Lavaca Basin

2021 Water Quality Update

Prepared by the
Lavaca-Navidad River Authority (LNRA)
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LAVACA BASIN 2021 Water Quality Update

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Preface:

The Clean Rivers Program (CRP) is a water quality monitoring, assessment, and public outreach program administered by the Texas Commission on Environmental Quality (TCEQ) and funded by state collected fees. The Lavaca Navidad River Authority (LNRA) coordinates the CRP for the Lavaca Basin.

Under the CRP, field staff collect water quality samples and measure field parameters and flow at sites throughout the watershed. This data is used to assess a water body and determine if it meets the appropriate standards for its designated use. Monitoring and assessment often provide information about land use and possible sources of pollution. Also, collecting and storing this data allows for the analysis of trends over time.

Under the authorization of the Clean Rivers Act (1991), the LNRA completes reports detailing highlights in the Basin, special studies, updates to ongoing projects, and assessments of trends. These reports are used to inform the communities LNRA serves about water quality and resource management.

Figure 1: Lavaca Basin within The State of Texas.

2020 Basin Highlights:

The precipitation contradiction of the watershed was acutely evident this year as seen by the wide range of average rainfall experienced across the Basin. In the Northern area, a precipitation gauge northeast of the city of Moulton in Lavaca County recorded 27.83 inches of rainfall. Fifty-eight (58) miles to the southeast near the city of Louise, LNRA's precipitation gauge (Site 1800) recorded 50.67 inches of rainfall. During year 2020, the Lavaca Basin received an average rainfall of 37.10 inches with most of the precipitation falling along the coast, 41.56 inches respectively. Despite some areas of the Basin receiving below average rainfall during the final quarter of the year, the watershed immediately above and below Lake Texana experienced above average rainfall which resulted in the reservoir being able to maintain its full conservation level for the last half of the year.

As another year comes to an end, the water quality has remained fairly consistent and the issues within the Basin remain focused on concerns with the presence of *E. coli* in area waterways and nutrient rich sediment being transported into Lake Texana. The Lavaca Navidad River Authority (LNRA) is still actively monitoring twenty-four (24) sites throughout the Basin for a variety of field and conventional parameters including bacteria. Eighteen (18) sites are sampled monthly for specific field data parameters which include dissolved oxygen, pH, temperature, specific conductivity, flow, salinity, and secchi disk. Conventional water quality analyses are conducted quarterly on several of these sites as well. Five (5) sites within the Basin are sampled quarterly for both field and conventional water analyses, and the remaining site is sampled bimonthly for field data. Two (2) of these sites are currently monitored for 24-hour dissolved oxygen.

In addition to LNRA's traditional water quality monitoring effort, during year 2020 LNRA was contracted by the Texas Water Resource Institute (TWRI) to conduct focused sample collection and lab analysis for *E. coli* in support of the Lavaca River Watershed Protection Plan published by the Institute. LNRA also contracted the United States Geological Survey (USGS) to conduct continuous turbidity monitoring of East Mustang Creek at a sample location in southeastern Wharton County aimed at quantifying the sediment load being transported in this waterway which is a contributing tributary of Lake Texana.

FY 2021 LNRA Water Quality Monitoring Schedule (includes USGS Metals and Organics in water sampling)							Pesticides & herbicides	***	**		*
Segment #	**TCEQ #**	**LNRA#**	**Description**	**Latitude**	**Longitude**	**Metals in Water**	**Organics in Water**	**Conv.**	**Bact**	**Flow**	**Field**
1601	15372	215	Lavaca River @ Frels Landing	28.82332366	-96.57524068	(dissolved)					12
1601	15371	220	Lavaca River @ Mobil dock	28.78765308	-96.58911447						12
1601	15370	225	Lavaca River @ mouth of RedfishLk	28.76513236	-96.57006427						12
1601	15369	230	Lavaca River @ mouth of Swan lake	28.71502277	-96.5682295						12
1601	18336	232	Lavaca River near Lavaca Bay mouth	28.699474	-96.575817			4			12
1602	12525	111	Lavaca River @ SHwy 111 bridge	29.15666667	-96.875			4	4	12	12
1602	12524	110	Lavaca River @ Hwy 59 bridge	28.96027	-96.68638889			4	4	12	12
1602	12527		Lavaca River @ Hallettsville 90A	29.44305611	-96.94416809			4	4	4	4
1602	18190	Rocky	Rocky Creek @ Lavaca CR 387	29.360900	-96.974300			4	4	4	4
1602	17594	Komensky	Lavaca River near Komensky					4	4	10	4
1602	17140	Moulton	Lavaca River @ FM 532 in Moulton							6	6
1603	15374	210	Navidad River 30m above Lavaca	28.84111110	-96.5766666			4			12
1604	15377	9	Lake Texana near spillway	28.89090639	-96.57940983	4		4			12
1604	15381	8	Lake Texana near dam	28.90405586	-96.55949577			4			12
1604	15379	7	Lake Texana south of Hwy 111	28.93615191	-96.53466189			4	4		12
1604	13984	6	Lake Texana north of Hwy 111	28.97145679	-96.53404139		2	4	4		12
1604	13985	5	Lake Texana main body near Hwy 59	29.01625988	-96.5540756		2	4	4		12
1604	13986	4	Lake Texana - Mustang Creek arm	28.99573954	-96.52387541		2	4	4		12
1604	13654	2	Sandy Creek @ FM 710	29.15951741	-96.54622804	1	2	4		12	12
1604	15382	10	East Mustang @ FM 647	29.07138889	-96.41722222	1	2	4		12	12
1604	13655	1	West Mustang @ Hwy 59	29.07200754	-96.46762824	1	2	4		12	12
1605	22161	Sublime	Navidad River @ Lavaca CR 142					4	4	4	4
1605	15380	3	Navidad River @ Strane Park bridge	29.06578707	-96.67453325	1	2	4		12	12
1605	15698	Speaks	Navidad River @ Speaks bridge	29.322	-96.709			4		4	4

***Field =** Dissolved oxygen, temperature, specific conductance, pH, salinity (in tidally influenced areas) Secchi disk (water clarity)

****Bact = Indicator Bacteria =** Idexx *E.coli*

*****Conv** Conventional = Total Alkalinity, Chloride, Ammonia, Total Organic Carbon, Turbidity, Total hardness, Sulfate, Nitrate, TKN, TSS, Total Phosphorus

And conventional includes Chlorophyll-A at reservoir sites only (#15377, 15381, 15379, 13984, 13985, 13986)

Figure 2: FY 2021 LNRA Water Quality Monitoring Schedule (Includes USGS Metals and Organics in Water Sampling)

Major Basin Activity Changes & Events:

Lavaca River Watershed Protection Plan (WPP):

The Lavaca River watershed covers approximately 910 square miles, with its headwaters starting north of the City of Moulton, in Lavaca County before discharging into the mouth of Lavaca Bay just northwest of the City of Point Comfort in Calhoun County. The Lavaca River watershed is comprised of several smaller contributing watersheds including Rocky Creek, Big Brushy Creek, and Dry Creek.

In 2008, Segment 1602, the Lavaca River Above Tidal, was placed on the State's 303(d) list of impaired streams due to elevated bacteria levels exceeding the water quality standard for primary contact recreation. The water quality standard for primary contact recreation states that bacteria levels cannot exceed 126 Colony Forming Units per 100 milliliters (CFU/100 mL). In 2014, Rocky Creek (Segment 1602B) was also identified as impaired and placed on the State's 303(d) list.

Areas of concern lie within Segment 1602 of the Lavaca River Basin. The Lavaca River Above Tidal (Segment 1602) and Rocky Creek (Segment 1602B) are combined segments that encompass both Lavaca and Jackson counties. Segment 1602C is considered an intermittent stream with pools and runs from the confluence with Campbell Branch just above the City of Hallettsville up to approximately 3.4 miles upstream of SH 95 in Lavaca County. From Campbell Branch downstream, the Lavaca River (1602) is identified as a perennial river that meanders through Lavaca and Jackson counties before becoming tidally influenced 0.8 miles downstream of the Lavaca River crossing of County Road 306 in Jackson County. Segment 1602B, Rocky Creek, is a tributary of the Lavaca River and is described as a perennial stream that flows roughly 23.5 miles through Lavaca County before merging with the Lavaca River downstream of the City of Hallettsville.

The Texas Commission of Environmental Quality (TCEQ) contracted with the Texas Water Resource Institute (TWRI) to produce a watershed protection plan for the Lavaca River including Rocky Creek. TWRI initiated the project in year 2016. TWRI staff compiled and analyzed bacteria data, potential sources of bacteria, and conducted stakeholder outreach. LNRA was contracted by TWRI to monitor four (4) designated sample sites for twenty-four (24) months, targeting areas of the River that had historical data for *E.coli.* In June 2019, LNRA personnel began collecting water samples at selected locations along the river and are actively monitoring each site monthly. To learn more about the Lavaca WPP please visit TWRI website for more information.

The four sites selected for monitoring are as follows:

1. Lavaca River @ Hwy 59 Bridge (TCEQ #12524)
2. Lavaca River @ State Hwy 111 Bridge (TCEQ #12525)

3. Lavaca River @ Hallettsville 90A (TCEQ #12527)
4. Rocky Creek @ Lavaca County Road 387 (TCEQ #18190)

Figures 3-6 indicate *E. coli* values from the start of sampling in June 2019 to September 2020.

The goal of the Lavaca Watershed Protection Plan (WPP) is to engage local stakeholders in the implementation of Best Management Practices (BMPs) along Segment 1602 of the Lavaca River aimed at lowering bacteria counts below primary recreation standards (126 CFU/100 mL).

There are a variety of factors that may contribute to elevated bacteria levels within the stream. Examples include livestock, wildlife, failure of onsite sewage facilities, and stormwater runoff. In order to meet the goals described in the WPP, it will take roughly 10 years to reduce bacteria levels below the State's criteria. Public outreach and stakeholder participation are vital for the success of the WPP.

Although the WPP is not a mandatory plan, stakeholders and landowners have access to programs which are available to them to help implement BMPs along Segment 1602 of the Lavaca River. If BMPs are implemented and sustained, the overall water quality of the stream in which stakeholders and landowners rely on for their livelihoods will improve.

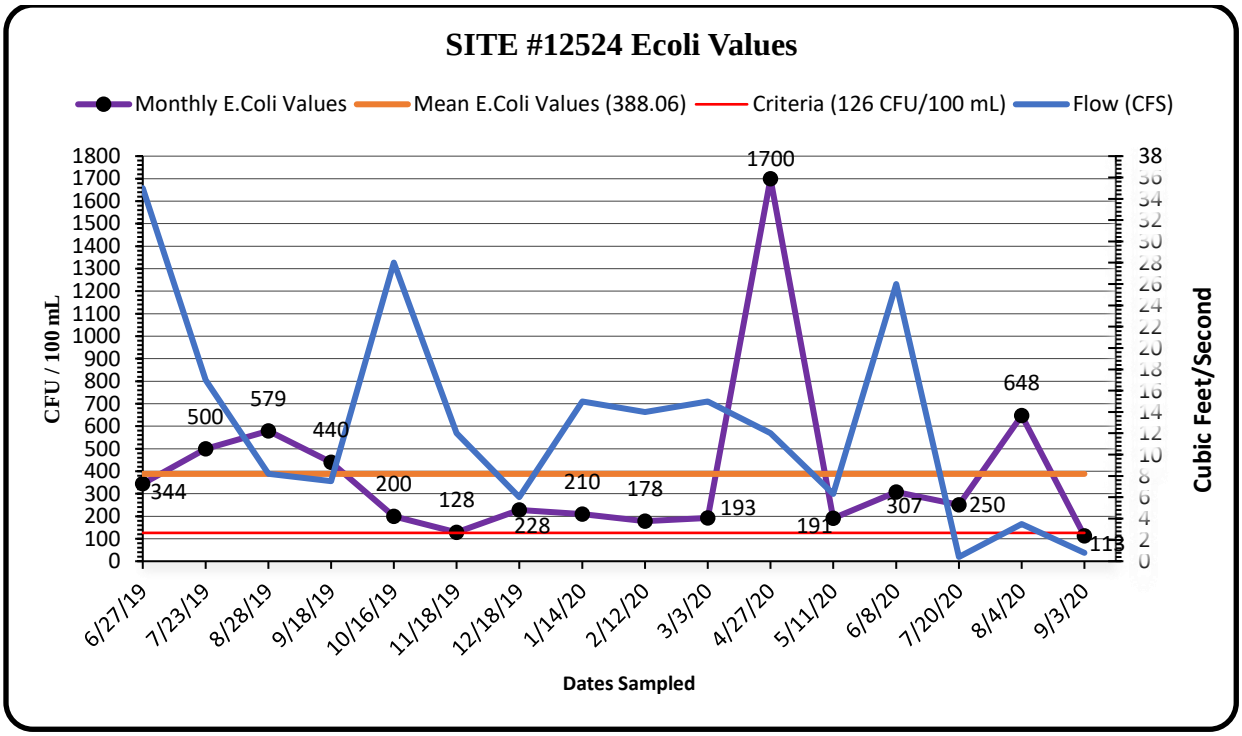

Figure 3: Site #12524 *E. coli* Values.

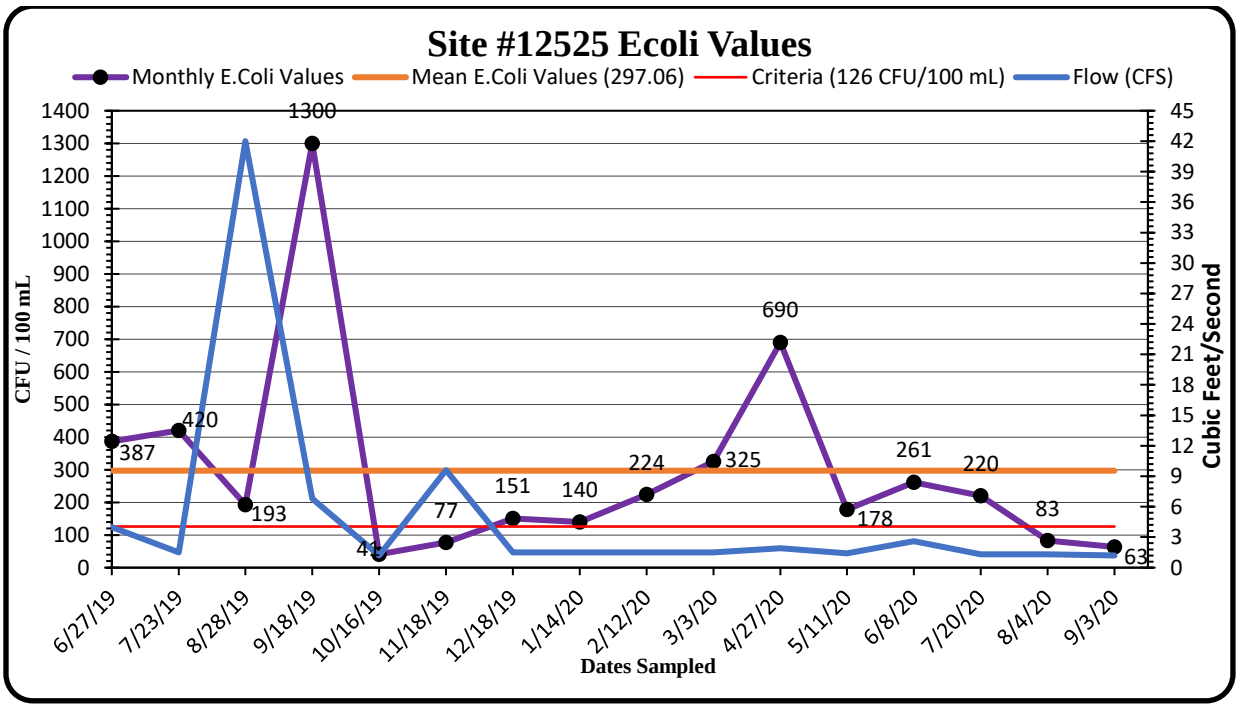

Figure 4: Site #12525 *E. coli* Values.

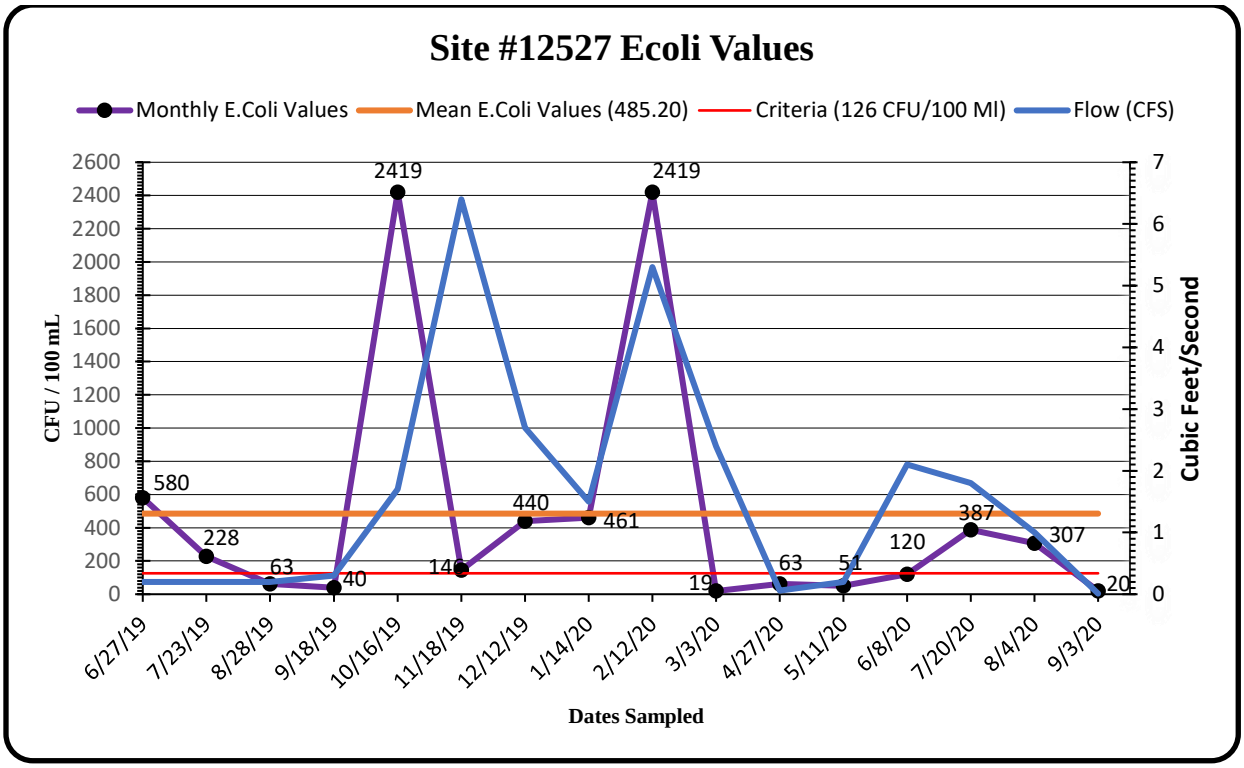

Figure 5: Site #12527 *E. coli* Values.

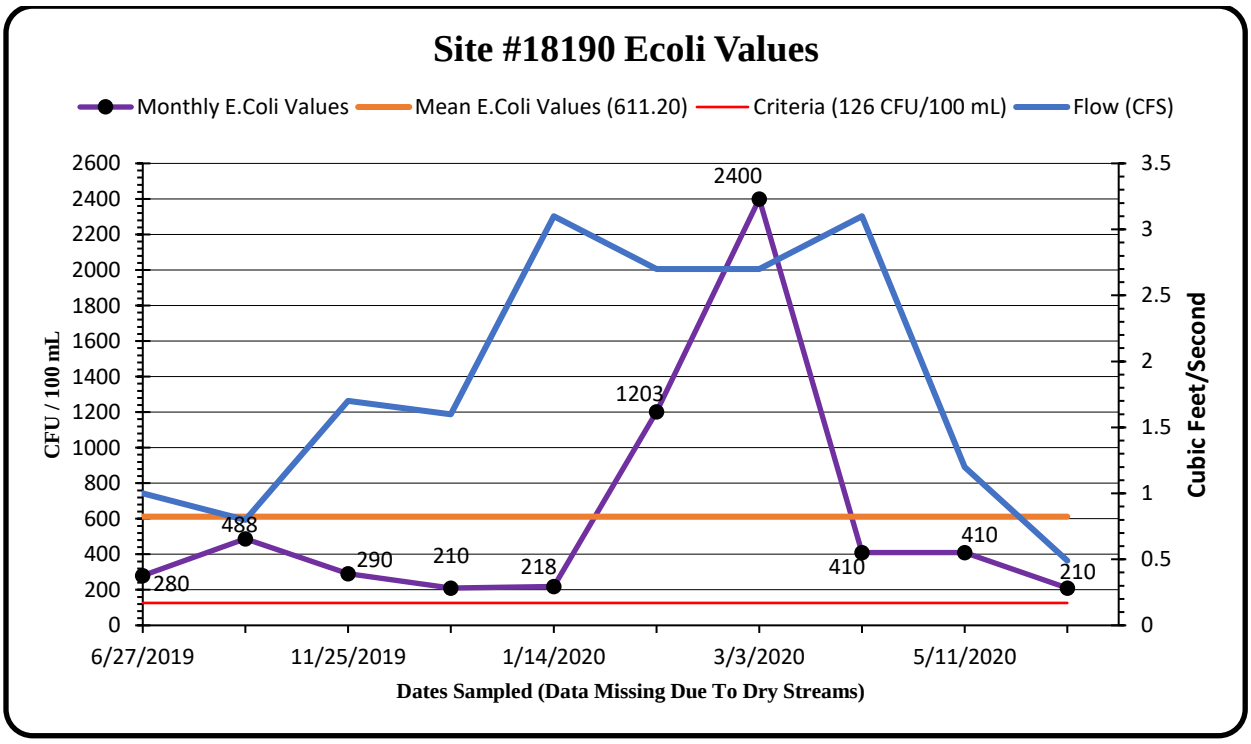

Figure 6: Site #18190 *E. coli* Values.

Abandoned Oil Wells:

As defined by the Texas Railroad Commission (RRC), an abandoned oil or gas well is one that has had no reported production, disposal, or other permitted activity for a period of greater than twelve (12) months. According to the Commission, there are more than 6,200 abandoned oil and gas wells in Texas with approximately fifty-nine (59) located within the Basin. While it is the responsibility of the producing company to plug and clean up the idle wells or abandoned wells, they are often completely abandoned with the responsibility of plugging the wells falling on the state and local taxpayers. Abandoned wells can cause harm by leaking pollutants into the atmosphere, groundwater and/or surface water supplies. Old abandoned wells may have degraded well casings that can allow oil, gas, or saline waters to leak and leach into neighboring waters. Furthermore, abandoned wells are also considered to be a significant emitter of methane gas into the atmosphere.

The two (2) abandoned oil wells located on the Lavaca River (Figure 7) are an example of abandonment by an oil producer. Both wells are located roughly 3.5 miles downstream of FM 616 on the Lavaca River in Jackson County. For many years the wells were situated on dry land, but flooding and tidal action has eroded the adjoining bank, leaving the wells located in the river channel. The Jackson County Navigation District estimates that these wells may have been drilled in the 1930's. There is no record of current ownership. Left unchecked, these abandoned wells pose a real threat to the Lavaca River and the estuary they are situated in.

This potential water quality issue was brought to the attention of the Jackson County Navigation District. By virtue of sale and transfer of deed from the General Land Office to the Jackson County Navigation District, the District owns and controls the bed and banks of the Navidad River downstream of Lake Texana and the Palmetto Bend dam to its confluence with the Lavaca River onto the mouth of the River at Lavaca Bay. Because the Texas Railroad Commission did not have funding to plug these two wells, the Jackson County Navigation District applied for funding thru the Restore Act Grant Program on the premise of environmental risk reduction. The District was notified in the fall of 2020 that they had been awarded a grant for $800,000 to fund the plugging of these wells. To date, there has not been any detailed correspondence regarding the fund disbursement or what management measures are required.

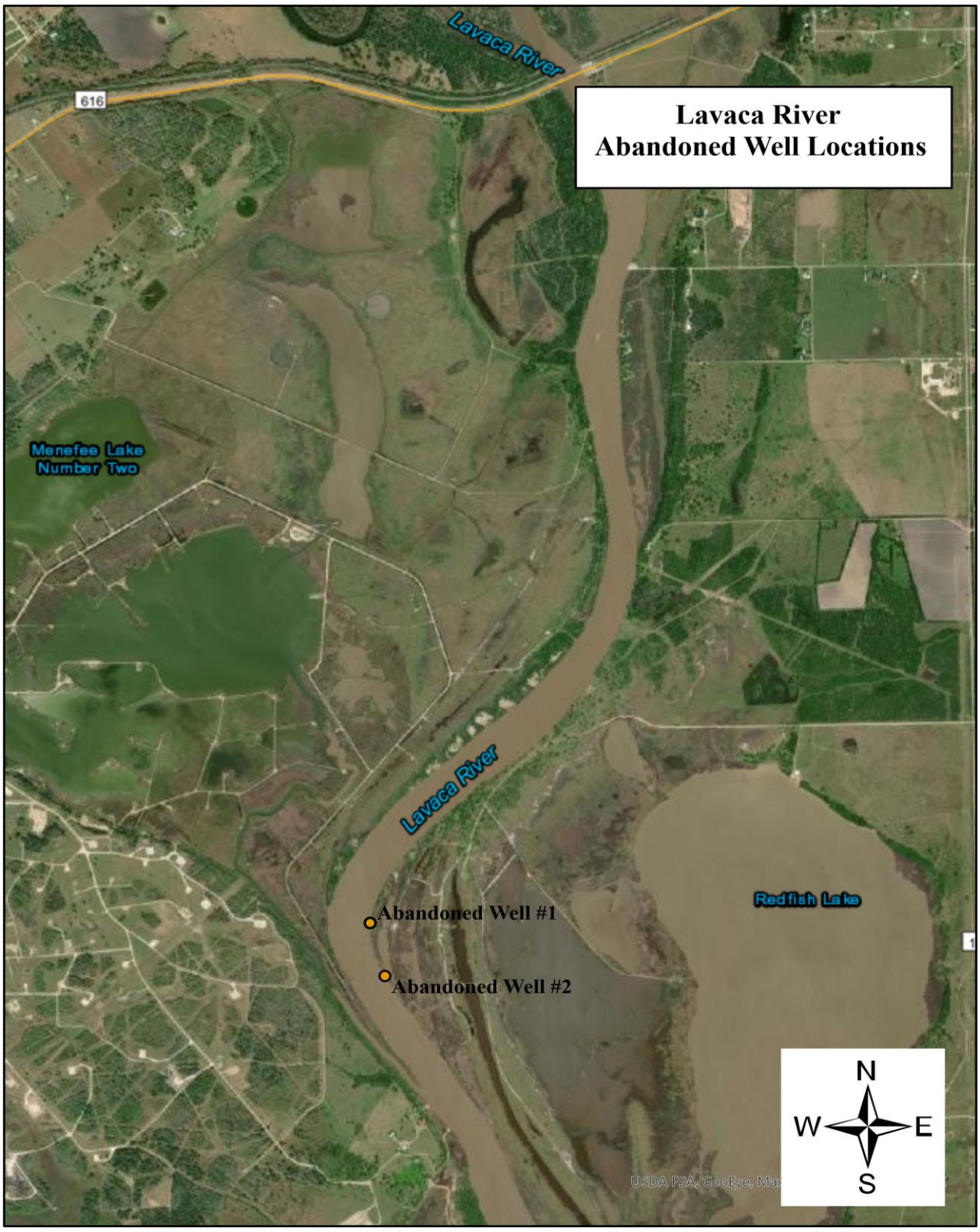

Figure 7: Abandoned Oil Well Locations.

Figure 8: Abandoned Oil Well Number One.

Figure 9: Abandoned Oil Well Number Two.

Lavaca Basin Water Quality Monitoring Activities:

24 Hour Dissolved Oxygen Study:

In 2004, the Texas Commission on Environmental Quality (TCEQ) placed Segment 1602C on the State's 303(d) list for depressed dissolved oxygen levels as a result of 24-hour dissolved oxygen monitoring conducted by both LNRA and Texas Parks and Wildlife. The 24-hour dissolved oxygen study stemmed from a possible fish kill that was reported in the highest reaches of the Lavaca River. Segment 1602 is a long river segment; approximately ninety-four (94) miles. Upper reaches of the Lavaca River differ greatly with the lower reaches, with differences including streambed size and flow. In 2014, the Environmental Protection Agency (EPA) revised the dissolved oxygen criteria for the upper portion of the Lavaca River. The upper portion was approved for a seasonal change in dissolved oxygen criteria for the period of March 15 through October 15 to greater than or equal to 3.0 mg/L average and 2.0 mg/L for minimum 24-hour oxygen content.

In August of 2020, LNRA initiated routine 24-hour dissolved oxygen monitoring at two locations that were studied in 2002 to gather data to work towards delisting this section from the State's 303(d) for depressed dissolved oxygen. The water quality stations are located on the upper reaches of the Lavaca River. Site 17594 near the community of Komensky is located on 1602C_01, which is defined as from the confluence of Campbell Branch in Hallettsville upstream to the confluence of West Prong Lavaca River. Site 17140 near the City of Moulton is on 1602C_02, described as from the confluence of West Prong Lavaca River to the headwaters approximately four (4) miles upstream of Hwy 95 in the City of Moulton.

To date, three independent 24-hour DO sets have been conducted during the Index (March 15-October 15) and Critical (July 1-September 30) Periods. The *Index Period* represent the months that are considered warm weather seasons for the year. The *Critical Period* represents minimum streamflow, maximum temperatures, and minimal DO concentrations within our streams. Two out of the three sampling events yielded mean dissolved oxygen values below the 24-hour mean and minimum DO criteria of 3.0 mg/L and 2.0 mg/L respectively. Current data shows a correlation between low dissolved oxygen levels and low flow periods at the time of sampling. Data for dissolved oxygen levels will continue to be collected in the upper reaches of the Lavaca River over the next two (2) years.

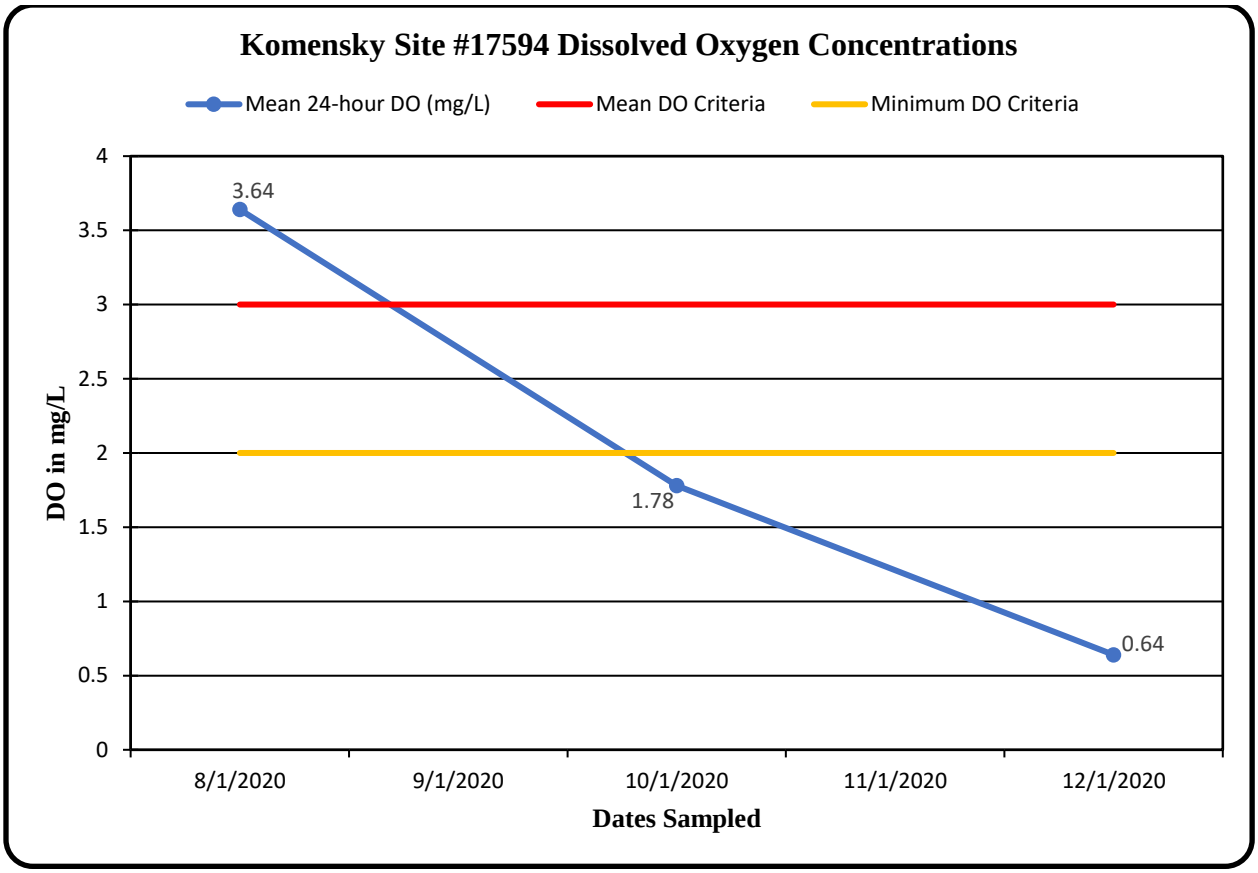

Figure 10: Komensky 24-hour Mean DO Concentrations Graph.

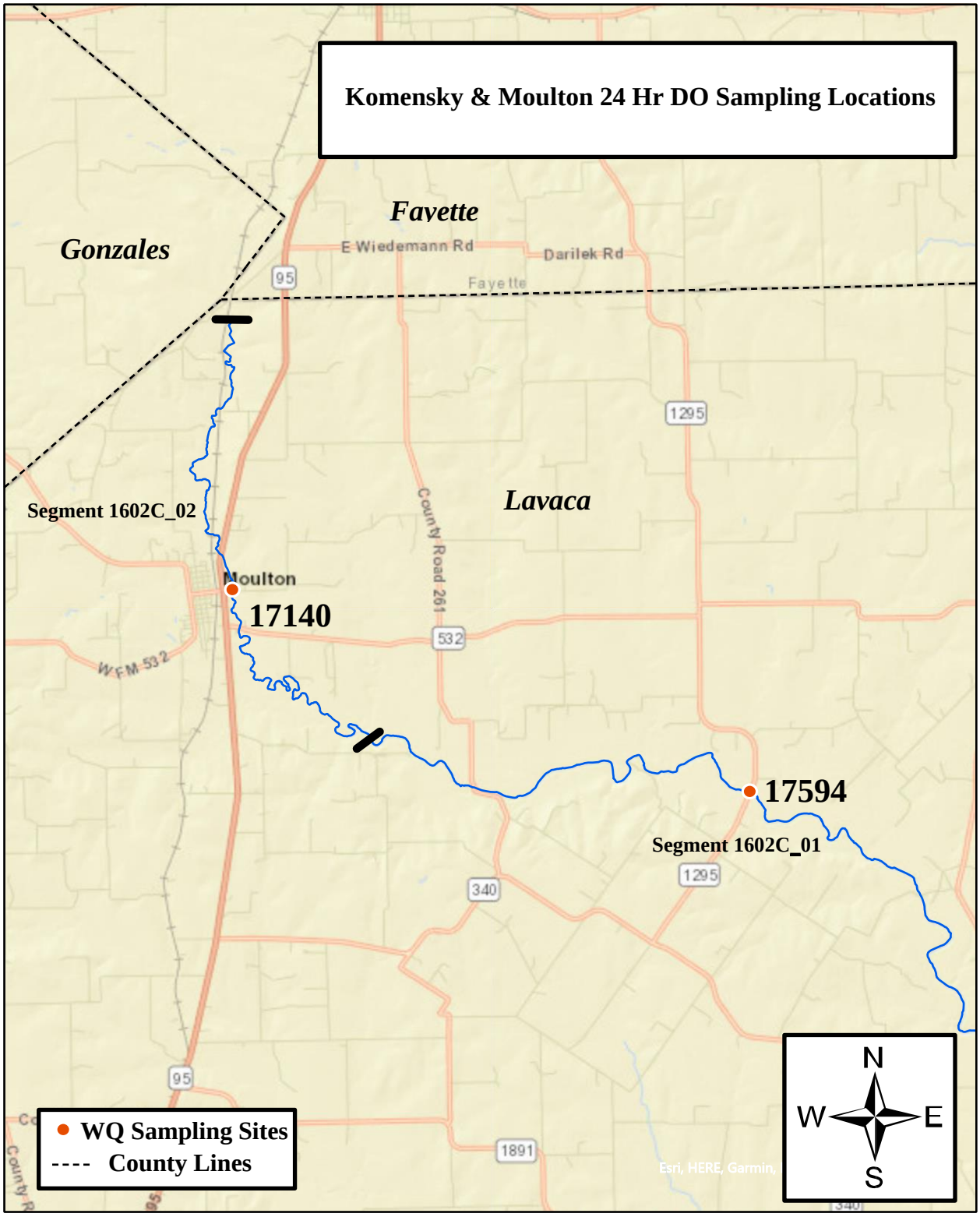

Figure 11: 24 Hour Dissolved Oxygen Sampling Locations.

Additional Water Quality Sample Sites:

The Lavaca Navidad River Authority (LNRA) has historically monitored a total of twenty-one water quality sites located throughout the Lavaca Basin. The northern most site monitored is located in the upper reaches of the Lavaca Basin where the Lavaca River crosses Hwy 90A in the City of Hallettsville. In the lower reaches of the Lavaca Basin, the southern most site monitored is the confluence of the Lavaca River with Lavaca Bay.

In December 2019, LNRA added two additional water quality sampling sites in the upper reaches of the Lavaca Basin. The sites are located on the Lavaca and Navidad Rivers. Komensky (TCEQ #17594) is located upstream of TCEQ Site #12527 on the Lavaca River. This site was added as a halfway sampling point between TCEQ Site #12527 and the headwaters of the Lavaca River. Sublime (TCEQ #22161) is located on the Navidad River and serves as the halfway point between LNRA's furthest upstream sampling site, Speaks (TCEQ #15698), and the headwaters of the Navidad River near the City of Schulenburg.

Both sites are sampled quarterly in the months of March, June, September, and December by LNRA. During each sampling event field data, conventional water analysis, and bacterial analysis are collected and conducted. Below are examples of the parameters collected during sampling events.

- Field Data: Temperature, Specific Conductance, Flow
- Conventional Water Analyses: Ammonia, Total Phosphorus, Chlorides
- Bacterial Analyses: Conducted for *E. coli*

LNRA will continue to monitor these sites on a quarterly basis annually. Agricultural practices including hay and cattle production are the dominant land uses in the areas surrounding the new sampling locations. Both locations are subjected to sustained low flow periods, forcing domestic livestock and area wildlife to water in area streams which could lead to elevated bacteria levels.

With the addition of Moulton (TCEQ #17140) in 2020 for the 24-hour DO study, 24 stations are now being monitored in the Lavaca Basin.

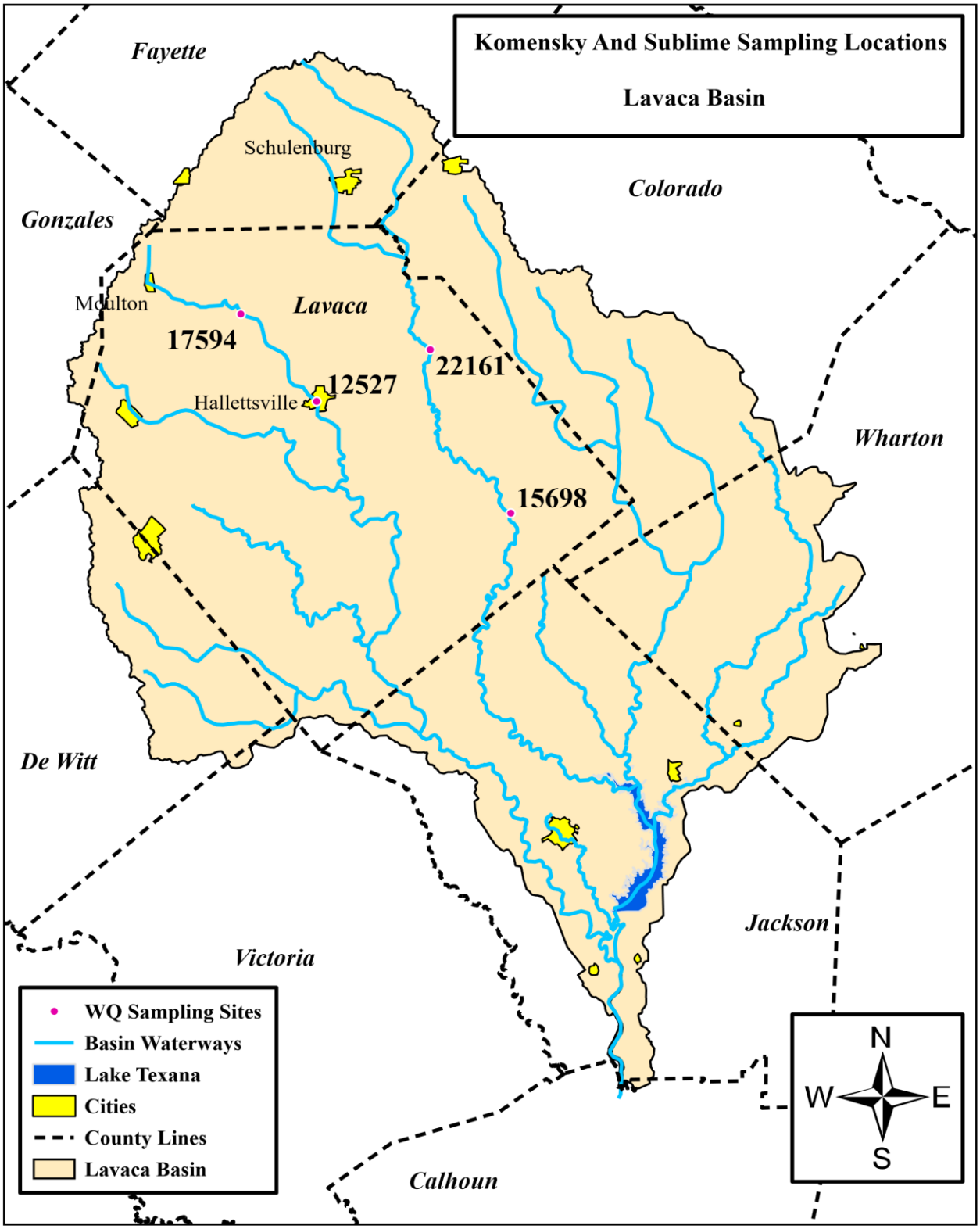

Figure 12: Additional Sampling Sites (17594) and (22161).

Lavaca Basin Water Quality Concerns & Issues:

Nutrient Levels:

Nutrients within a waterbody are essential for a healthy and viable ecosystem. Although nutrients are important for an ecosystem to function, an excess of nutrients can have an opposite, and adverse effect. High levels of nutrient loads can affect water quality, drinking water sources, and aquatic life. Elevated concentrations within a waterbody can result in the growth of algal blooms and other nuisance plants. Algal blooms and plant decay can cause a decrease in dissolved oxygen levels within the waterbody. The decaying process uses oxygen within the water to break down plant matter. Even though nutrients occur naturally in the water, elevated concentrations can result from manmade sources such as fertilizers, agriculture run off, and soil erosion.

Nutrient loading within Lake Texana has been a concern due to elevated sediment loads coming into the reservoir thru the Mustang Creek arm of the reservoir. A vast majority of the land use along Mustang Creek is in agricultural production and is dry land row crop. During periods of high flow, nutrients bound in the soil are transported by sediment through overland flow into the creek, and are then carried and deposited into Lake Texana. The high flow of suspended solids is another concern for the LNRA. Suspended solids are defined as small solid particles that remain suspended in the water. An increase in sediment loads within a stream can reduce water clarity and light penetration within the water column.

In 2020, LNRA contracted with the United States Geological Survey (USGS) to install and maintain a turbidity sensor on East Mustang Creek. Turbidity is a measure of water clarity or light transmitting properties. An increase in turbidity can be caused by suspended matter such as clay, silt, and other microscopic organisms. The USGS installed the turbidity sensor at the existing gauge house on East Mustang Creek. The sensor was installed to collect daily turbidity values of water which will flow into the Mustang Arm of Lake Texana. LNRA will monitor the sediment values in East Mustang Creek and come up with the best management practices to help reduce sediment loads entering the reservoir.

Figure 13: Turbidity Probe On East Mustang Creek.

Figure 14: Turbidity Probe On East Mustang Creek.

Figure 15: Turbidity Probe On East Mustang Creek.

Stakeholder Participation and Public Outreach:

Public outreach efforts by LNRA include seeking input from the Lavaca Basin Steering Committee about water quality issues and activities, education outreach, assistance in water conservation and drought contingency planning, news releases, public meetings, and attendance at water quality issues meetings. LNRA staff members are available to answer questions or give assistance with water quality information to Basin students, stakeholders, members of the public, and to respond to calls from concerned citizens. LNRA staff investigate information provided by citizens and contact the appropriate regulatory agency to address the issue. This cooperation between citizens, LNRA, and regulatory agencies has resulted in effective response to potential water quality problems in the Basin. Michael Price is LNRA's public outreach coordinator. Mr. Price teaches nature crafts and programs at Texana Park and is also available to travel to schools and libraries to present various environmental education programs. LNRA provides the cost of these programs. You may contact Michael Price by phone, 361-308-0153 or via e-mail at **mprice@lnra.org**.

Anyone interested in participating as a member of the Steering Committee may contact the offices of LNRA and speak to General Manager Patrick Brzozowski or Director of Environmental Services Chad Kinsfather.

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