# Lower Neches River & Neches-Trinity Coastal Basin 2023 Basin Highlights Report

LNVA
LOWER NECHES VALLEY AUTHORITY

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# Introduction

## The Clean Rivers Program

The Texas Clean Rivers Program was established in 1991. It is a state fee-funded, non-regulatory program that was created to provide a framework and forum for managing water quality issues with a holistic state-wide approach. The focus of the program is to work at the watershed level within each river basin and coordinate the efforts of the organizations included in each basin. There are currently 15 regional water authorities that have CRP contracts with the TCEQ to conduct water quality monitoring assessments and stakeholder outreach in the 23 major river and coastal basins of Texas. Of the 15, 12 are river authorities; one a water district; one a council of governments; and an international water commission. The map below shows the basins in Texas as well as the CRP partner agencies.

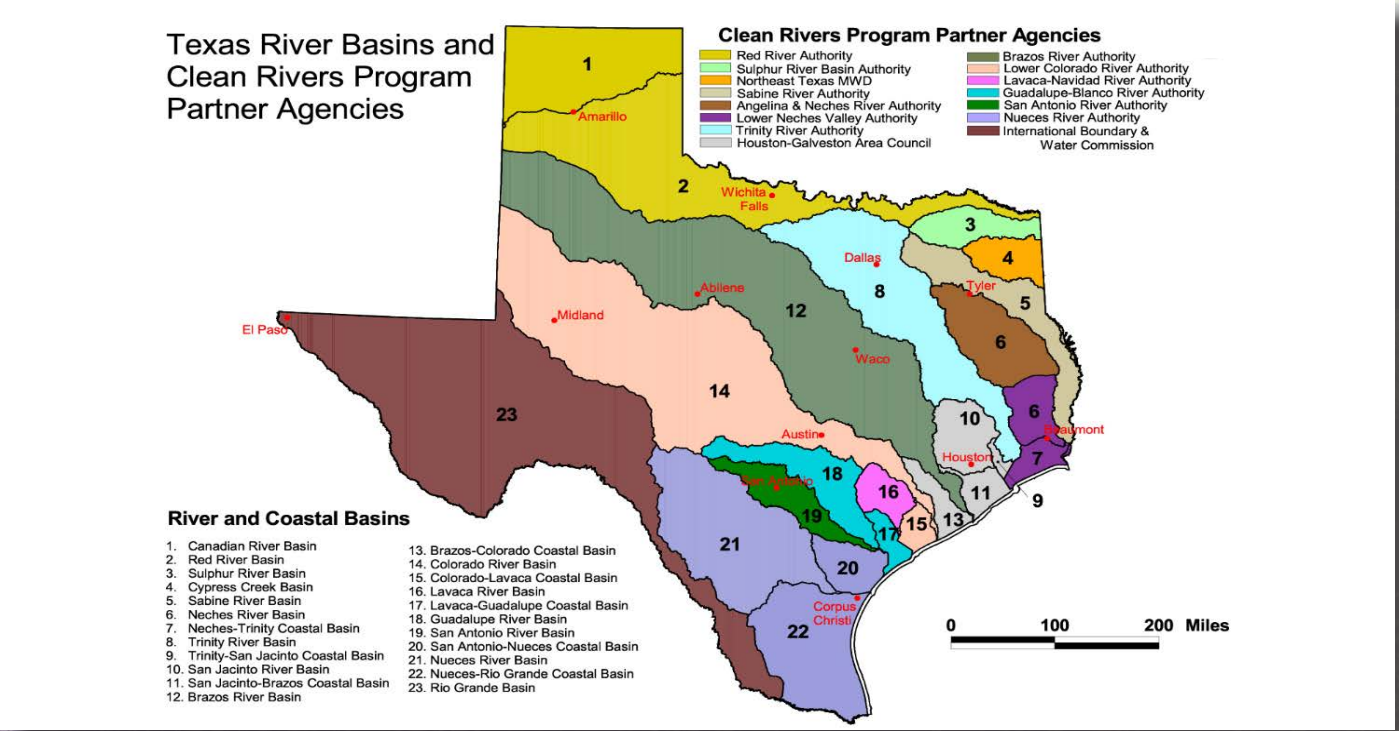



Figure 1.1. Texas River Basins and Clean Rivers Program (Image from www.tceq.texas.gov)

## CRP Goals and Objectives

The goal of the Clean Rivers Program is to maintain and improve the quality of surface water within each river basin in Texas through an ongoing partnership involving the Texas Commission on Environmental Quality, river authorities, other state agencies, regional entities, local governments, industry, and citizens. The program's watershed approach will identify and evaluate water quality issues, establish priorities for corrective action, work to implement those actions and adapt to changing priorities.

There are six program objectives for the Clean Rivers Program. These objectives are:

- Provide quality-assured data to the TCEQ for use in decision making
- Identify and evaluate water quality issues
- Promote cooperative watershed planning
- Recommend management strategies
- Inform and engage stakeholders
- Maintain efficient use of public funds

In order to accomplish the program goal and objectives, the Clean Rivers Program is divided into seven different tasks. These tasks are as follows:

- Task 1 - Project Administration
- Task 2 - Quality Assurance
- Task 3 - Water Quality Monitoring
- Task 4 - Data Management
- Task 5 - Data Analysis and Reporting
- Task 6 - Stakeholder Participation and Public Outreach
- Task 7 - Special Projects

Ship on the Neches River. (Photo courtesy of Timberly Palmer)

Under the Task 5 for Data Analysis and Reporting, completing a Basin Highlights Report each year is a requirement except for the year a Basin Summary Report is due. The focus of the Basin Highlights Report shifts each year to help cover water quality conditions throughout the basin while avoiding unnecessary repetition. This report will focus on the watershed characterization of B.A. Steinhagen Lake, the Neches River below B.A. Steinhagen Lake, and Neches River Tidal (Segment 0603, 0602, and 0601, respectively). The purpose of a watershed characterization report is to outline segment descriptions including land uses, natural characteristics, and hydrology while also addressing the impairments listed by the Texas Integrated Report for that segment.

LNVA Sea Ark Ship on the Neches River. (Photo courtesy of Timberly Palmer)

Watersheds are broken down into segments that are intended to have relatively homogeneous chemical, physical, and hydrological characteristics. A segment provides a basic unit for assigning site-specific standards and for applying water quality management programs of the agency. Classified segments may include streams, rivers, bays, estuaries, wetlands, lakes, or reservoirs. Figure 1.2 on the next page shows the segments for the Neches River Basin as well as the Neches-Trinity Coastal Basin.

View of downtown Beaumont from the Neches River. (Photo courtesy of Joe Winston)

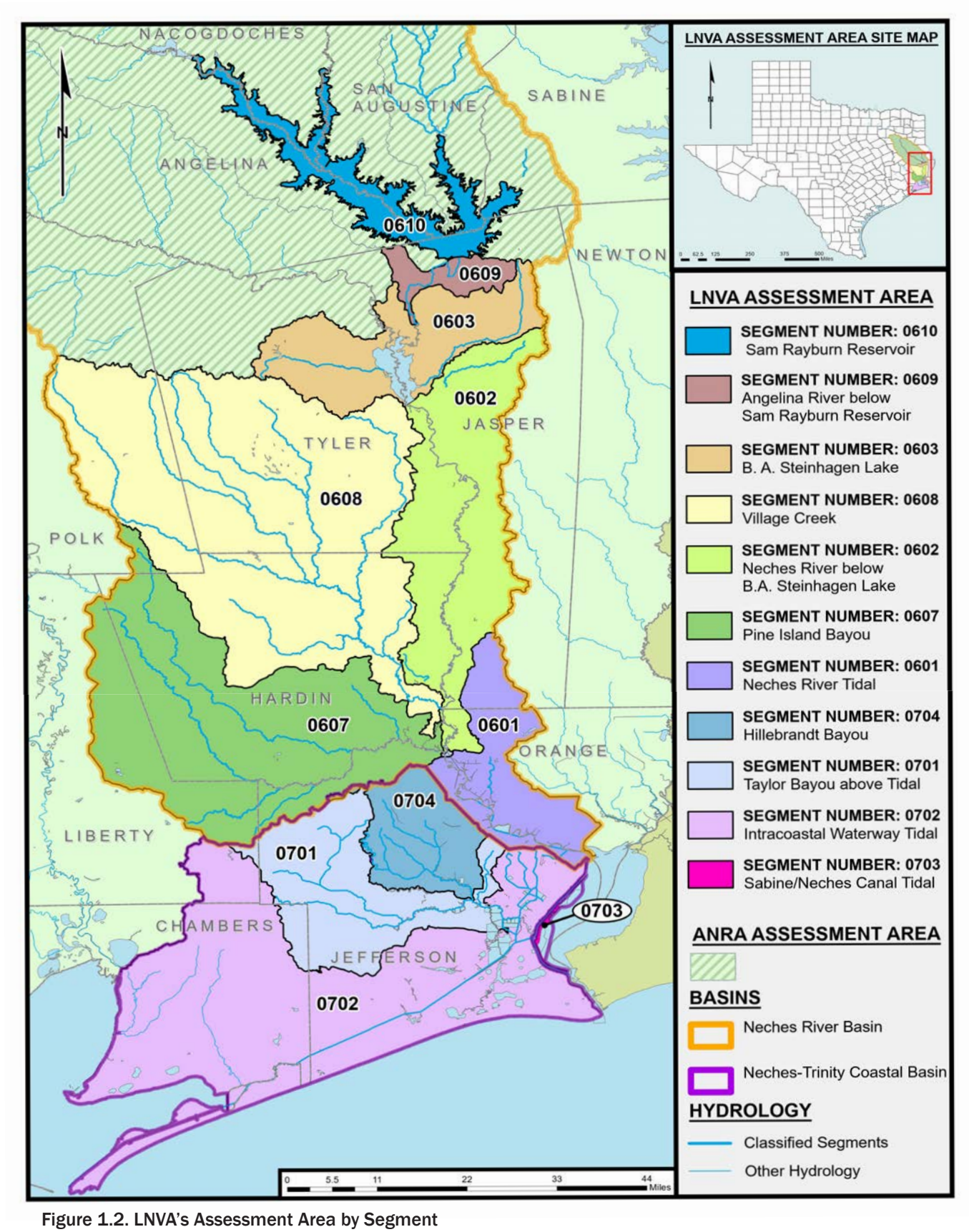



Figure 1.2. LNVA's Assessment Area by Segment

# Basin Assessment

## 2022 Texas Integrated Report

Required by Sections 305(b) and 303(d) of the federal Clean Waters Act, the Texas Integrated Report is generated every two years by TCEQ and approved by the Environmental Protection Agency (EPA). This report uses surface water quality data collected across the state to assess the condition of the state's surface waters. To make assessments, the data is compared to Texas Surface Water Quality Standards (TSWQS). TSWQS establish water quality goals for chemical, physical, and biological conditions of Texas surface waters. Along with these goals, TSWQS also identifies appropriate uses for classified water bodies that includes aquatic life use, recreation use, general use, fish consumption use, and public water supply use.

Aquatic Life Use: Each classified segment in the TSWQS is assigned an aquatic life use (ALU) category. The five categories are exceptional, high, intermediate, limited, or minimal aquatic life use. The categories are assigned based on physical, chemical, and biological characteristics of the water body. Support of the ALU category is based on the assessment of dissolved oxygen criteria, toxic substances in water criteria, ambient water and sediment toxicity test results, and indices for habitat, benthic macroinvertebrate, and fish community, provided the minimum number of samples needed are available. Segment 0601 is classified as Intermediate for aquatic life use while segment 0602 and 0603 are categorized as high aquatic life use.

Recreation Use: To assess the ability of water to support certain recreational activities, bacteria indicators such as *E. Coli* and Enterococcus are monitored. Each water body is placed into a recreation use category. Segment 0601, 0602, and 0603 are classified as primary contact recreation 1. Primary contact recreation 1 includes recreational activities that are presumed to involve a significant risk of ingestion of water such as swimming or water skiing. Due to this classification, these water bodies must meet a certain criterion for *E.Coli* and Enterococcus levels set by TSWQS.

General Use: General use criteria are set to safeguard general water quality rather than for protection of one specific use. The general use criteria are established for each segment to ensure healthy conditions and aesthetics. Water temperature, pH, chloride, sulfate, TDS, and nutrients are parameters monitored for general use criteria.

Blue crab on the Neches River (Photo courtesy of Timberly Palmer)

Fish Consumption Use: A Texas Department of State Health Services risk assessment or advisory is required for a full assessment of use attainment for fish consumption and to determine if a water body is fully supporting. A fish consumption Advisory 51 has been issued for segment 0602 and 0603 due to mercury and dioxin being present in edible tissue. A fish consumption Advisory 46 has been issued for segment 0601 due to polychlorinated biphenyls (PCBs) in edible tissue.

Public Water Supply Use: A water body designated for public water supply use are known to be used or exhibit characteristics that would allow them to be used as the source for public water systems. Human health criteria from TSWQS are what a water body must meet in order to be supporting public water supply use in the Texas Integrated Report.

The 2022 Texas Integrated Report is the most recent version of the report and was approved by the EPA on July 7th, 2022. Table 1 below summarizes the status of the water quality use designations for segments 0601, 0602, and 0603 according to the 2022 Texas Integrated Report.

| Segment Number | Segment Names | General Use Criteria | Contact Recreation | Domestic Water Supply | Fish Consump-tion | Aquatic Life |
|---|---|---|---|---|---|---|
| 0601 | Neches River Tidal | ✳ | ✳ | ✳ | ✳ | ✳ |
| 0601A | Star Lake Canal | ✳ | ✳ | N/A | N/A | ✳ |
| 0602 | Neches River Below B.A. Steinhagen Lake | ✳ | ✳ | ✳ | ✳ | ✳ |
| 0603 | B.A. Steinhagen Lake | ✳ | ✳ | ✳ | ✳ | ✳ |
| 0603A | Sandy Creek | ✳ | ✳ | N/A | N/A | ✳ |
| 0603B | Wolf Creek | ✳ | ✳ | N/A | N/A | ✳ |

*Legend*

| | |
|---|---|
| ✳ | All parameters fully support that particular use designation |
| ✳ | There is a use concern or non-support of a particular parameter in that use category |
| N/A | Not a use for that particular segment |

**Table 1. Status of Water Quality Use Designation per Segment**

Historical photo of the Neches River

## Neches River: A History

The Neches River has a rich and lengthy history that can be dated back as early as the Paleo-Indian culture. When the first Europeans entered the area in the sixteenth century, they found various tribes of Hasinai Indians of the Caddo Confederacy living along the river's upper reaches, which they called Snow River or River of Snows. The river was given its present name by Spanish explorer Alonso De León, who led several expeditions to the region in the late 1680s. De León dubbed the river Neches after the Neches Indians, one of the southern Caddoan tribes he encountered. It is believed that the name of the river was derived from the Caddo word "Nachawi", meaning "wood of the bow", after Spanish settlers called it Río Neches.

Missionary Fray Damián Massanet accompanied De León on his final expedition to the area and founded the first mission in Texas, San Francisco de los Tejas.

Spanish maps from the early years of the eighteenth century called the river Río Mexicano, Río de los Tejas, or Río del Arcángel San Miguel. Many maps mislocated the Neches or confused it with the Sabine or other streams of the region. José Antonio Pichardo, who made a close study of the Louisiana-Texas boundary in the first decade of the nineteenth century, reported all of this past confusion, pointing out at the same time that the designations for the two streams-Neches or Río de Nievas for the western and Río de Sabinas for the eastern-had been well-established for years and that, when the Río Mexicano designation was used, it was only properly applied to the Neches. Between 1819 and 1836 an argument that the names of the Neches and Sabine had been confused on maps received considerable attention, especially in the United States.

Despite the attempts of the Spanish to colonize the area, large numbers of Europeans did not enter the Neches basin until the 1820s, when Anglo-Americans from the southern United States began to settle there. Numerous hand-propelled ferries established along the river during the 1830s and 1840s helped open the area for settlement.

Christopher Long, "Neches River," Handbook of Texas Online, accessed February 01, 2023, https://www.tshaonline.org/handbook/entries/neches-river.

During the late nineteenth and early twentieth centuries the upper Neches River basin was the site of intensive logging, and numerous sawmills were built along the banks of the river and its tributaries.  In addition to the lumber industry, there was also a rise in the cattle industry during this time period.  Downstream, the broad Neches floodplain became the site of intensive rice culture during the early 1900s. After the Spindletop boom of 1901, the Neches basin also became the site of large-scale oil exploration. The growth of the oil industry led to the development of the Beaumont-Port Arthur-Orange metropolitan area as a major site for oil refining, processing, and shipping.

The Lucas Gusher at Spindletop Oilfield (Image from www.tshaonline.org)

## The Neches River: Location and Land Use

The Neches River rises just east of Colfax in eastern Van Zandt County (at 32°30` N, 95°45’ W) and flows southeast for 416 miles to its mouth on Sabine Lake, on the northeastern edge of Port Arthur (at 29°58’ N, 93°51’ W). Except for a few miles near its head, the Neches for its entire length serves as a boundary stream, forming the county lines between Van Zandt and Smith, Smith and Henderson, Henderson and Cherokee, Cherokee and Anderson, Cherokee and Houston, Houston and Angelina, Angelina and Trinity, Angelina and Polk, Angelina and Tyler, Tyler and Jasper, Jasper and Hardin, Hardin and Orange, and Orange and Jefferson counties. Two major reservoirs are located on the Neches: Lake Palestine just north of Cuney, and Lake B.A. Steinhagen. Major tributaries include the Angelina River, which drains one-third of the basin area, Bayou La Nana, Ayish Bayou, Pine Island Bayou, Village Creek, Kickapoo Creek, and Flat Creek. In its lower reaches the Neches flows through generally flat terrain with a substrate composed of sand, gravel, and clay.

With the exception of dams and manmade lakes, much of the river is in a natural state. Approximately 11 miles of the upper Neches flows through the Neches River National Wildlife Refuge, established to protect the biologically diverse bottomland hardwood forest and habitat for migratory birds, and opened to the public as recently as 2019. Downstream, the river delineates the eastern border of Davy Crockett National Forest including more than nine miles of the Big Slough Wilderness Area. Further downstream the Neches defines much of the southern border of Angelina National Forest including roughly four miles of the Upland Island and Longleaf Pine Wilderness Area. The Angelina Neches/Dam B Wildlife Management Area is situated at the confluence of the Neches and Angelina Rivers protecting 12,636 acres of the river’s floodplain and bottomland, administered by the Texas Parks and Wildlife Department along

The Ivory Bill on the Neches River in the Big Thicket National Preserve. (image from www.nechesriveradventures.org)

with the adjacent Martin Dies Jr. State Park on the eastern side of Lake B. A. Steinhagen. South of the lake, beginning at Town Bluff Dam and running 56 miles south to Beaumont, is the Neches River Corridor Unit of the Big Thicket National Preserve, administered by the National Park Service. The Big Thicket National Preserve is recognized as a biosphere reserve by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), preserving an area where several ecosystems converge. The Big Thicket Visitor Center is located approximately 7 miles north of Kountze, TX at the intersection of FM 420 and U.S. Highway 69.

Two major reservoirs are located on the Neches: Lake Palestine just north of Cuney, and Lake B. A. Steinhagen near Town Bluff. The Neches river begins west of Rhine Lake, a small reservoir that is located above Lake Palestine. The Neches has a drainage area estimated at 10,011 square miles. Abundant rainfall in the basin results in a flow of some 6,000,000 acre-feet per year. Major tributaries include the Angelina River, which drains one-third of the basin area, Bayou La Nana, Ayish Bayou, Pine Island Bayou, Village Creek, Kickapoo Creek, and Flat Creek. The Neches and Neches-Trinity Coastal River Basins in 2020 were estimated to have a population of 963,000 people (U.S. Census Bureau). Beaumont is the largest city in the basin; other cities include Tyler, Lufkin, and Nacogdoches. In its upper reaches the river traverses rolling terrain surfaced by deep sandy loams, loamy sands, and sand. Loblolly, longleaf, and shortleaf pine, post, southern red, and white oak, and flowering dogwoods grow throughout the region. Cottonwood, hackberry, pecan, blackgum, and blackjack oak are scattered throughout the area. A variety of native grasses is also found, including little and big bluestem, Indian grass, switch grass, and Virginia wild rye. In its lower reaches the Neches flows through generally flat terrain with a substrate composed of sand, gravel, and clay. Vegetation in this region consists largely of water-tolerant hardwoods, conifers, and grasses. High rainfall rates produce frequent flooding of low-lying areas, and large floods occur on the average every five years. Floods in the basin are often of long duration.

Station 10582 monitored by TCEQ at B.A. Steinhagen near Dam

The Lower Neches Valley Authority oversees the Neches River in Tyler, Hardin, Liberty, Chambers, and Jefferson counties of Texas.

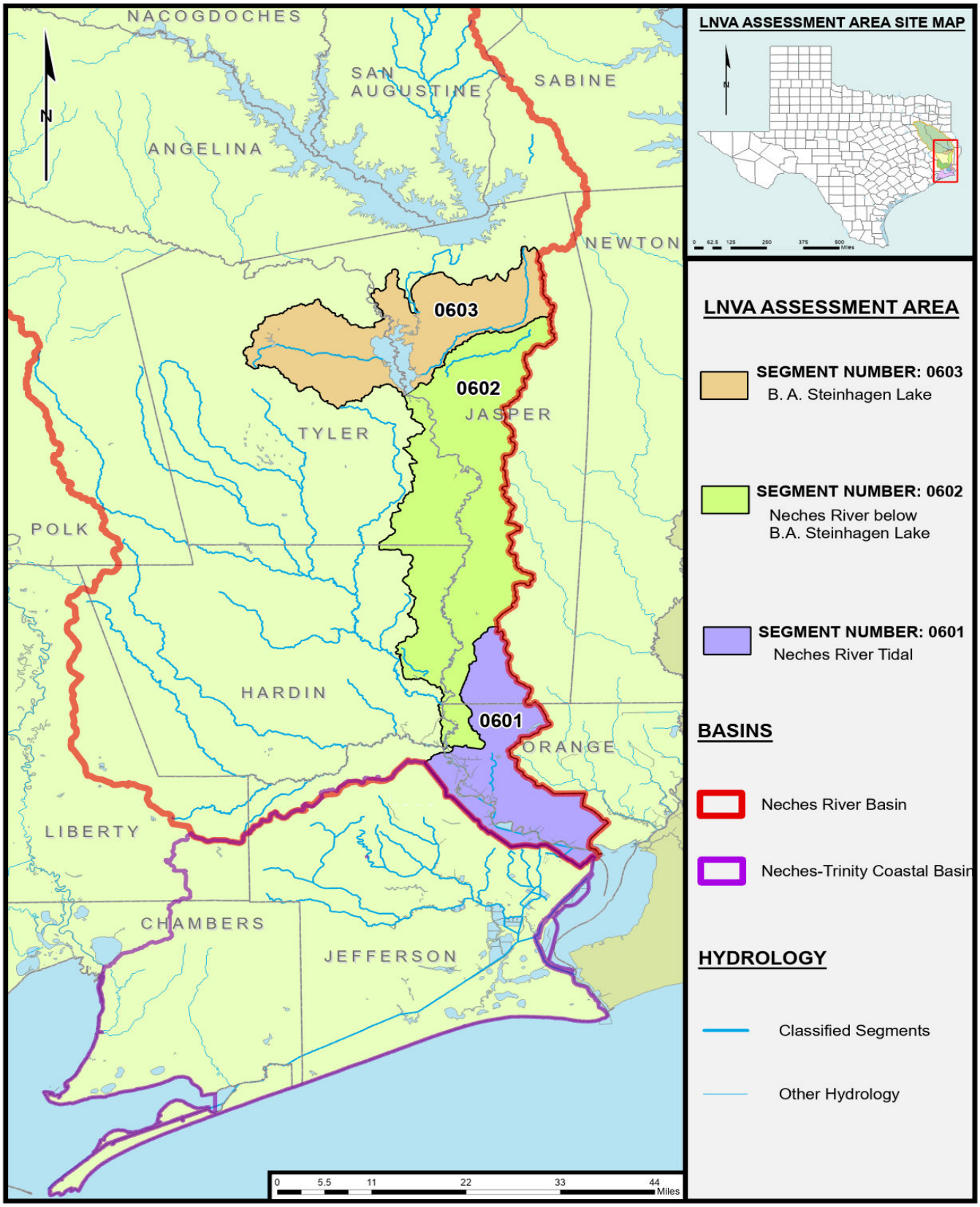



Figure 2. Assessment area site map for segments 0603, 0602, and 0601.


B.A. Steinhagen Lake (image from tpwd.texas.gov)

## Segment 0603: B.A. Steinhagen Lake

B.A. Steinhagen Lake is a reservoir managed by the U.S. Army Corps of Engineers covering over 13,000 acres and is situated in the piney woods. B.A. Steinhagen assists Sam Rayburn Reservoir in flow regulation, produces electric generation, and supplies raw water to the LNVA and City of Beaumont's intakes. At a normal pool elevation of 83 feet, the lake is defined as from Town Bluff in Jasper/Tyler County to a point immediately upstream of the confluence of Hopson Mill Creek on the Neches River Arm in Jasper/Tyler County and to a point immediately upstream of the confluence of Indian Creek on the Angelina River arm in Jasper County. B.A. Steinhagen Lake is located off of Hwy 190 between Woodville and Jasper where it impounds the Neches and Angelina Rivers.

Sandy Creek (0603A) and Wolf Creek (Segment 0603B) as can be seen in Figure 2.2, are major tributaries of Lake B.A. Steinhagen. The Sandy Creek segment, from the confluence of B.A. Steinhagen Lake southwest of Jasper County to the confluence of Big and Little Sandy Creeks in the City of Jasper, is 23 miles long. The Wolf Creek segment, from the confluence of B.A. Steinhagen Lake southeast of Colmesneil in Tyler County to the upstream perennial portion of the stream south of Colmesneil in Tyler County, is twelve (12) miles long. Land use for Segment 0603 can be seen in Figure 2.1. The area is covered by mixed forest, evergreen forest, decidous forest, and pine plantations that include large expanses of loblolly and shortleaf pine trees. Soils are acidic and sandy, which supports upland longleaf pine woodlands, longleaf pine savannas, and hardwood slope forests. Segment 0603 is largely represented by the hilly ecological region called the Southern Tertiary Uplands. The soils generally drain well and are more permeable. Land use is primarily for timber production, public land use, pasture and livestock production, recreation and

Station 15344 Wolf Creek

wildlife habitat. 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. The Sandy Creek (0603A) watershed is primarily rural with large swaths of pine forests contributing to the local forest and paper industries. The city of Jasper is the only municipality in the Sandy Creek (0603A) watershed. The Wolf Creek (0603B) watershed is also primarily rural with a large amount of pine forests. The town of Colmesneil, on the northwestern edge of the watershed, is the only municipality in the watershed. Both watersheds have relatively limited cattle grazing and agricultural production.

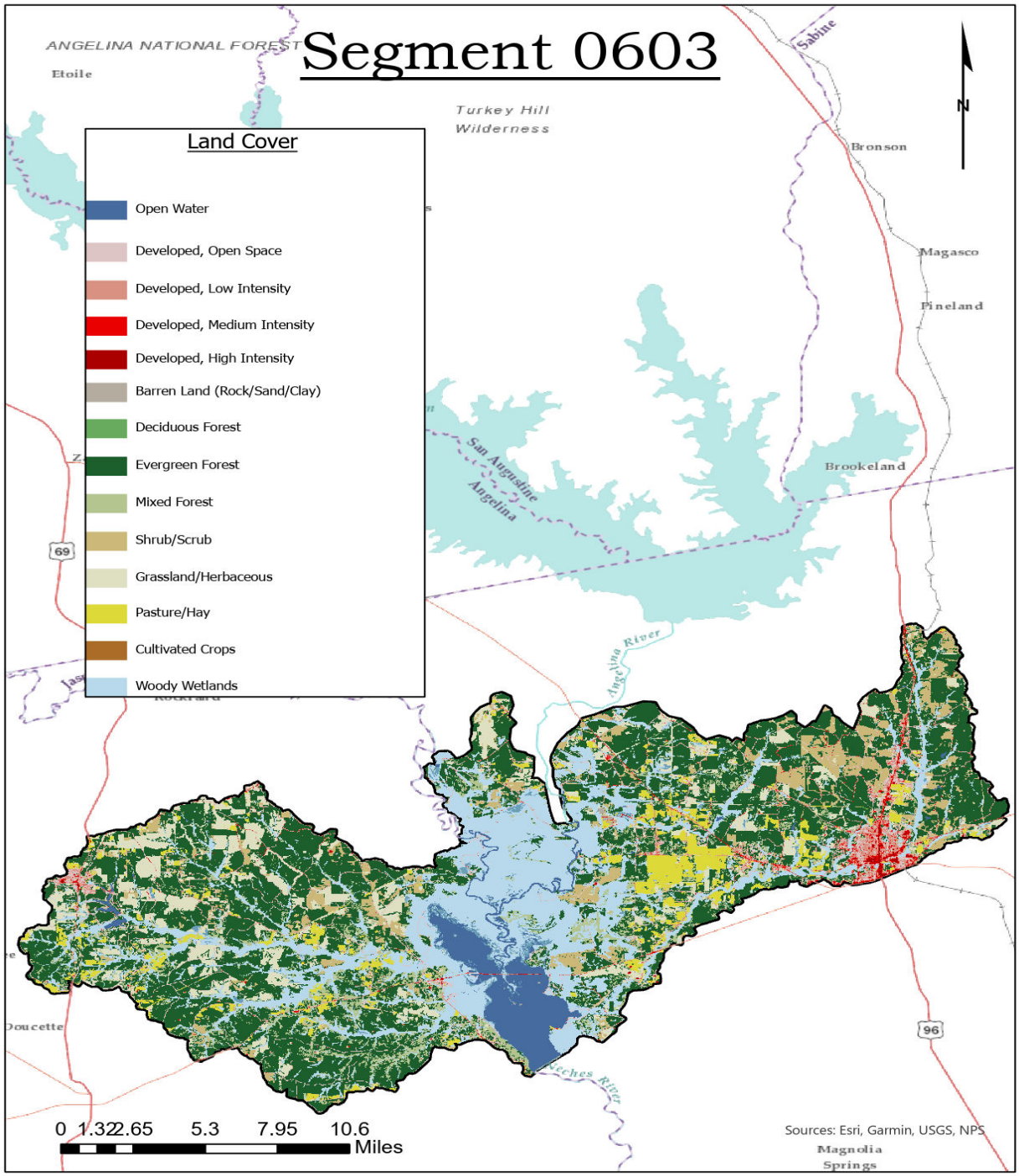



Figure 2.1. Land use map for segment 0603

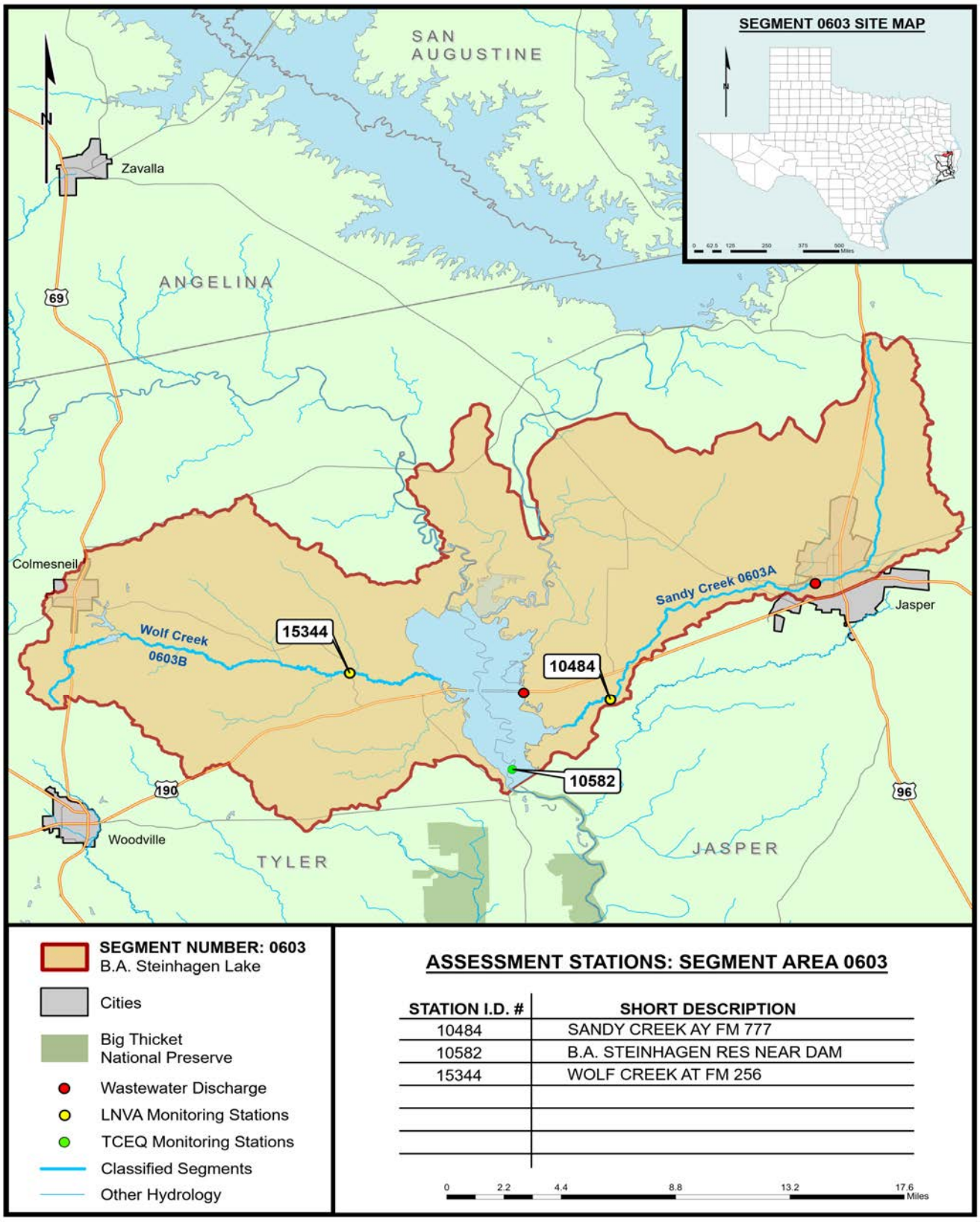



Figure 2.2. Monitoring stations for segment 0603

| Segment # | Segment Name | Impairment/Concern Listed in 2022 Texas Integrated Report | Reason for Impairment |
|---|---|---|---|
| 0603 | B.A. Steinhagen Lake | Not supporting fish consumption use due to mercury and dioxins in edible tissue | Atmospheric Deposition-Toxics; Industrial Point Source Discharge; Other Unkown Source |
| 0603A | Sandy Creek | Not supporting contact recreation use due to bacteria | Nonpoint Source- Agriculture and Grazing in Riparian Zone or Shoreline Zones |
| 0603B | Wolf Creek | Not supporting contact recreation use due to bacteria | Nonpoint Source- Agriculture and Livestock Grazing or Feeding Operations |

Table 2. Segment 0603 Impairments

The LNVA performs routine water quality monitoring on Sandy Creek at Station 10484 and Wolf Creek at Station 15344, while TCEQ Region 10 monitors B.A. Steinhagen Lake on the main pool near the dam at Station 10582 as shown in figure 2.2. Segment 0603 is designated for high aquatic life use, primary contact recreation, and public water supply, as shown in Table 2 above. This segment fully supports the high aquatic life use for dissolved oxygen and the general use criteria parameters. These parameters include pH, temperature, chloride, sulfate, chlorophyll-a, nutrients and total dissolved solids. Due to segment 0603 fully supporting the general use criteria parameters, it also has good water quality for public water supply. The uses that are not supported are fish consumption due to mercury and dioxin in edible tissue in 0603 B.A. Steinhagen Lake and contact recreation use due to bacteria in 0603A Sandy Creek and 0603B Wolf Creek.

Segment 0603 is under Advisory 51 for fish consumption issued by the Department of Safety and Health Services. This impairment due to mercury and dioxins is thought to be attributed to atmospheric deposition, industrial point source discharge, or other unknown sources. The main source of dioxins is combustion processes such as waste incineration or burning wood, coal, or oil and chlorine bleaching of pulp and paper. Mercury is naturally found in the sediment as a result of normal breakdown of the earth's crust by wind and water. Once in the atmosphere, it can travel long distances. Inorganic mercury can enter the environment from ore deposits, burning of fuels or trash, or emissions from factories. Non-air deposition contributions, including sources such as soil erosion, tributaries, and waste streams, and factors influencing methylation of mercury to methyl mercury concentrations in fish tissue are not well understood. In addition, basin water quality data

shows no mercury in water or sediment exists in water bodies with mercury in fish tissue concerns or impairments. The issue of mercury in fish tissue is regional, encompassing other water bodies in East Texas in addition to B.A. Steinhagen Lake. The level of mercury contamination in fish tissue is the result of bioaccumulation, and (apart from consumption), there are no risks to the public in other recreational activities.

The primary contact recreation use is not supported due to elevated *E.coli* bacteria in Segments 0603A, Sandy Creek, and 0603B, Wolf Creek. These segments are both located in watersheds with large forested areas with an abundance of wildlife contributing to bacteria levels in the soil and sediment. Sandy Creek also flows through the City of Jasper, which discharges wastewater effluent and stormwater runoff to the segment. Urban runoff/storm sewers, manure runoff, sewage discharges in areas lacking infrastructure, and wildlife are factors influencing high *E. coli* counts.

In response to the bacteria impairments on Sandy and Wolf Creek, TCEQ contracted the Texas Water Resources Institute (TWRI) to develop a total maximum daily load (TMDL) and implementation plan (I-Plan) for the two water bodies. TMDLs for the two creeks were adopted by TCEQ and approved by the EPA on August 18th, 2022. A TMDLs purpose is to determine the amount of a particular pollutant a water body can handle while still meeting water quality standards set for that water body. Once approved, the TMDLs become a part of the state's Water Quality Management Plan (WQMP). The WQMP is a waste treatment plan that is used to direct planning for implementation measures that control and prevent water quality problems. The full TMDLs for Sandy and Wolf Creek can be found at https://www.tceq.texas.gov/waterquality/tmdl/nav/118-sandy-wolf-creeks-bacteria

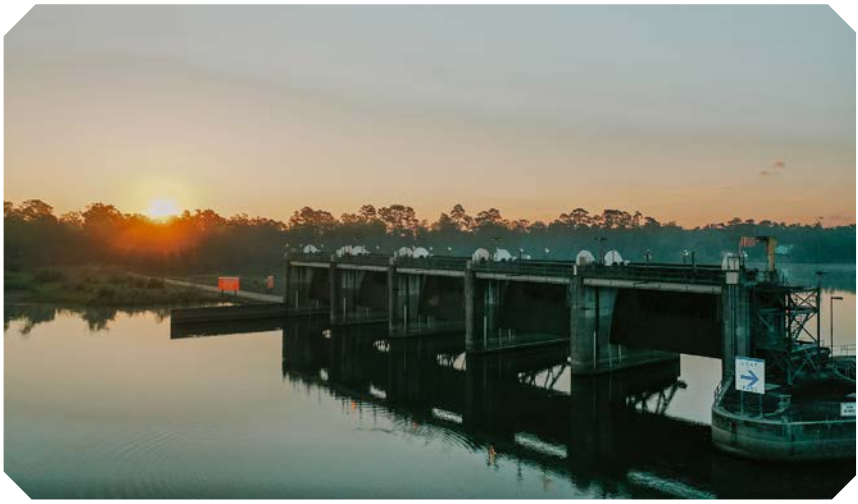
## Recommendations

The LNVA and TCEQ Region 10 will continue to coordinate routine monitoring in the segment. The TCEQ has initiated watershed TMDL and I-plan projects to address the contact recreation use concerns. Mercury and dioxins in fish tissue sampling should continue in B.A. Steinhagen Lake with updates to current advisories being issued promptly by the Texas DSHS.


Neches River in Big Thicket National Preserve (image from nps.gov)

## Segment 0602: Neches River Below B.A. Steinhagen Lake

The Neches River below B. A. Steinhagen Lake is defined in the TSWQS as a river segment from the Neches River Saltwater Barrier as shown in Figure 3, 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 with major tributaries of Village Creek and Pine Island Bayou. Stream discharge is regulated by Town Bluff Dam at Lake B.A. Steinhagen and varies depending on releases from Sam Rayburn Reservoir (for flood control, hydropower generation, and downstream water supply) and upstream Neches Rivers inflows. Segment 0602 is situated in the ecological region termed the "piney woods".



Saltwater Barrier Sunrise (Photo courtesy of Timberly Palmer)

Figure 3.1. Breaks the segment down by land use. The segment is dominated by loblolly and shortleaf pines, but several oak species, sweetgum, flowering dogwood, and longleaf pine are present throughout. A thick understory grows in forested areas and includes American beautyberry, greenbriers, sumac, hawthorns, and some grass species. In the floodplains, which includes sections of the Neches River, riparian species such as bald cypress, water tupelo, water hickory, and red maple thrive. Soils are sandy loams, acidic sands, and some silty substrates, with poorly drained soils in the floodplains, flatwoods, and low terraces. Bottomland forests provide abundant wildlife habitat to many native species. Louisiana pine snakes are thought to be found in the piney woods and are listed as threatened in Texas. Historically, their range extended through the piney woods in west Louisiana to east Texas, but today the range of the Louisiana Pine Snake is the southern parts of the Sabine and Angelina National Forests. Land use is livestock grazing, hunting, timber production, improved pasture, recreation, wildlife habitat, oil and gas production, and both state and federal land. As show in figure 3.1., mixed forest, as well as evergreen forest, deciduous forest, pine plantations, and forested wetlands are present in the segment.

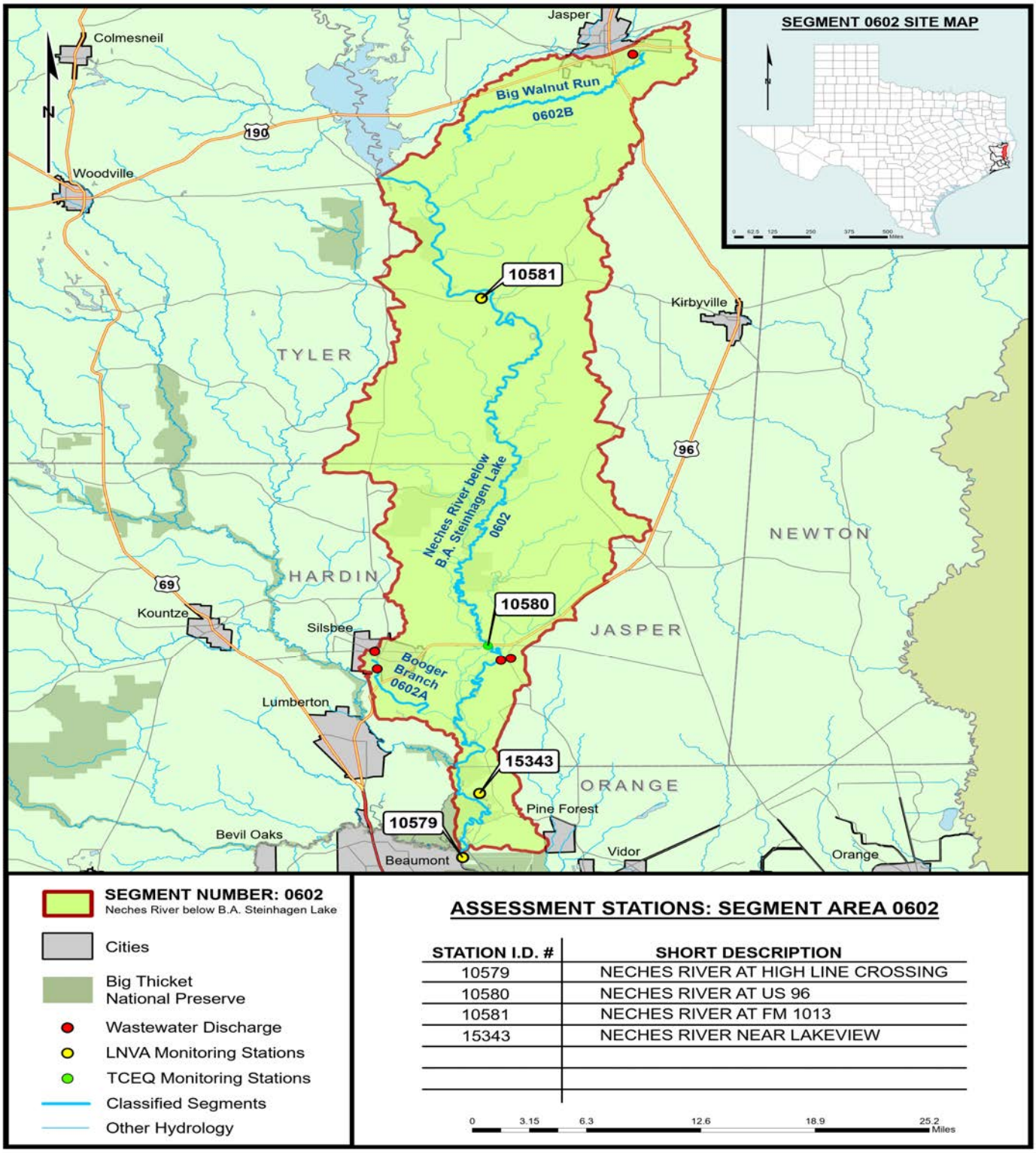



Figure 3. Monitoring stations for segment 0602

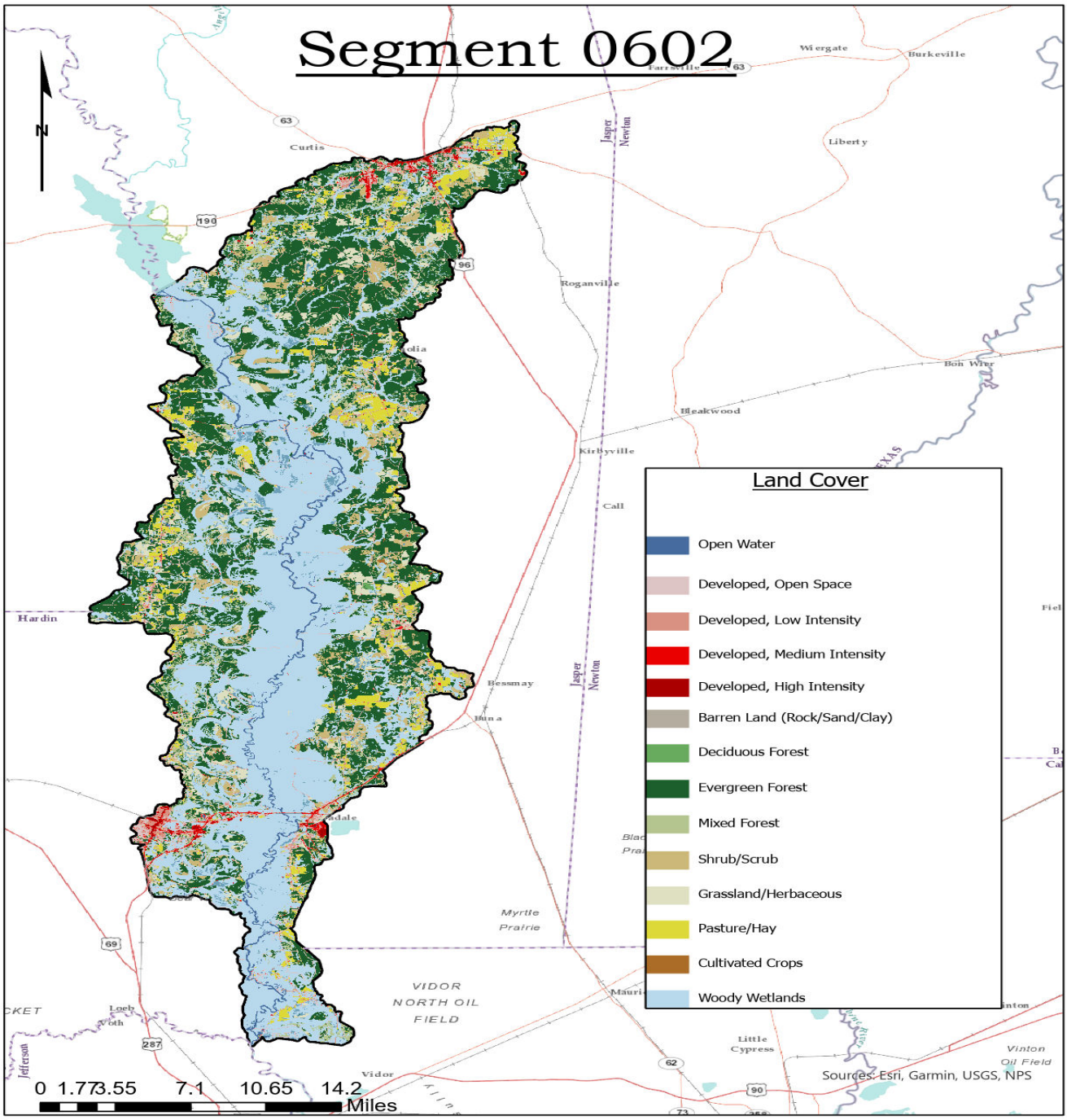



Figure 3.1. Land use map for Segment 0602

The Big Thicket National Preserve manages a total of 106,684 acres. In Segment 0602, five (5) management units border the watershed, which include the Beaumont Unit, Lower Neches River Corridor Unit, Neches Bottom, Jack Gore Baygall Unit, and the Upper Neches River Corridor Unit. Three stations are monitored by the LNVA in segment 0602, including #10581, #15343, and #10579, with TCEQ monitoring one station, #10580 as shown in Figure 3.

| Segment # | Segment Name | Impairment/Concern Listed in 2022 Texas Integrated Report | Reason for Impairment |
|---|---|---|---|
| 0602 | Neches River Below B.A. Steinhagen | Not supporting fish due to mercury and dioxin | Atmospheric Deposition-Toxics; Industrial Point Source Discharge; Unknown Source |
| | | Concern for mercury in edible tissue | Source Unknown |

Table 3. Segment 0602 Impairments

In the TSWQS's, Segment 0602 uses are designated as primary contact recreation, high aquatic life use, and public water supply. Current assessments show an impairment for fish consumption due to mercury and dioxin and a concern for mercury in edible fish tissue as shown in Table 3. There is currently a fish consumption advisory for the Neches River from the Department of Safety and Health Services for mercury and dioxins. A link for more information about Advisory 51 can be found at https://www.dshs.texas.gov/seafood-aquatic-life-group/information-on-consumption-advisories-possession-bans-rescinded-orders-seafood-aquatic-life/fishing-advisories-bans-faqs. As mentioned in Segment 0601, Mercury is naturally found in sediment while inorganic mercury can enter the environment through human activities such as the burning of fuels or trash. Because mercury can travel long distances in the atmosphere, mercury can bioaccumulate in fish in areas where no obvious source of mercury pollution exists. The main source of dioxins is incineration and unintentional by-products of chlorine bleaching. Results from the current assessment show no impairment for the contact recreation use as well as no impairments for pH, temperature, chloride, sulfate, and total dissolved solids. Aquatic life use is also unimpaired for dissolved oxygen, nutrients, and chlorophyll-a.

Alligator sighting on the Neches River (Photo courtesy of Timberly Palmer)

## Recommendations

Advisory 51 for the mercury and dioxin in fish tissue was issued in 2014. The LNVA recommends assisting the TDSHS in updating the data to provide current insight into the issue of mercury and dioxin in fish tissue. In order to address the mercury in fish tissue, The LNVA and TCEQ should contact the TDSHS for more information on when fish advisories are updated. Surface water quality monitoring of the routine stations in Segment 0602 should be continued by the TCEQ and LNVA to maintain baseline water quality data collection, and ensure stream standards and nutrient screening levels are still being met.

Neches River (Photo courtesy of Timberly Palmer)


Rainbow Bridge over the Neches River (image from historicbridges.org)

## Segment 0601: Neches River Tidal

The Neches River Tidal is the segment of the Neches River from Sabine Lake in Orange County to the Neches River Saltwater Barrier, a half-mile downstream of the confluence of Pine Island Bayou. Segment 0601 is classified as a tidal stream segment with intermediate aquatic life use and primary contact recreation use designations. Tidal exchange and fresh water inflows are the hydrologic influences in this segment. The substrates in this area consist primarily of sand, silt, and clay and consists of low, flat plains with some of the area being tidal marshes with bayous. Common reed and grasses, including little bluestem, yellow Indiangrass, switchgrass, and salt meadow cord grass, are prevalent in the lower part of Segment 0601. The land use map in Figure 4 shows that few trees are present in this portion of the segment; however, further upstream near the Saltwater Barrier, the vegetation is dominated by water tolerant trees such as water tupelo, bald cypress, willow, and oaks.

Water quality sampling on the Neches River (Photo courtesy of Timberly Palmer)

The tidal influence has become more prevalent and is negatively impacting this wetland ecosystem, despite multiple years of historic flows. A dredged navigation channel from the mouth of the river to the Port of Beaumont is maintained by the U.S. Army Corps of Engineers (USACE). The navigation channel is currently dredged to 40 feet deep and 400 feet wide in order to accommodate marine traffic and large vessels. There is currently a channel improvement project planned to deepen the Sabine-Neches Waterway from 40 feet to 48 feet to accommodate marine traffic and large vessels. The land in the segment consists of low, flat plains with some of the area being tidal marshes with bayous. Operational maintenance has resulted in spoils and dredge along the water's edge in some areas. Land use is primarily

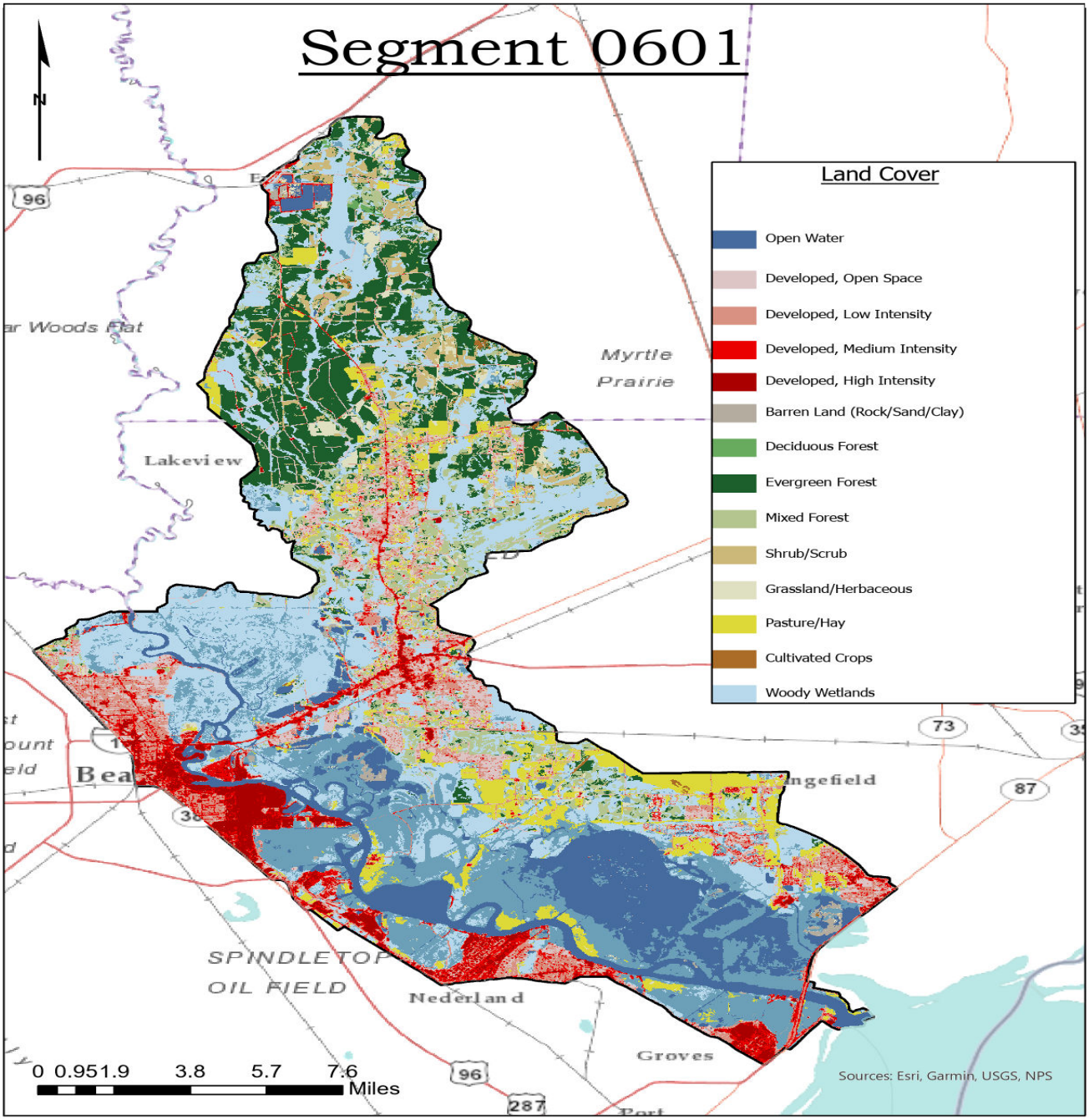



Figure 4. Land use map for segment 0601

oil and gas production, along with marshland, wildlife and waterfowl habitat, cropland, and urban/industrial.

Beaumont, Nederland, Port Neches, and Groves are cities located along Segment 0601. Visible in Figure 4.1., Star Lake Canal (Segment 0601A) is a tidally influenced, dredged canal receiving industrial effluents, which discharge into the Neches River. The canal was constructed in the late 1940's and has been utilized for industrial and storm water purposes by chemical and manufacturing facilities.

The LNVA Neches River Saltwater Barrier was designed and constructed by the U.S. Army Corps of Engineers to protect critical freshwater intakes on the Neches River and Pine Island Bayou. The saltwater intrusion from the Gulf of Mexico and Sabine Lake to the Neches River Tidal segment can be substantial during periods of drought and low-flow conditions. The saltwater intrusion during these periods is worsened due to the dredging of ship channels in the Neches River. Since 2003, the permanent Saltwater Barrier (SWB) has conserved billions of gallons of freshwater stored in Sam Rayburn Reservoir previously used to "flush" saltwater from the lower Neches River channel. The Neches River SWB facilities also help provide additional access to the river for recreational activities as well as protects upstream ecosystems from saltwater intrusion. The project included a 4,500-squarefoot administration building with a water quality laboratory, control room, and conference room, a 2,000-square-foot boathouse; public boat ramps; public restrooms; an access road, and parking lots.

Saltwater Barrier lit up during the night (Photo courtesy of Jamesky Saberon)

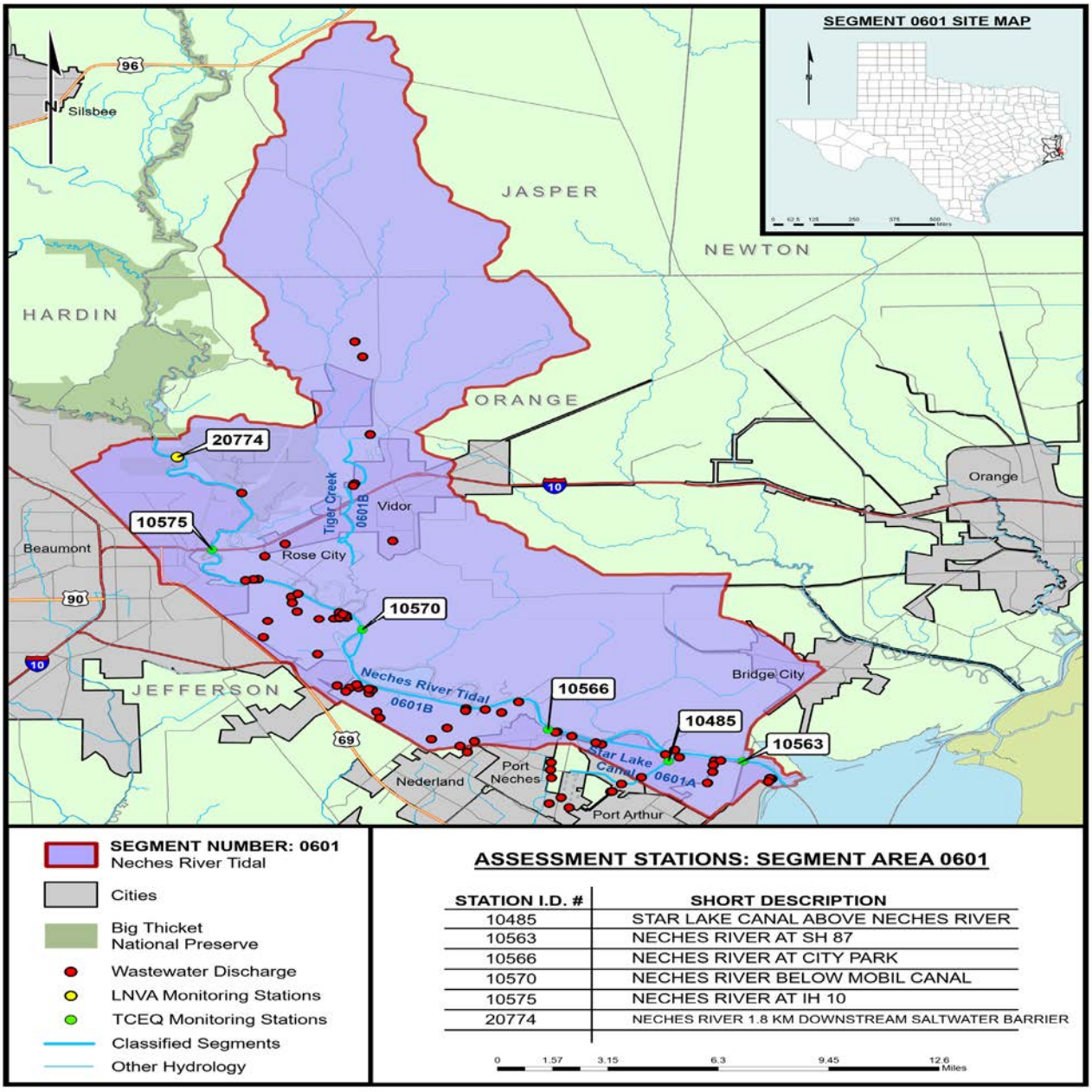



Figure 4.1. Monitoring stations for Segment 0601

TCEQ Region 10 currently monitors five stations in Segment 0601 and 0601A, while the LNVA monitors one station in segment 0601, as shown in Figure 4.1. Segment 0601 is designated in the current TSWQS with intermediate aquatic life use and primary contact recreation. This segment is currently listed in the 2020 Texas Integrated Report for not supporting fish consumption due to polychlorinated biphenyls and a contact recreation use impairment for bacteria, as shown in Table 4. There is also an aquatic life use concern for malathion. On December 29, 2011, the Texas Department of State Health Services (TDSHS) issued Advisory 46 limiting the consumption of gafftopsail catfish from Texas waters of Sabine Lake in Jefferson and Orange counties. Laboratory testing showed levels of polychlorinated biphenyls, or PCBs, exceeding TDSHS standards in samples of gafftopsail catfish collected from the lake. The advisory also covers contiguous Texas waters, including Sabine Pass and portions of the Sabine and Neches rivers; therefore, the Neches River Tidal segment is not supporting fish consumption use due to PCBs in edible tissue. The TDSHS did not find elevated levels of contaminants in samples of alligator gar, black and red drum, sand trout, southern flounder,

| Segment # | Segment Name | Impairment/Concern Listed in 2022 Texas Integrated Report | Reason for Impairment |
|---|---|---|---|
| 0601 | Neches River Tidal | Not supporting contact recreation due to bacteria in Neches River Tidal | Source Unknown |
| | | Not supporting fish consumption due to polychlorinated biphenyls in edible tissue | Source Unknown |
| | | Impairment for aquatic life use due to malathion (lower segment only) | Nonpoint Source pesticide application; Source Unknown |
| 0601A | Star Lake Canal | Not supporting contact recreation due to bactreia | Source Unknown |
| | | Concern for aquatic life use due to malathion | Nonpoint source pesticide application; Source Unknown |

Table 4. Segment 0601 Impairments

spotted seatrout, or striped bass. The contaminant level in fish often depends on their diet, age, species, and size as well as their place in the food chain. PCBs are industrial chemicals once used as coolants and lubricants in electrical equipment and for other industrial purposes. The U.S. EPA banned PCBs in 1979, but equipment containing PCBs did not have to be replaced. PCBs break down very slowly in the environment and can accumulate in animals such as fish. Long-term consumption of PCBs may cause cancer as well as reproductive, immune system, developmental and liver problems in humans. Elevated levels of PCBs in fish do not pose a health risk for people participating in recreational activities on Sabine Lake or the Neches River Tidal. The 2020 Integrated Report lists non-point source pesticide use as the potential cause for the malathion.

To address the bacteria concerns in Segment 0601, the Texas State Soil & Water Conservation Board, the Texas A&M AgriLife Extension, and the Texas Water Resources Institute have entered into a partnership with TCEQ to begin a Texas Watershed Steward program for stakeholders in the Neches River Tidal watershed. This program will engage area stakeholders in using a watershed approach to identify the potential sources of the bacterial issues, increase public awareness and involvement, coordinate agency efforts in the watershed, and measure success through monitoring. Through this process, stakeholders were able to assist in determining whether a Total Maximum Daily Load (TMDL) project or a watershed protection plan is the best approach to help manage the bacterial issues. If selected, the TMDL is submitted to EPA for approval, followed by an implementation plan (I-Plan), which is developed and submitted to TCEQ. This process can take two to three years. In contrast, a watershed protection plan is a community driven management plan using the watershed approach to address the bacterial concerns. A watershed protection plan is a streamlined effort developed and approved by stakeholders, allowing immediate implementation. As a

living document, the plan is revised as needed, but can also take two to three years to develop. A TMDL and I-plan project for the Neches Rival Tidal Segment was determined to be the appropriate path forward after a number of public meetings beginning in 2019. The indicator bacteria for this segment is Enterococcus due to the brackish nature of the Neches River Tidal segment. Data from the TCEQ Surface Water Quality Information System (SWQMIS) will be used in this project, and more information about the status of the TMDL on Segment 0601 Neches River Tidal can be found on TCEQ's website at: https://www.tceq.texas.gov/waterquality/tmdl/nav/118-nechestidal-bacteria.

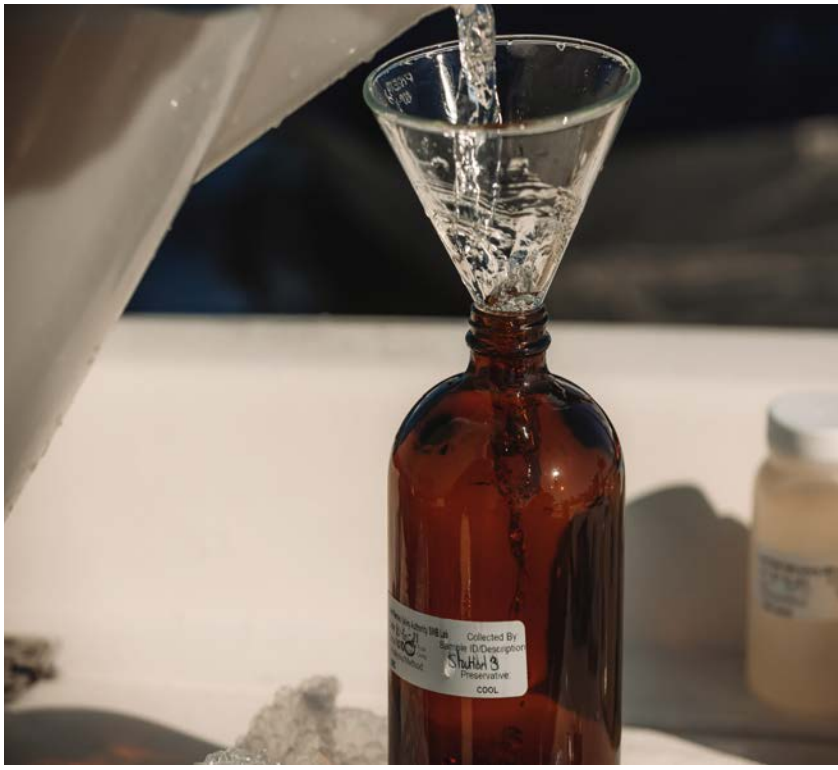
The 2022 Integrated Report lists the potential causes of elevated bacteria levels, resulting in a nonsupport classification, as originating from unknown sources. These sources can be divided into two categories: regulated or unregulated. A regulated source, also known as a point source, is permitted under the Texas Pollutant Discharge Elimination System (TPDES) program. Wastewater treatment facility and stormwater discharges from industry, construction activities, and municipal storm sewer systems are examples of regulated sources. There are currently 76 facilities within the basin permitted for either domestic or industrial wastewater. Wildlife, runoff from agricultural practices, and improper residential discharges are unregulated, or nonpoint, sources.

Star Lake Canal (0601A) is listed specifically for a nonsupport of contact recreation for bacteria and a concern for aquatic life use due to malathion. The segment is a tidally influenced, dredged canal receiving industrial wastewater and storm water discharges from industrial facilities. Residential, industrial, and recreational activities are land

Industrial view from the Neches River (Photo courtesy of Timberly Palmer)

uses around Star Lake Canal. In July 2000, Star Lake Canal, along with Jefferson Canal and Molasses Bayou, were declared a Superfund Site by the United States Environmental Protection Agency (EPA). The site is currently defined by the EPA as consisting of two industrial canals, the Star Lake Canal and the Jefferson Canal, from their origins to the Neches River. The Star Lake Canal joins the Jefferson Canal in an area between State Highway 366 and Sara Jane Road (a.k.a. Atlantic Highway). These sites were added to the EPA National Priorities List based on evidence that hazardous substances (including chromium, copper, polynuclear aromatic hydrocarbons (PAHs), and polychlorinated biphenyls [PCBs]) have migrated or could potentially migrate to Molasses Bayou, Star Lake Canal, Neches River, Sabine Lake, and their associated wetlands.

The EPA is currently preparing an agreement to implement the remedy selected in the Record of Decision (ROD), which includes excavation and disposal of contaminated soil/sediment, containment with soil cap and pipe, and monitored natural recovery for the seven areas of the site. The EPA issued the ROD for the site in September 2013. An administrative order on consent to complete the remedial design (RD) was signed in September 2016. As part of the RD, plans were made to conduct a Preliminary Design Investigation (PDI) starting July 31, 2017. The PDI was delayed by of the impact of Hurricane Harvey in August of 2017 resulting in torrential precipitation and flooding in the area. The site experienced mild to moderate flooding for a few days due to the rain. The PDI Report was finalized in August of 2018. After a review of the material presented in the Final PDI Report, the EPA concluded the data supports a decision to revise some of the areas identified in the ROD as requiring remediation. The work plan for the RD was approved in October of 2018, and a work plan for the Treatability Study (TS) was approved in February of 2019. Work on the Explanation of Significant Differences (ESD), RD, and the TS is ongoing at this time. The homepage for the Star Lake Canal superfund site on EPA's website can be found at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0605043



**Water sample collection (Photo courtesy of Timberly Palmer)**

Results from the current assessment indicate an aquatic life use concern for chronic malathion in water based on the freshwater/saltwater chronic criteria (0.01 µg/L) for both the Neches River Tidal and Star Lake Canal. Malathion is an organophosphate insecticide registered for use in the United States since 1956. The insecticide is used in the agricultural production of a wide variety of food and feed crops to control many types of insects such as aphids, leafhoppers, and Japanese beetles. It is also used for residential insect control and home vegetable gardnes. Malathion applications are very common in Southeast Texas for the eradication of mosquitoes, and poses little risks to human health as long as labeled application rates and safety precautions are followed. Malathion is very toxic to insects, including honeybees. Elevated levels of malathion in water may be caused by aerial spraying applications made along drainage canals and waterways near the Neches River Tidal and Star Lake Canal. No recent data has been collected to validate these concerns. The last sampling event for malathion in Segment 0601 took place in 2013.


Water samples (Photo courtesy of Timberly Palmer)

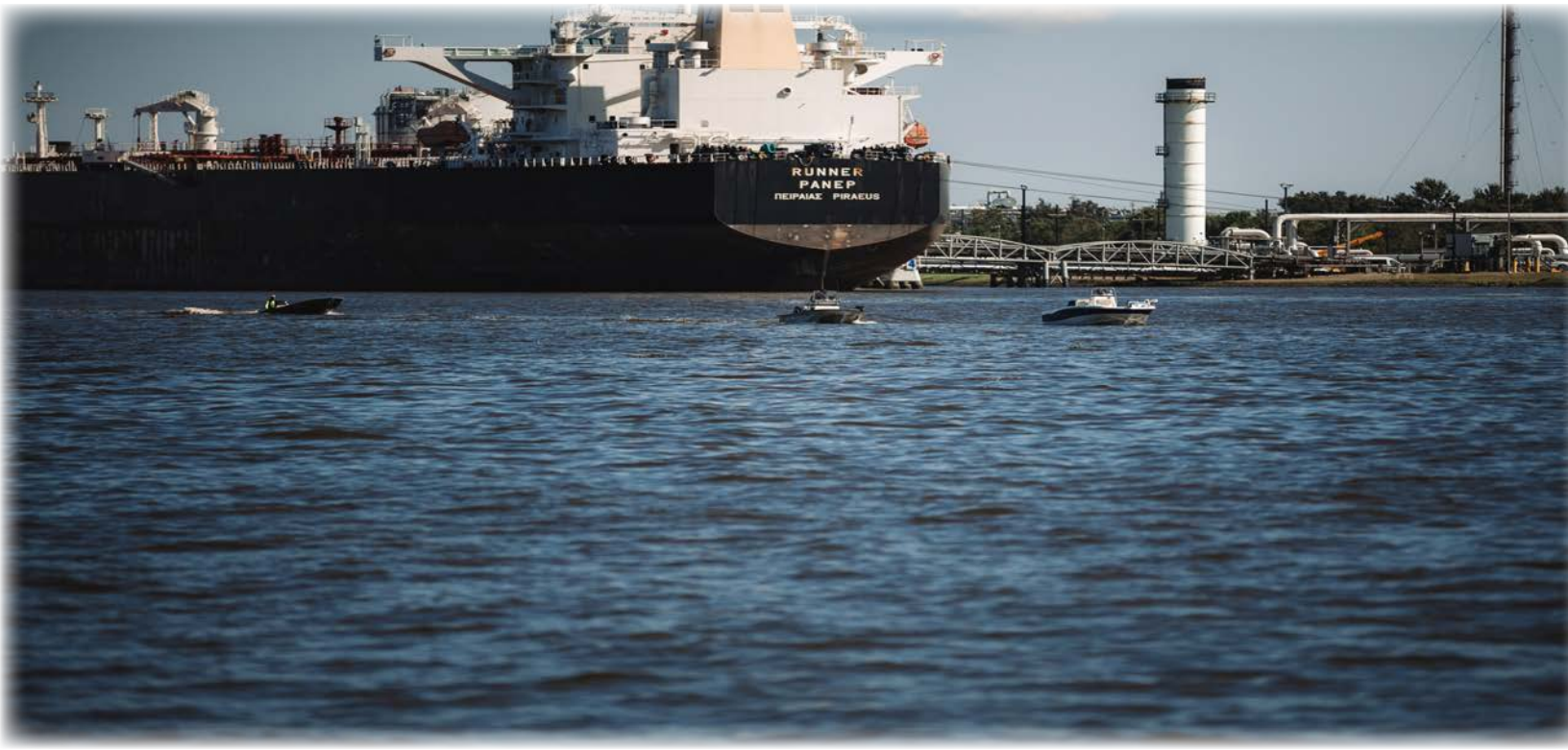
The analytical reporting limit laboratories were able to reach for malathion was 0.5 µg/L when it was last sampled. Water quality laboratories are now currently able to reach the water quality standard limit of 0.1 µg/L. Malathion was sampled from 1999 to 2013 at Station #10563, Neches River Tidal at SH 87, with only one result over the 0.5 µg/L laboratory reporting limit. This result was collected on October 4th, 2012 with a concentration 0.96 µg/L. The only way to truly assess potential malathion concerns is to conduct more sampling.

Water Quality Sonde (Photo courtesy of Timberly Palmer)

One improvement for segment 0601A, Star Lake Canal was seen in the 2022 Integrated Report. A general use concern for ammonia was listed in the 2020 report and was removed for the 2022 report due to sufficient data being collected to show the segment was currently meeting water quality standards.

## Recommendations

Advancements in water quality laboratory technology now allow screening to reach the standard limit for malathion of 0.1 mg/L. Additional malathion testing should be done to provide a current assessment of this segment. Water quality impairments due to elevated bacteria should continue to be monitored by the LNVA and TCEQ Region 10. The TMDL and I-plan project is currently in progress to address bacteria concerns for segment 0601. The Department of Safety and Health Services should continue to monitor fish from Sabine Lake for changes or trends in contaminants or contaminant concentrations necessitating a change in the fish consumption advice.




Neches River Ship Channel (Photo courtesy of Timberly Palmer)

# Public Outreach and Education

## Stakeholder Participation and LNVA's Steering Committee

Maintaining and improving the quality of Texas water bodies is the main goal of the Clean Rivers Program. Engaging with local stakeholders is a critical step in the process and LNVA's program includes stakeholders ranging from concerned citizens, representatives of local industry and municipalities, state and federal agencies, tribal and environmental groups, to the general public. These stakeholders make up LNVA's CRP Steering Committee. An LNVA Steering Committee meeting is held annually and allows members to voice local or regional concerns on water quality issues and help create realistic water quality objectives. Through these meetings, monitoring priorities are established, and the need or want for special studies are discussed. Having a diverse basin-wide committee helps open the platform for different interests, concerns, and priorities of each watershed to be represented. LNVA's annual meetings are open to the public and are posted on the website at https://lnva.dst.tx.us/

## Neches River Rally

September 10th, 2022 marked the 10th annual River Rally held by the Big Thicket Association. The Rally begins at the LNVA Saltwater Barrier boat launch and paddlers follow the 4 mile Cooks Lake Paddling Trail that travels through cypress-tupelo swamps found in the backwaters of the Neches. During this event the Saltwater Barrier opened its doors and allowed participants to tour the laboratory and gain information on LNVA, the Clean Rivers Program, the Texas Stream Team, and the important role of the Saltwater Barrier in the protection of upstream ecology and freshwater supply.

Neches River Rally (Image by John Stafford from bigthicket.org)

## Neches River Festival

The Neches River Festival (NRF) has been a part of Southeast Texas' history since 1949. The NRF works to recognize and celebrate the Southeast Texas area and its greatest natural resource, the Neches River. Each year,  a festival week is held to bring local businesses and the community together while focusing on the area's high school seniors. The event also highlights local organizations and how they are working to improve the environment in and around the Neches River. The one day focus allows the LNVA to set up its educational booth and have staff ready to answer any questions graduating seniors may have.

Neches River Festival Logo


LNVA CRP staff members, Bethany Stanton and Brian Fife, prepare to discuss water quality with the visiting seniors at River Day

## Texas Stream Team

Since 2009, LNVA has supported local members of the Texas Stream Team (TST). The TST is a program based out of Texas State University in San Marcos and is a statewide volunteer network committed to understanding and protecting Texas waterways. Volunteers are trained to test for parameters such as dissolved oxygen, pH, and conductivity at approved water bodies on a monthly basis. Historically, LNVA has provided volunteers in the area with water quality test kits, supplies, and refill agents needed for Stream Team monitoring activities. In addition to providing supplies, LNVA is now capable of hosting Texas Stream Team Trainings. LNVA employee, Brielle Patronella, received her training certificate in December of 2022 and will host Stream Team trainings at the Saltwater Barrier in Beaumont, Texas. Upcoming trainings will be posted to the LNVA website at: https://lnva.dst.tx.us/


LNVA employee Brielle Patronella holding Texas Stream Team Trainer Certificate

| Site ID | Site Description |
|---|---|
| 80979 | Village Creek at US |
| 15489 | Keith Lake at Hwy 87 |
| 10668 | Neches River at the Saltwater Barrier |
| 80681 | Village Creek at Hwy 327 |
| 80549 | Acid Ditch at Atlantic Road |

Table 5. List of current TST monitoring sites in the basin

## Have you seen this turtle?

The Alligator Snapping Turtle is a protected species in Texas and is proposed for listing as a threatened species under the Endangered Species Act. It is easily identifiable by its triangular shaped head, pointed nose, hooked beak, and three rows of prominent ridges along their shell. Maintaining a safe distance from these animals is important as they can grow up to 200 lbs and have a powerful bite. However, sightings of an Alligator Snapping Turtle are extremely helpful to current research projects. LNVA has posted signs at public boat ramps that include educational information and photos along with an email to report sightings to. Photos and GPS coordinates can be emailed to AST@lnva.dst.tx.us. Intentionally harming or killing an Alligator Snapping Turtle is illegal. If you witness someone collecting or intentionally harming one of these turtles report to Operation Game Thief at 1-800-792-4263.


AST sign posted at Angelina @ Hwy 63 boat ramp

# Major Events

Seining on the Neches River (Photo courtesy of TImberly Palmer)

## Academy Study

Since 1953, the Academy of Natural Sciences of Drexel University has monitored water quality and the health of key aquatic ecosystem elements periodically (1953, 1956, 1960, 1973, 1996, & 2003) at several sites on the lower Neches River, with the most recent survey completed in October of 2021. The most recent study included five sample locations ranging from upstream of the Saltwater Barrier down to the lower portions of the Neches River in Port Neches. The survey examined environmental chemistry (water and sediments), protozoans, plankton, attached algae, aquatic macrophytes (rooted or floating aquatic plants), macroinvertebrates, and fish. Many levels of the aquatic food web are studied because no single group can reliably indicate the condition of an ecosystem. The report from the surveys findings is currently in draft form and will be made available to the public following final approval.

Academy Study Sampling (Photo courtesy of Timberly Palmer)

Alligator Gar on the Neches River (Photo courtesy of Timberly Palmer)

## Total Maximum Daily Load

### Neches River Tidal

TCEQ and TWRI are currently developing a TMDL and I-plan for segment 0601, Neches River Tidal. The goal of a TMDL and I-plan is to address water quality impairments. For segment 0601, high concentrations of indicator bacteria (Enterococci) qualify impairment. These indicator bacteria are found in both human and animal waste. This portion of the Neches River is classified as being used for primary contact recreation such as swimming or wading. Project goals are to improve water quality to help protect recreational uses on the Neches River.

TMDLs for segment 0601 have already been proposed and are being considered for adoption by the TCEQ in 2023. A TMDL acts as a budget and determines the amount of a particular pollutant that a water body can receive and still meet its water quality standards. Once the TMDL is established, an I-plan is generated that helps describe the steps that stakeholders and TCEQ will take toward achieving the limits set by the TMDL, along with a schedule for implementation activities. An I-plan is currently in draft form for segment 0601 and is available for public comment. More information can be found at https://www.tceq.texas.gov/waterquality/tmdl/nav/118-nechestidal-bacteria

### Sandy and Wolf Creek

Segment 0603A, Sandy Creek, and segment 0603B, Wolf Creek, also have an impairment due to bacteria levels. TMDLs for the two creeks were adopted by TCEQ and approved by the EPA on August 18th, 2022. A draft I-Plan is currently in progress to address management measures to be taken. More information can be found at https://www.tceq.texas.gov/waterquality/tmdl/nav/118-sandy-wolf-creeks-bacteria

Praying Mantis on the Neches River (Photo courtesy of Timberly Palmer)

For more information about the Lower Neches Valley Authority Clean Rivers Program, please visit the LNVA website at
https://lnva.dst.tx.us/
or contact 409-892-4011

LNVA
LOWER NECHES VALLEY AUTHORITY

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

THE TEXAS CLEAN RIVERS PROGRAM