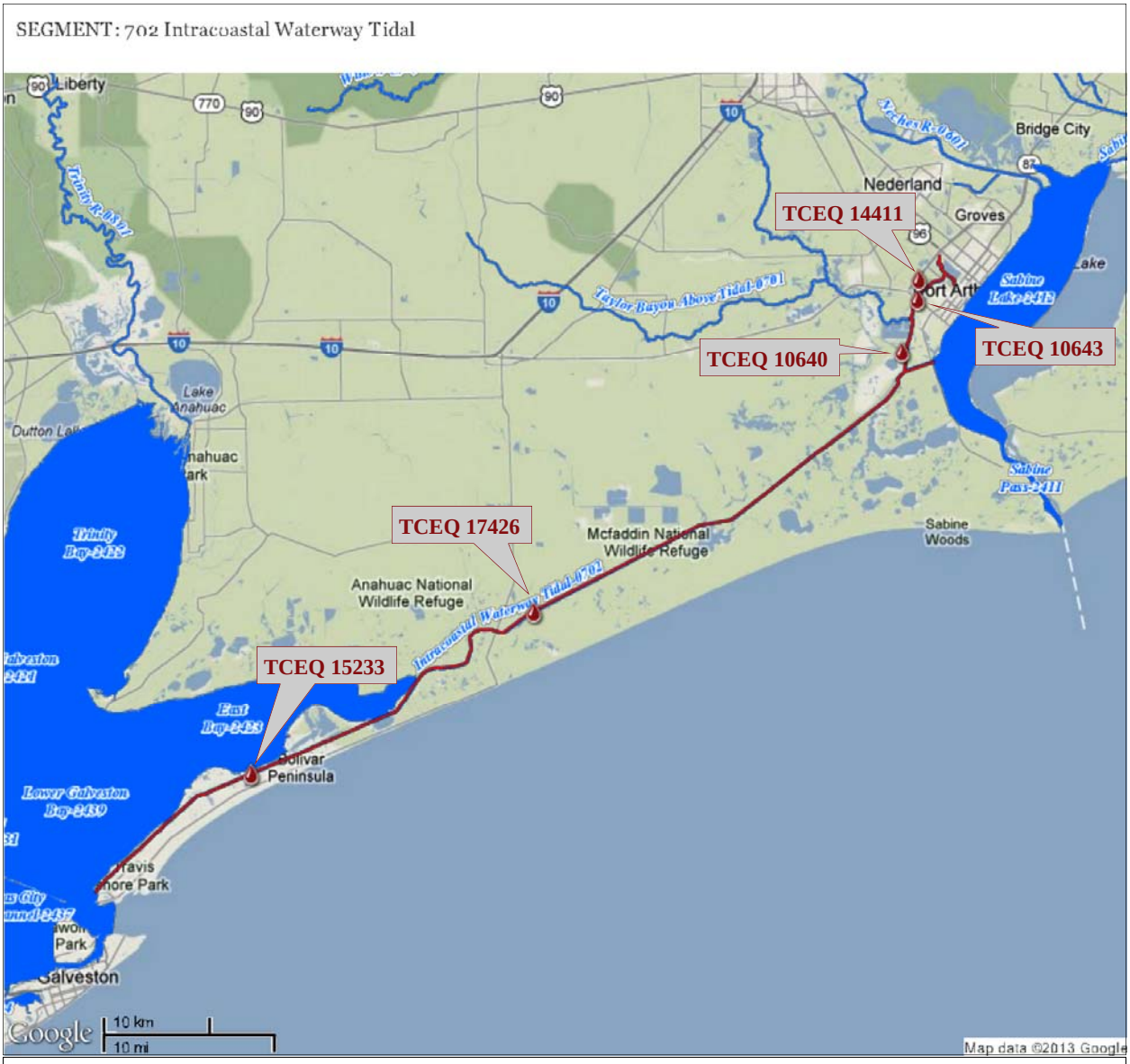
Hillebrandt Bayou near SH 124 in Beaumont, Texas

2013 Water Quality Monitoring Stations

SEGMENT: 701 Taylor Bayou Above Tidal

Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Flow	Metals in water
TAYLOR BAYOU AT LABELLE ROAD 80 M UPSTREAM OF LABELLE ROAD	10669	0701	7	LNVA	4	4	4	4	
TAYLOR BAYOU AT SH 73 WEST OF PORT ARTHUR	10668	0701	7	TCEQ	4	4	4	4	
TAYLOR BAYOU NORTH FORK AT IH 10	10674	0701	7	TCEQ	4	4	4	4	
SHALLOW PRONG LAKE ON BIG HILL BAYOU WEST-ERNMOST ARM NEAR FENCE PILINGS	10642	0701D	7	TCEQ	4	4	4	4	4

2013 Water Quality Monitoring Stations



Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Ben-thics	Metals in water	Metals in sedi-ment	Amb Tox Water/ Sedi-ment
ICWW AT 95GB022 IN EAST BAY NORTH OF CRYSTAL BEACH	15233	0702	7	TCEQ	4	4	4	1		1	
INTERCOASTAL WATERWAY (ICWW) MID CHANNEL AT THE JEFFER-SON/CHAMBERS COUNTY LINE APPROX 5 KM EAST OF SH124 NEAR HIGH ISLAND	17426	0702	7	TCEQ	4	4	4				
TAYLOR BAYOU MID CHANNEL 420 M UPSTREAM OF OF CONFLUENCE WITH INTRACOASTAL WATERWAY TIDAL	10640	0702	7	TCEQ	4	4	4				
ALLIGATOR BAYOU AT SH82	10643	0702A	7	TCEQ	5	5	5			5	5
JEFFERSON COUNTY DRAINAGE DIS-TRICT MAIN OUTFAL NO. 7 CANAL ADJA-CENT TO WEST SIDE OF STAR ENTER-PRISE 2.4 KM UPSTREAM OF ALLIGATOR BAYOU	14411	0702A	7	TCEQ	5	5	5				5

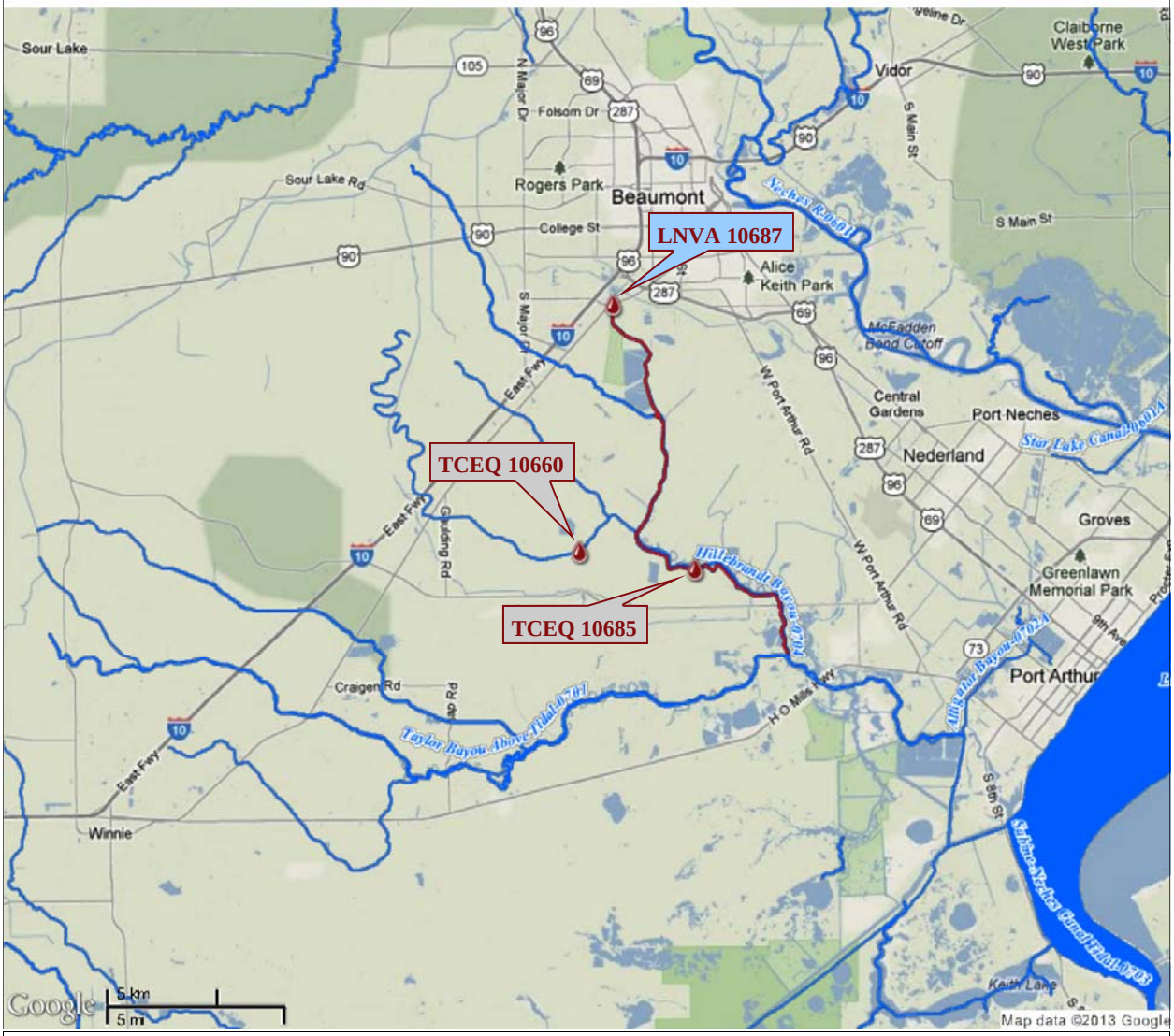
2013 Water Quality Monitoring Stations

SEGMENT: 703 Sabine-Neches Canal Tidal

Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Flow
SABINE-NECHES CANAL TIDAL MID CHANNEL ADJACENT TO TOPCO DOCKS 340 M SOUTH OF TAFT AVE AT DD 7 LEVEE RD	10683	0703	7	TCEQ	4	4	4	
TAYLOR BAYOU TURNING BASIN AT TEXACO DOCK AT CONFLUENCE WITH SABINE-NECHES CANAL TIDAL	10652	0703	7	TCEQ	4	4	4	

2013 Water Quality Monitoring Stations

SEGMENT: 704 Hillebrandt Bayou



Site Description	Station ID	Water-body ID	Basin	Agency	Field	Conv.	Bacteria	Flow
HILLEBRANDT BAYOU AT SH 124 IN BEAUMONT	10687	0704	7	LNVA	4	4	4	4
HILLEBRANDT BAYOU AT HILLEBRANDT ROAD NEAR LOVELL LAKE 30 M DOWNSTREAM OF MIDDLE OF HILLEBRANDT ROAD BRIDGE	10685	0704	7	TCEQ	4	4	4	
BAYOU DIN AT LABELLE ROAD SOUTH OF BEAUMONT	10660	0704D	7	TCEQ	4	4	4	