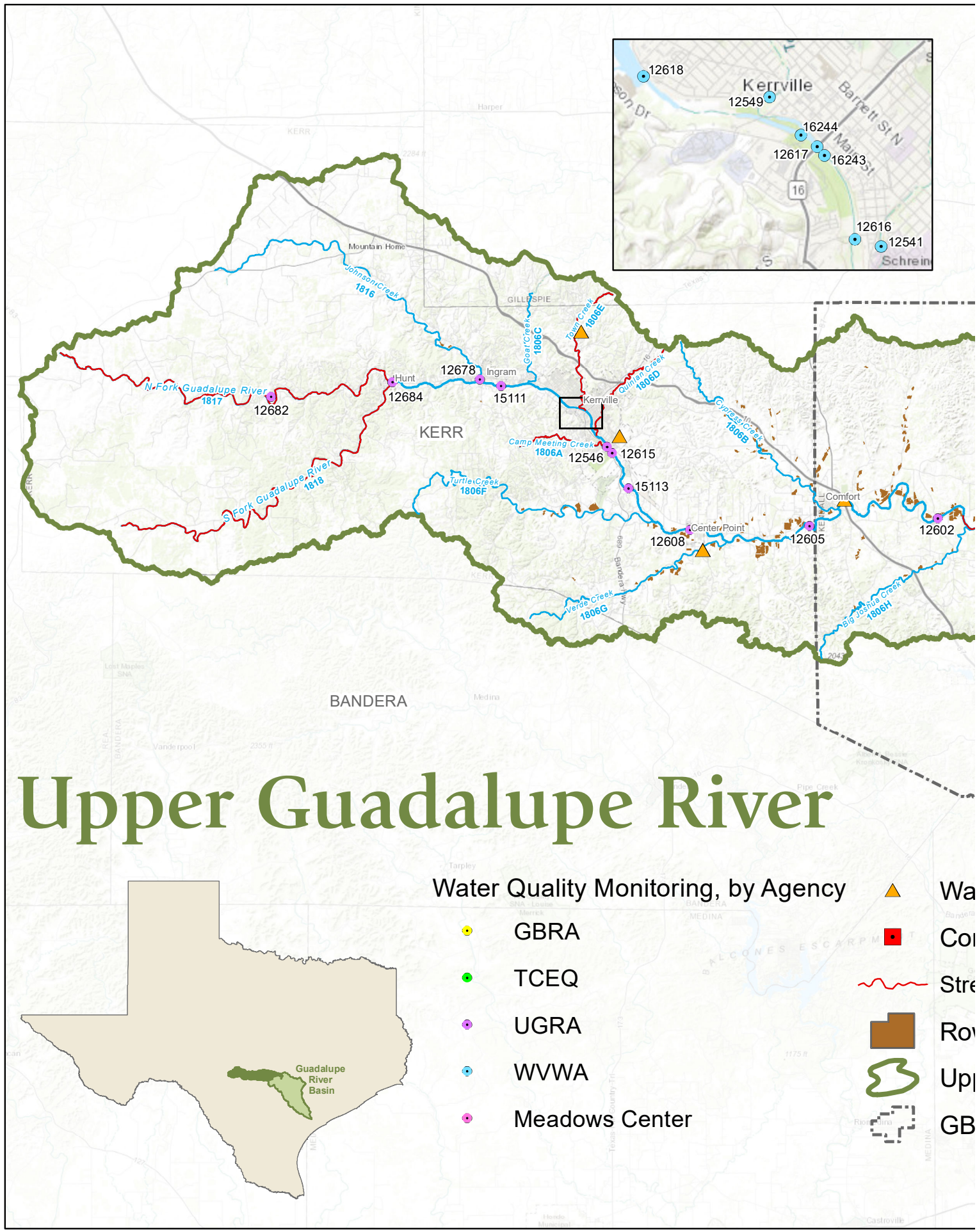
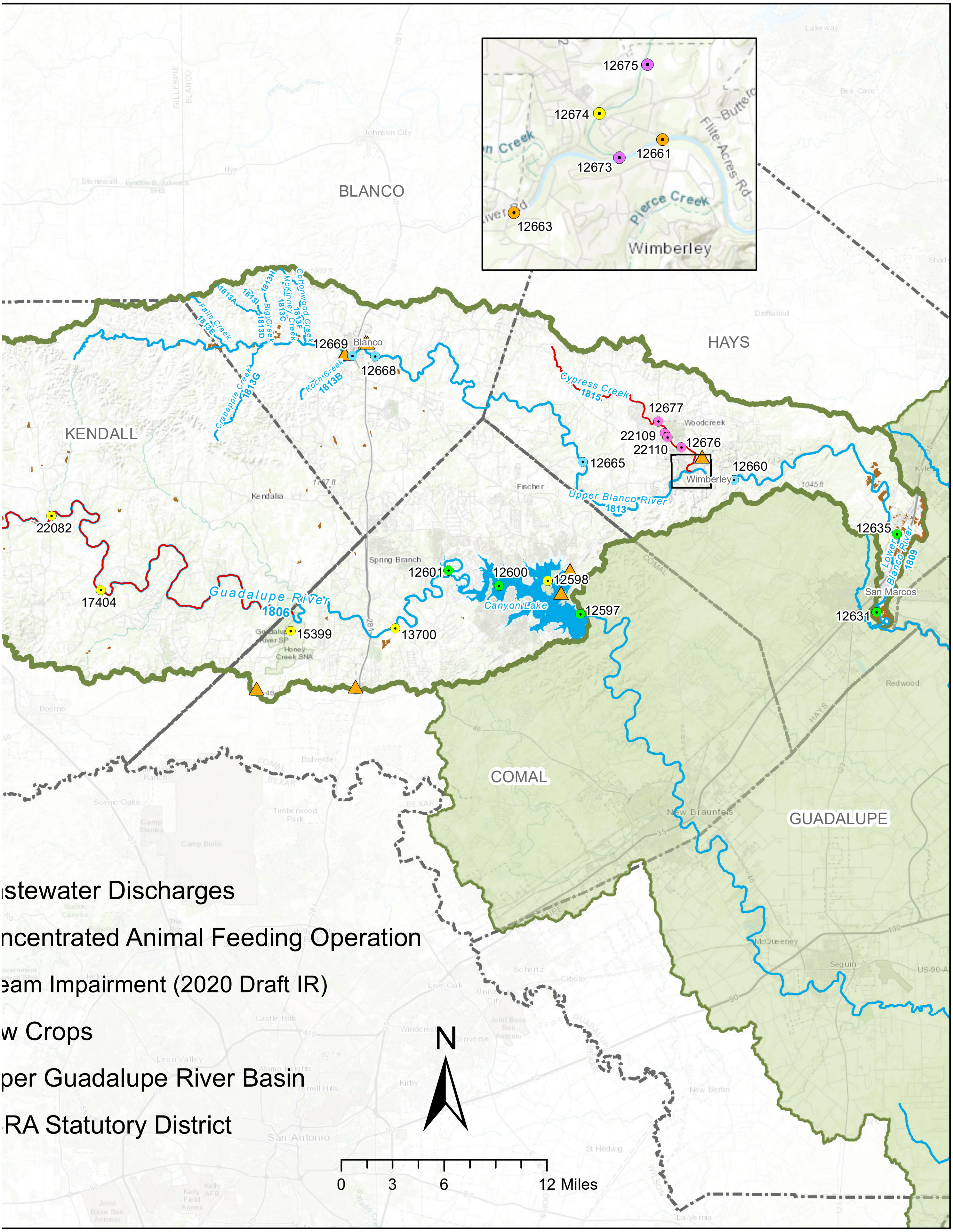
2022
Basin Highlights
Report

Clean Rivers Program



Upper Guadalupe River


12675
12674
12661
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12663
Wimberley
Pierce Creek
Flite Acres Rd
BLANCO
KENDALL
HAYS
COMAL
GUADALUPE
12669
12668
Blanco
Koch Creek
1813B
Crabapple Creek
1813G
Falls Creek
1813E
1813A
1813I
1813H
Big Creek
1813D
McKinney Creek
1813C
Cottonwood Creek
1813F
Cypress Creek
1815
12677
Woodcreek
22109
22110
12676
12665
12660
Wimberley
Upper Blanco River
1813
Fischer
Kendalia
22082
17404
Guadalupe River
1806
15399
13700
Spring Branch
12601
12600
12598
Canyon Lake
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12635
Lower Blanco River
1809
San Marcos
12631
New Braunfels
Seguin
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RA Statutory District
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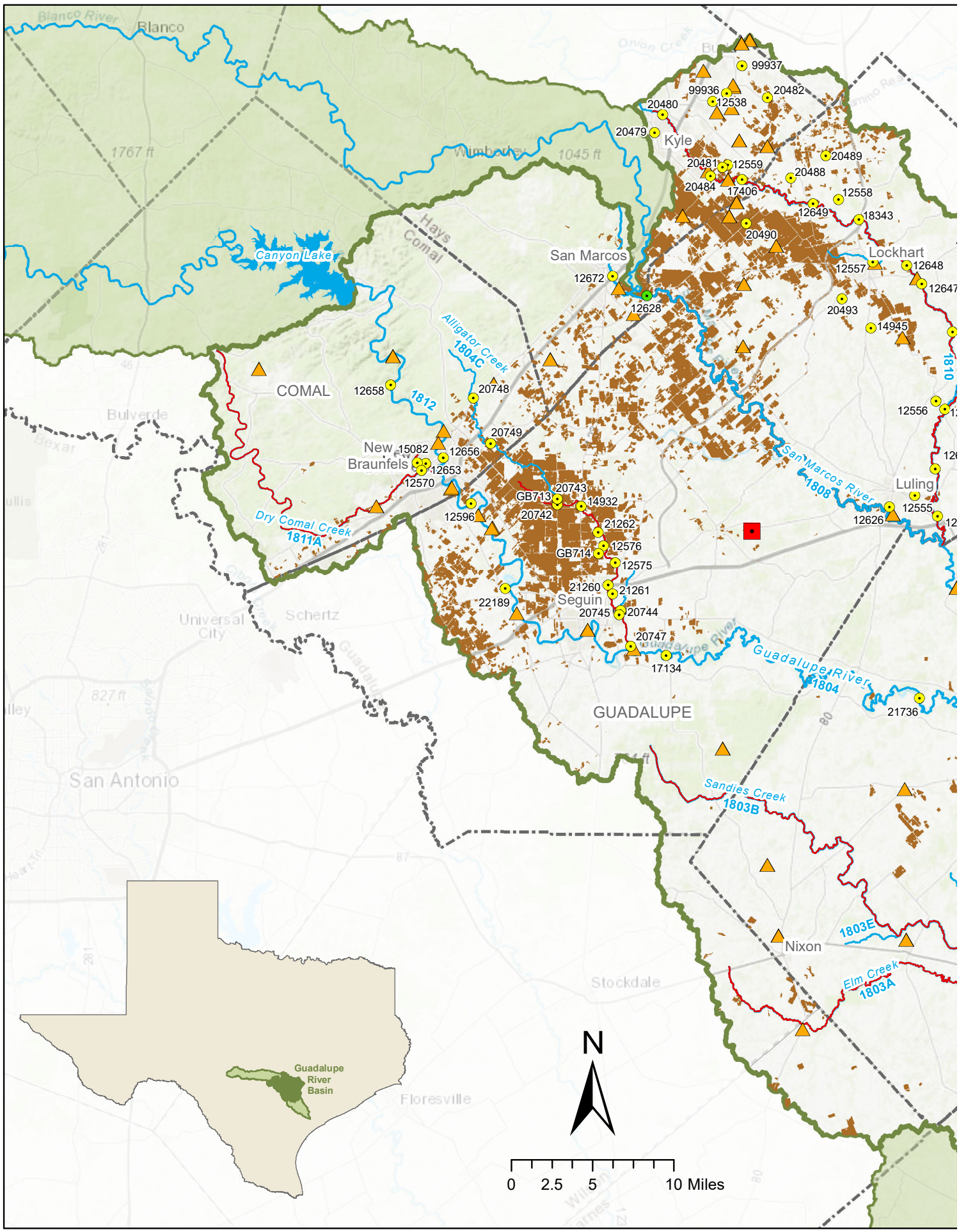
Blanco River
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1767 ft
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Canyon Lake
Hays
Comal
Wimberley
Kyle
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Lockhart
Alligator Creek
1804C
COMAL
1812
Bulverde
New Braunfels
Dry Comal Creek
1811A
San Marcos River
1808
Luling
Seguin
Guadalupe River
1804
GUADALUPE
Universal City
Schertz
San Antonio
827 ft
Sandies Creek
1803B
Nixon
1803E
Elm Creek
1803A
Stockdale
Floresville
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Guadalupe River Basin
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5
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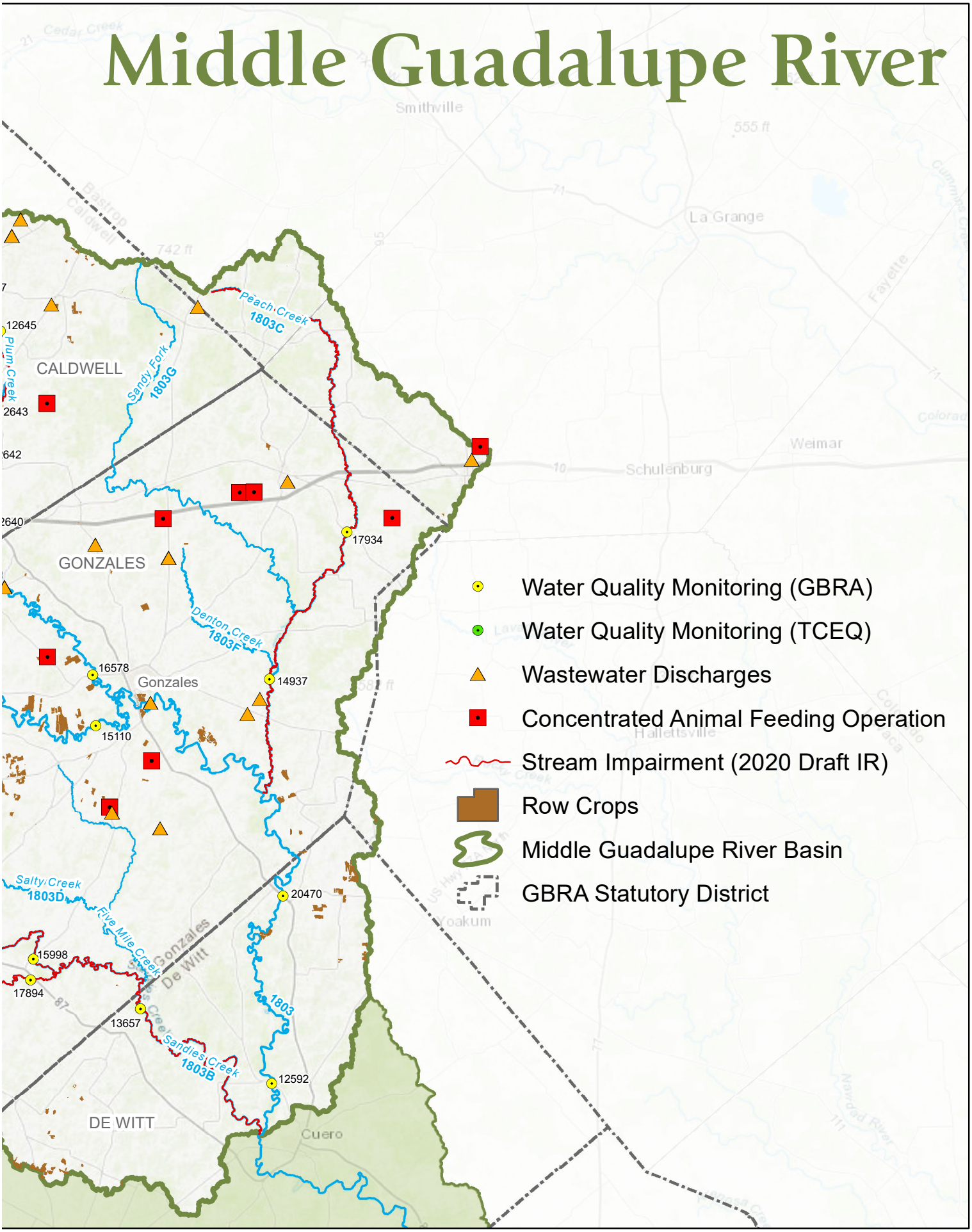
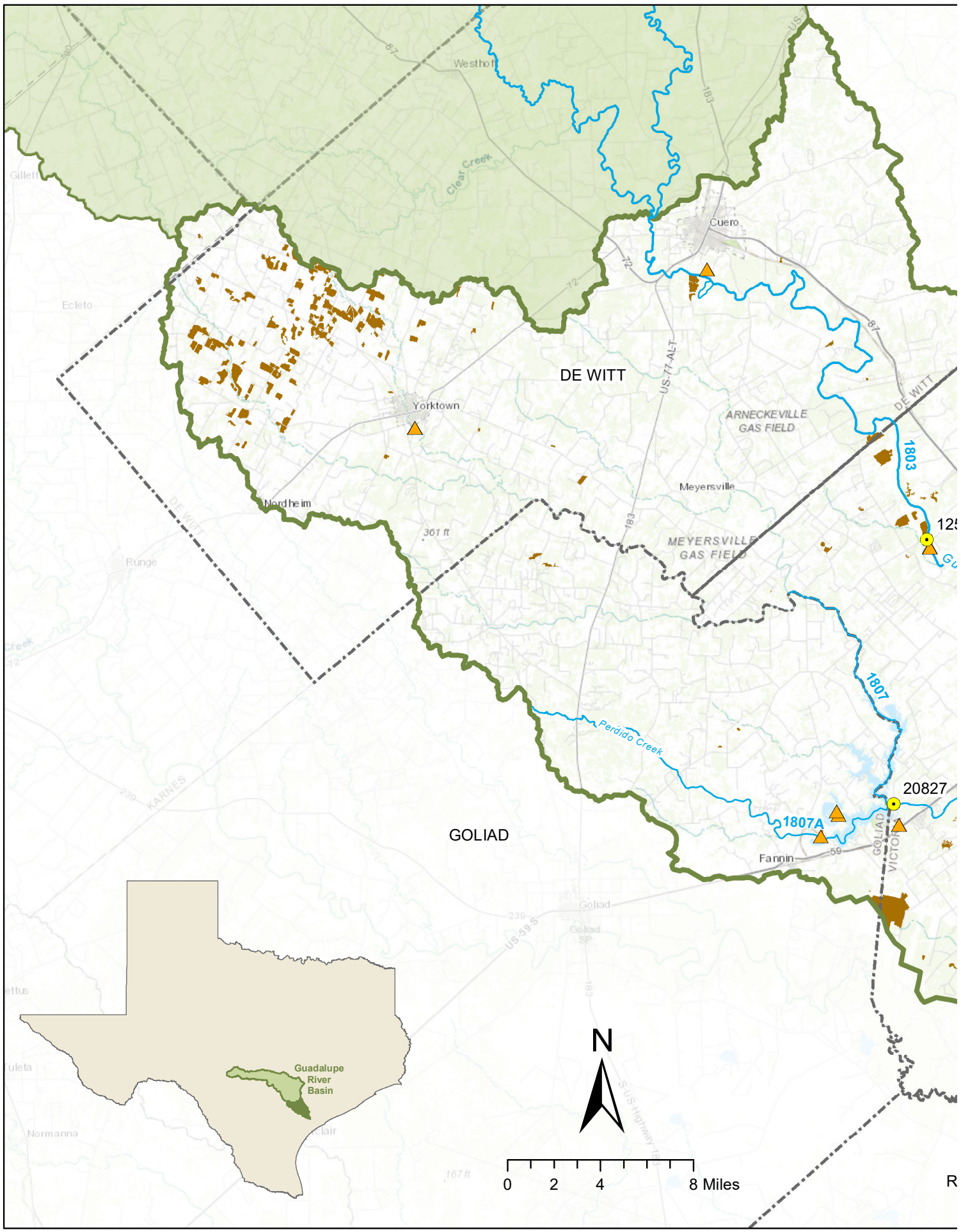
Middle Guadalupe River




DE WITT
GOLIAD
Yorktown
Cuero
Westhoff
Meyersville
Nordheim
Fannin
Runge
Ecleto
Gillett
ARNECKEVILLE GAS FIELD
MEYERSVILLE GAS FIELD
Clear Creek
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1807A
20827
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VICTORIA
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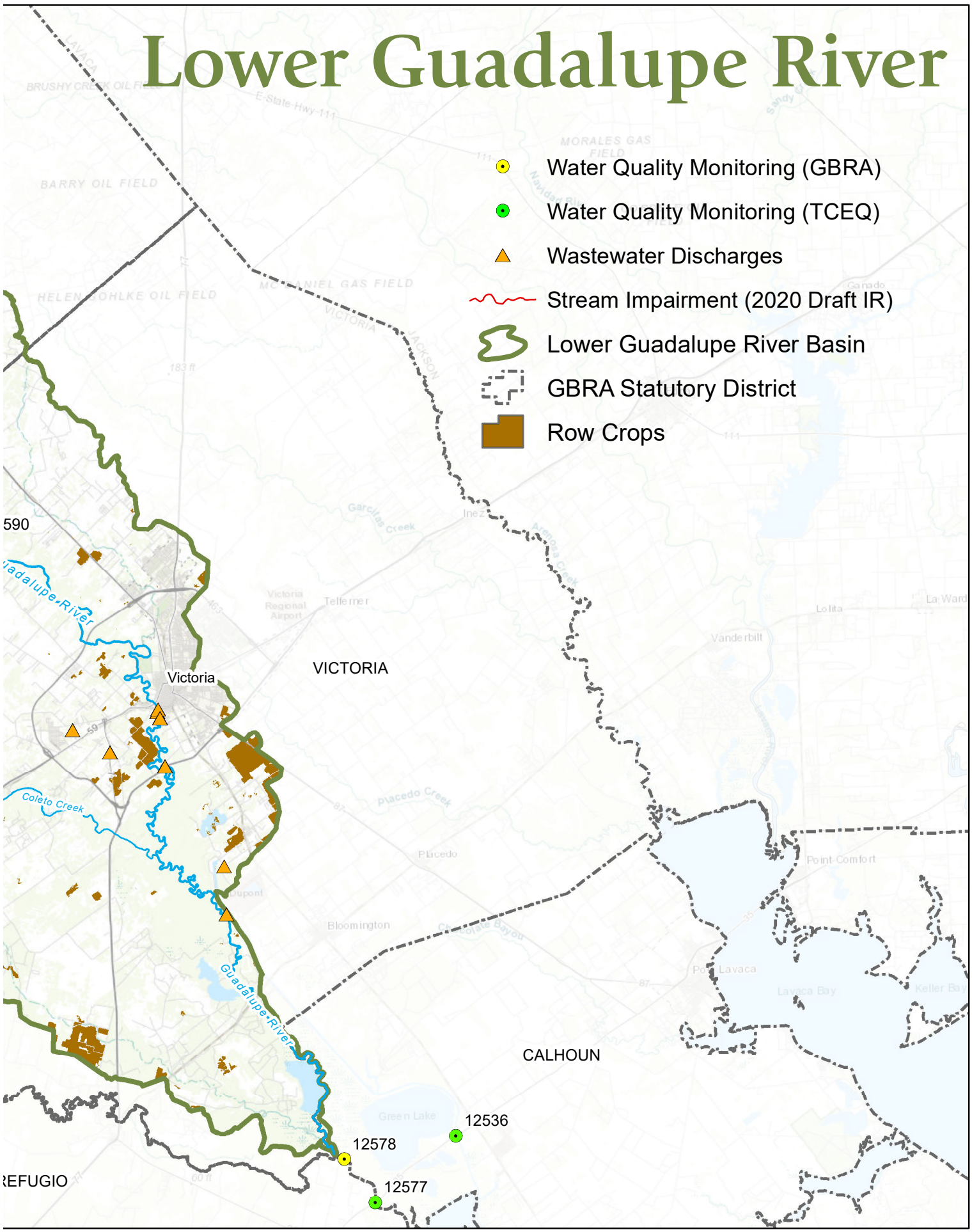
Lower Guadalupe River



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Cover Photo: Biologist Carrying Seine Through Cypress Creek in Hays County

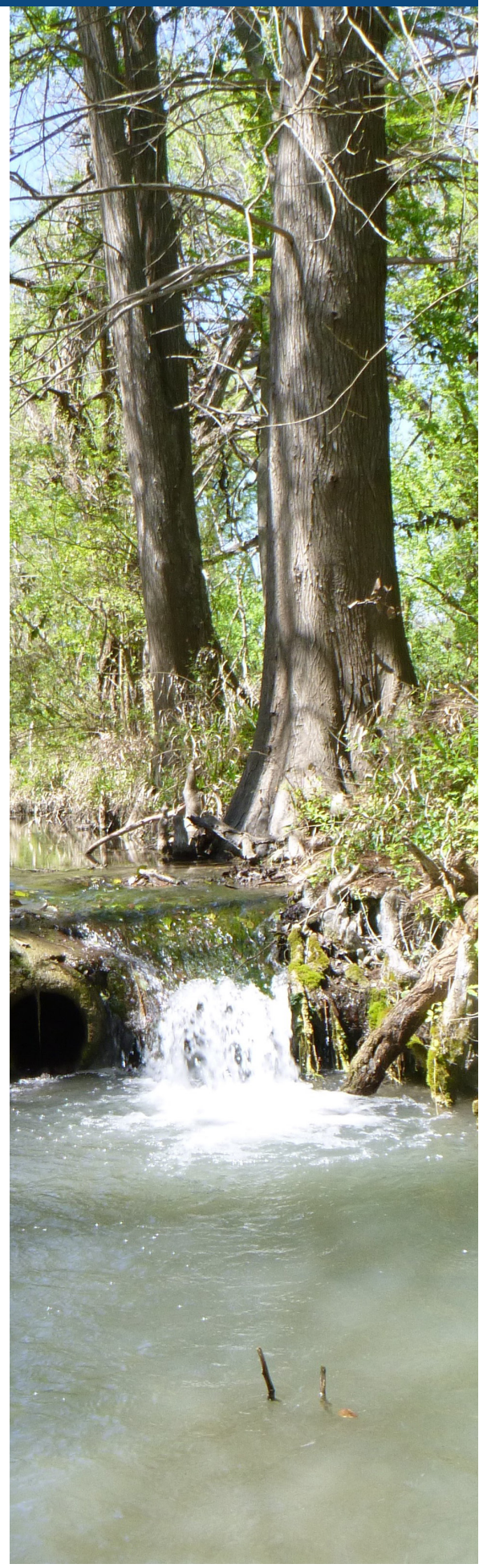
2022 Basin Highlights Report Introduction

By Elizabeth Edgerton

This report highlights activities in the Guadalupe River Basin and the Lavaca-Guadalupe Coastal Basin in the Clean Rivers Program (CRP) in 2021. The CRP is a statewide program managed by the Texas Commission on Environmental Quality (TCEQ), established in 1991 to holistically manage water quality issues throughout the state of Texas. The program is funded by fees assessed to water rights and wastewater discharge permit holders. The objectives of the program are to 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, and maintain efficient use of funds.

The Guadalupe-Blanco River Authority (GBRA), along with the Upper Guadalupe River Authority (UGRA), carry out the water quality management efforts in these basins under contract with the TCEQ. The Wimberley Valley Watershed Association (WVWA) and the Meadows Center for Water and the Environment (MCWE) contribute monitoring data collected from the Blanco River and Cypress Creek watersheds under the Guadalupe Basin CRP quality assurance project plan. The majority of funding allocated to this program is used by the partners to carry out monitoring efforts and perform quality assurance and data management.

This report includes watershed characterizations of two watersheds in the basin that have Watershed Protection Plans in place to address water quality concerns: Plum Creek Watershed (1810 and 1810A) and Geronimo & Alligator Creeks Watershed (1804A, 1804C, and 1804D). Watershed characterizations include segment descriptions, land uses, potential stakeholder issues, descriptions of water quality concerns and impairments, major events, ongoing projects, and maps. This report also includes articles from basin partners and stakeholders that highlight ongoing projects and activities throughout the Guadalupe River Basin.



New Faces in the Basin

Kristyn Armitage

GBRA Water Quality Technician

2021 was a year of growth at GBRA and throughout the basin. Kristyn Armitage joined GBRA as our Water Quality Technician in September of 2021. Kristyn received her BS in Biology and MS in Aquatic Resources from Texas State University. Her master's work focused on intra- and inter-species variability in mercury concentrations in Texas marine fish and shellfish. Her previous experience includes invasive species removal and native habitat restoration work under the Edwards Aquifer Habitat Conservation Plan, at the Meadows Center for Water and the Environment. As Water Quality Technician, Kristyn carries out all water quality monitoring efforts in the basin under the Clean Rivers Program, Plum Creek Watershed Protection Plan, and the Geronimo and Alligator Creeks Watershed Protection Plan. Welcome to Team GBRA, Kristyn!

Christina Lopez, Ph.D.

Plum Creek Watershed Coordinator

Christina Lopez, PhD, began serving as the Plum Creek Watershed Coordinator in June 2021. Christina is an environmental geographer and earned her M.S. and Ph.D. in Geography at Texas State University. Her dissertation focused on environmental volunteerism and natural resource conservation. She has held several positions at Texas State University including Instructor of Environmental Geography and Chair of the Environmental Service Committee. Christina has also worked for environmental organizations, such as the Meadows Center for Water and the Environment and the Colorado River Alliance, and served as a Research Fellow for the National Wildlife Federation and San Marcos Greenbelt Alliance. In her free time, she enjoys hiking local green spaces, swimming in the San Marcos River, and traveling to Big Bend National Park. Christina is responsible for promoting and coordinating activities within the watershed, which aim to improve the health of the Plum Creek Watershed.

Guadalupe River Habitat Conservation Plan

The Guadalupe River is home to 18 federally listed endangered species, eight federally listed threatened species, numerous candidate species and several species with potential to become listed in the future. In July 2021, GBRA began the process of creating a comprehensive basin-wide conservation strategy to benefit both listed and non-listed species. GBRA will develop a holistic Guadalupe River Habitat Conservation Plan (GRHCP) and associated incidental take permit (ITP) that will provide protections for threatened and endangered species, while improving certainty to meet future human needs for water and wastewater treatment services.

What is a Habitat Conservation Plan?

An HCP is the primary planning document required to obtain an incidental take permit (ITP) under Section 10(a)(2)(A) of the federal Endangered Species Act of 1973 (ESA). This section of the ESA is intended to foster "creative partnerships between the public and private sectors and among governmental agencies in the interest of species and habitat conservation." A non-federal entity can obtain an ITP if its activities cause "take" of an endangered or threatened wildlife species. An HCP describes how "take" will be minimized and mitigated, and how the HCP is to be funded.

"Take" means...

"to hunt, harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a species or attempt to engage in any such conduct."

Rebecca Springs Salamander

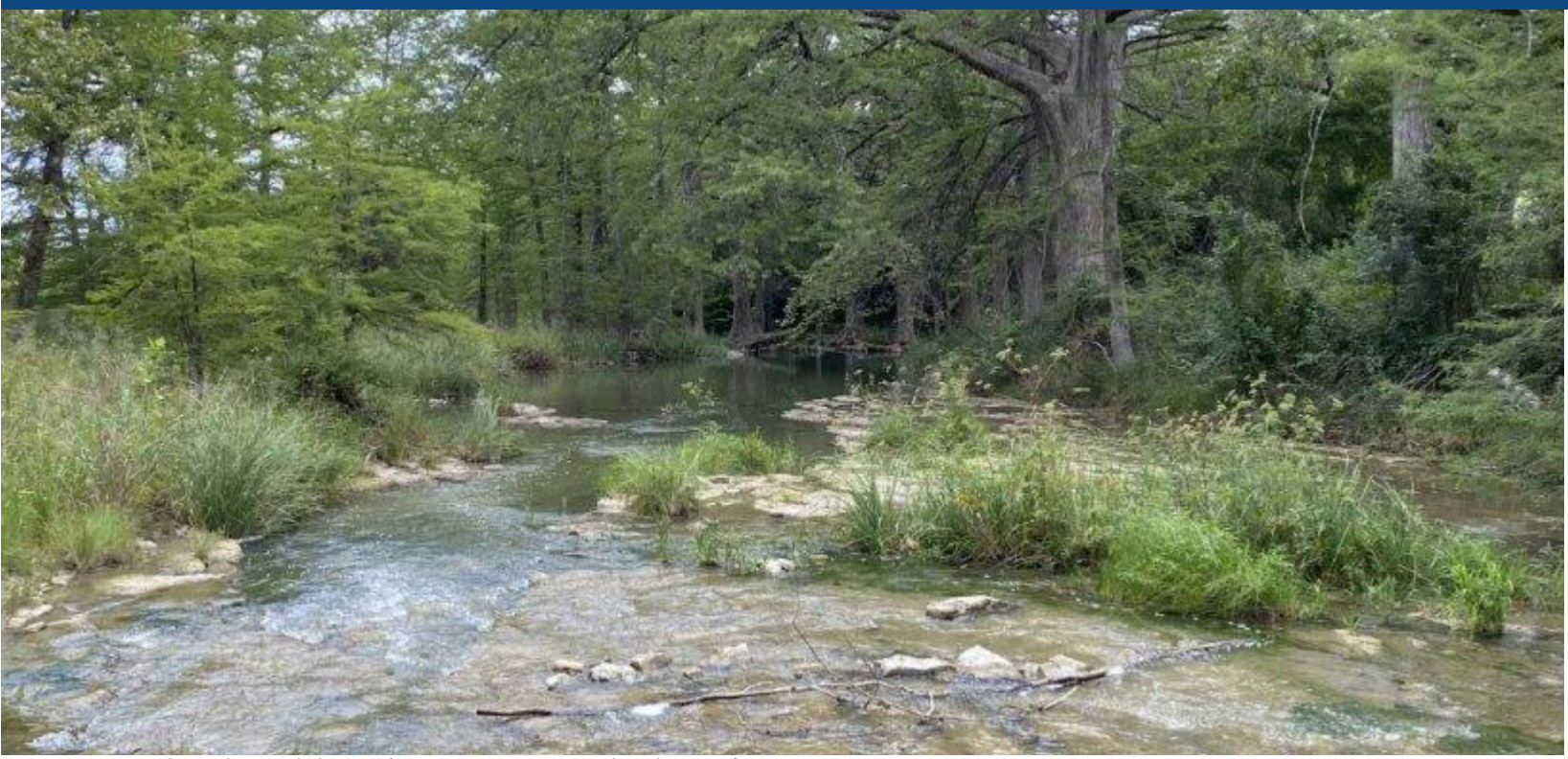
Guadalupe Orb

GRHCP Process

As a regional leader, GBRA will apply for a 50-year long incidental take permit (ITP) that will allow other utilities, landowners, industries, and municipalities to contribute to conservation efforts and receive second party take protection. The basin-wide GRHCP and ITP is anticipated to focus on conservation of species such as the whooping crane, salamanders (Eurycea sp.) and freshwater mussels, but will benefit other rare and common species. The best available science will be used to make policy decisions that will form the foundations of this process. The long-term planning effort will benefit the region by improving the predictability and effectiveness of species conservation measures, while reducing future mitigation costs and regulatory uncertainty. The ITP is estimated to be issued in June 2026.

Opportunities to Participate

GBRA is committed to a transparent, public process where participation is welcomed and encouraged. For more information, visit the Habitat Conservation Plan page at gbra.org. Comments and questions can be submitted at future public meetings or by emailing grhcp@gbra.org.



South Fork Guadalupe River at Camp Arrowhead Crossing

Upper Guadalupe River Authority (UGRA) Programs and Services

Water Quality Monitoring

As the lead water resource planning agency for the Upper Guadalupe River Basin, UGRA partners with municipal and county governments, communities, civic groups, and citizens to preserve and protect the water quality in all Kerr County surface waterbodies.

UGRA Staff Water Quality Sampling

UGRA is an active Texas Clean Rivers Program partner and performs routine sampling at twelve sites quarterly and seven sites monthly. In addition, UGRA continues the County Wide Goal Based Monitoring Program that concentrates on the main tributaries to the Guadalupe River and monitors the same parameters as the Clean Rivers Program. Routine monitoring provides consistent tracking so that changes in water quality can be identified and addressed quickly. Additionally, UGRA staff investigates water quality concerns ranging from strange sights and odors to hazardous waste spills and partners with the appropriate agencies to resolve them.

UGRA's Summer Swimability Program provides information on current water quality conditions for local citizens. Samples for *E. coli* bacteria analysis are taken at 21 sites on a weekly basis from Memorial Day to Labor Day. The results are compared to state standards for contact recreation and are posted on the UGRA website.

UGRA provides opportunities for citizen stewardship and community involvement in protecting the water resources of Kerr County. A popular activity is the UGRA Volunteer Summer Study. This program is supported by interested members of the community who collect samples for *E. coli* bacteria analysis each summer. The information collected by the volunteers provides important data and helps identify areas in need of further investigation while including the community in water quality monitoring.

Central to these diverse water monitoring programs is the nationally accredited UGRA Environmental Laboratory, a full-service laboratory serving the entire Hill Country. The Laboratory's analytical services include bacteriological, chemical, and biological testing of drinking water, wastewater, and surface water. The laboratory is accredited according to the National Environmental Laboratory Accreditation Program and is one of the largest microbiological laboratories in the region.

Water Stewardship

UGRA is committed to the elimination of trash from the river and actively solicits and promotes community involvement in the multipart Trash-Free Initiative. Since 2004, UGRA has routinely picked up trash from 15 low water crossings throughout Kerr County which results in the removal of tens of thousands of pounds of litter each year. The Annual River Clean Up is a county-wide event to promote awareness of the importance of the Guadalupe River to the community and encourage stewardship. In 2021, more than 7,800 pounds of garbage was collected by 489 participants, working along the river from above Hunt, all the way to Center Point. In addition, mesh waterway cleanup bags continue to be provided at a dispenser at Ingram Dam to support cleanup efforts throughout the year. As a proactive measure to reduce littering, UGRA continues to fund summertime litter patrols with licensed peace officers at the most popular river crossings to promote the message, "Pack it in, Pack it out."

River Clean Up Participants from Ingram ISD's National Junior Honor Society

UGRA Large Rainwater System Incentive Program Recipient

UGRA promotes landowner practices that have the potential to enhance groundwater and surface water resources. Numerous studies have indicated that brush control, primarily ashe Juniper removal, can help increase Edwards Plateau Aquifer recharge, enhance spring flow, and improve range and pastureland productivity. UGRA offers financial assistance to eligible landowners to aid their brush management efforts. Additionally, UGRA has worked with landowners to construct nine water and sediment control basins in western Kerr County. The structures temporarily retain high flows and sediment associated with heavy rainfall while providing erosion control, water quality protection, and bolstering spring flow.

To promote water conservation and reduce stormwater runoff, UGRA encourages the practice of rainwater harvesting by offering a rebate up to $200 on the purchase of rainwater harvesting equipment. UGRA also supports the construction of higher capacity rainwater catchment systems through the Large Rainwater System Incentive Program. One project is selected annually to receive up to $5,000 towards the construction of a new rainwater catchment system or to expand capacity of an existing system.

Riparian areas are the dense band of native vegetation along a body of water. When full of native trees, grasses, and forbs, they improve water quality and quantity by intercepting runoff from upland areas and stabilizing the bank. UGRA joined Texas Parks and Wildlife Department in the Healthy Creeks Initiative to assist landowners with the treatment of invasive giant cane (*Arundo donax*) on their properties. The cane invades riparian areas and displaces native riparian vegetation which reduces the health of streamside areas and their ability to improve water quality and quantity. Additionally, UGRA has partnered with Kerr County to offer a bounty payment on feral hogs. The hogs seek out areas along waterways and cause damage to streamside vegetation which increases erosion and bacteria pollution from runoff.

Public Education

Part of UGRA's mission is to actively facilitate the understanding of water issues and engage the community in maintaining and promoting the health and enjoyment of the Upper Guadalupe River Basin. UGRA has an active education program designed to give Kerr County residents a better understanding of the Upper Guadalupe River and its watershed. UGRA staff prepares presentations for area schools, clubs, organizations, and summer camps to teach about water quality, pollution threats, conservation, the water cycle, and the importance of the Guadalupe River to the community. UGRA's public awareness campaign keeps the community informed of water issues through newspaper features and radio announcements.

The UGRA EduScape continues to be an educational asset as a demonstration landscape. Through a partnership with Riverside Nature Center, virtual and in person tours of the EduScape are conducted and many visitors also stop by for a self-guided tour. The landscape presents 15 water-saving features in addition to 30 interpretive and water conservation tip signs. A quarter mile walking trail leisurely meanders through several different plant zones demonstrating techniques like rainwater harvesting, rain gardens, pervious walkways and the use of native plants. The features highlight practical ways to improve water conservation and stormwater detention in your home or business landscape. In 2019, the Texas Water Development Board awarded UGRA the Texas Rain Catcher Award for the UGRA EduScape in recognition of exemplary efforts to promote rainwater harvesting and water conservation through educational and outreach activities.

Programs focusing on riparian areas have been another priority in UGRA's education program. UGRA sponsors workshops for streamside landowners to share techniques and information to increase stewardship of these vital streamside habitats. Streamside landowners in Kerr County can contact UGRA for a free copy of "The Remarkable Riparian Field Guide" to help inform management of these crucial habitats.

Above all, UGRA is a resource and advocate for the community on water quality, surface water, and the Guadalupe River. Please contact UGRA with comments, questions or concerns at (830) 896-5445 or visit ugra.org.

The EduScape at UGRA Headquarters

Lower Cypress Creek Pilot Project:
Concurrent Assessment of *E.coli* Bacteria and Optical Brighteners

By Sandra Arismendez, Senior Watershed Scientist and Research Coordinator
& Nick Dornak, Director of Watershed Services
The Meadows Center for Water and the Environment

Thirty-two percent of surface water assessed in Texas does not meet the bacteria water quality standard for primary contact recreation (TCEQ, 2020). Cypress Creek in Hays County is not on the list of impaired waters for the contact recreation use but the lower reach is showing signs of water quality degradation and consistently exceeds the state's *E. coli* bacteria water quality standard (126 CFU/100 ml). This is cause for concern because of the recreational activities such as swimming, kayaking and fly fishing that take place on Cypress Creek and the important role tourism plays in the economy of the area.

E. coli bacteria originate in the digestive tract of endothermic organisms, are found in feces of warm-blooded animals, and are used by state and federal agencies as freshwater indicators of potential pathogen contamination. Water quality standards have been established using *E. coli* bacteria for determining support/non-support of the contact recreation use in areas frequented by recreational enthusiasts.
Optical brighteners are chemical compounds or dyes added to laundry detergents, cleaning agents, textiles, synthetic fibers, and many kinds of paper including toilet paper to make them appear brighter. Optical brighteners have been used by researchers as surrogates of wastewater contamination from illicit discharges in storm drains and failing septic systems because they adsorb to cotton and fluoresce under ultraviolet light, therefore can be easily detected. Optical brightener monitoring and detection can assist in pollution screening and source identification in areas where fecal contamination is known to occur. Researchers around the country have used a combination of targeted bacteria and optical brightener fluorescence to detect human fecal contamination. Historically, monitoring in Cypress Creek occurred quarterly on an annual basis but did not include optical brightener monitoring as a pollution screening tool. This project employed more frequent spatial and temporal *E. coli* bacteria sampling in lower Cypress Creek and included "tampling" monitoring for optical brightener detection of wastewater contamination.

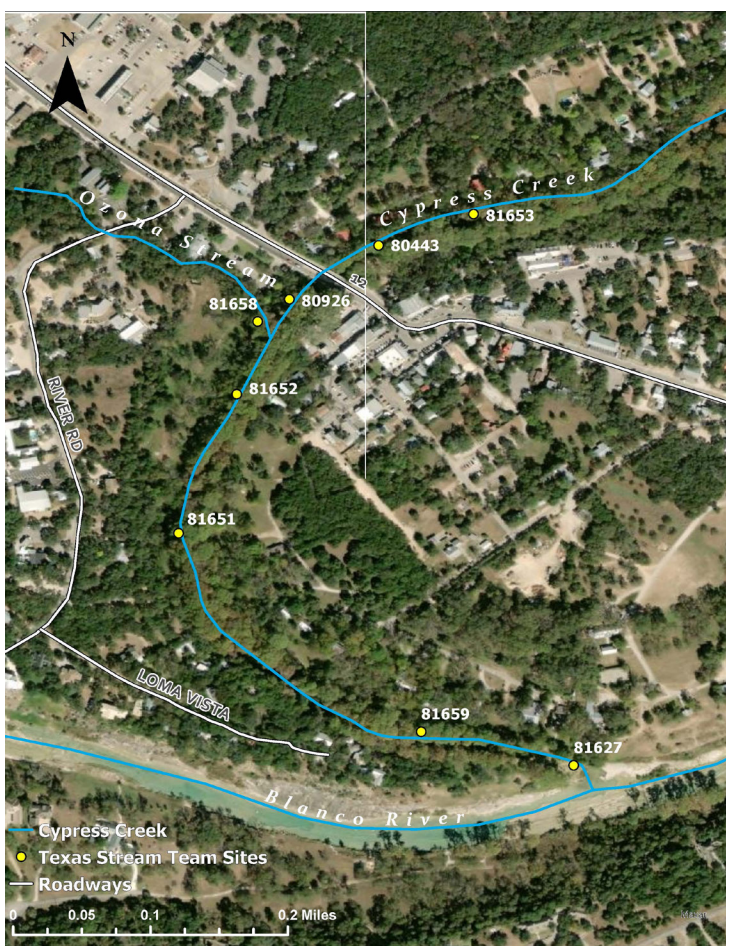


Figure 1: Lower Cypress Creek Texas Stream Team Monitoring Sites

The lower Cypress Creek project included two phases. Phase I consisted of concurrent targeted *E. coli* bacteria, field parameters (i.e., water temperature (°C), dissolved oxygen (mg/l), pH (s.u.), and specific conductance

Tampling Monitoring Devices

(µS/cm)), and optical brightener monitoring at eight sites on lower Cypress Creek twice weekly for thirteen weeks from June 27 thru September 19, 2021 (Figure 1). The monitoring frequency conducted during phase I was designed to identify and compare bacteria concentrations during different times of the week (Sunday and Thursday) and to detect optical brighteners (presence/absence) associated with potential wastewater contamination using the "tampling" method with organic cotton tampons. Phase II consisted of an extension of the sampling at the same eight sites as for phase I, a modification of the sampling frequency to once a week (Thursdays) and the suspension of "tampling" monitoring for the detection of optical brighteners. Texas Stream Team citizen scientist monitoring protocols were implemented for the *E. coli* bacteria and field parameters. The optical brightener "tampling" monitoring was conducted using a modified optical brightener "Tampling – Volunteer Procedures (Beta version)" prepared by Dr. Kelly Albus, Extension Program Specialist at Texas A&M AgriLife.

Phase II of this study is currently ongoing, but preliminary results infer sources of *E. coli* bacteria contamination likely originate from a bat colony inhabiting the underside of the RR12 bridge, nonpoint source runoff during rainfall events and/or leaking wastewater from on-site septic systems. *E. coli* monitoring results showed a significantly higher geometric mean downstream of the RR12 bridge than upstream of the bridge where the bat colony is located. In addition, Ozona Stream, a tributary merging with Cypress Creek below the RR12 bridge, exhibited a constant flow and had the highest *E. coli* bacteria colony counts throughout this study (Figure 2). There was a strong correlation between *E. coli* bacteria and rainfall accumulation at all Cypress Creek sites which supports contamination due to nonpoint source pollution during rainfall events from the surrounding urbanized areas. Optical brightener fluorescence was detected at all sites and for all deployment treatments during phase I of the project, indicative of wastewater influence throughout lower Cypress Creek.

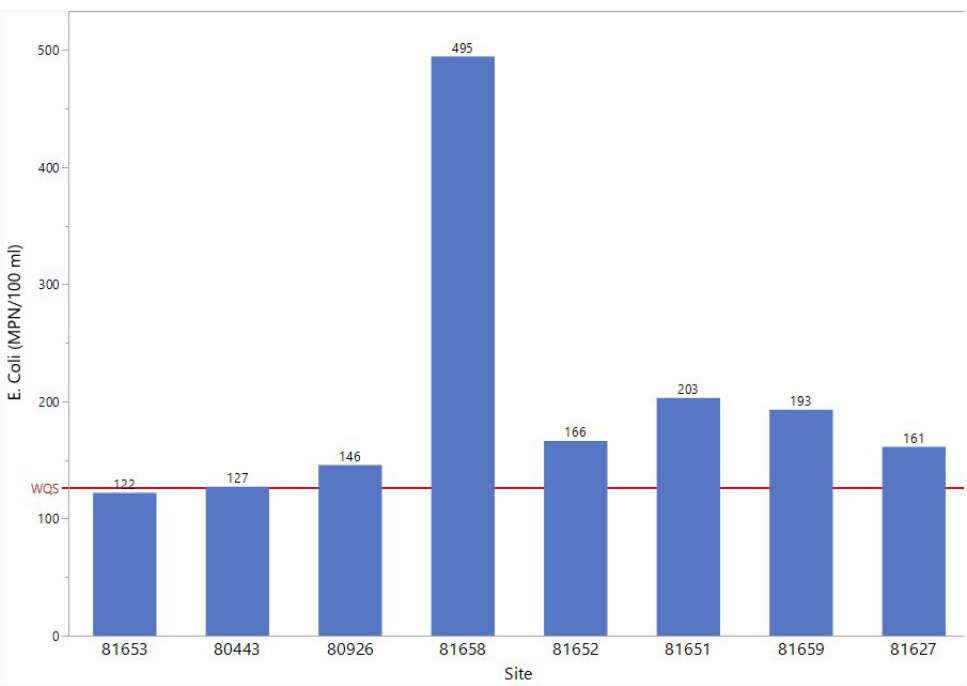
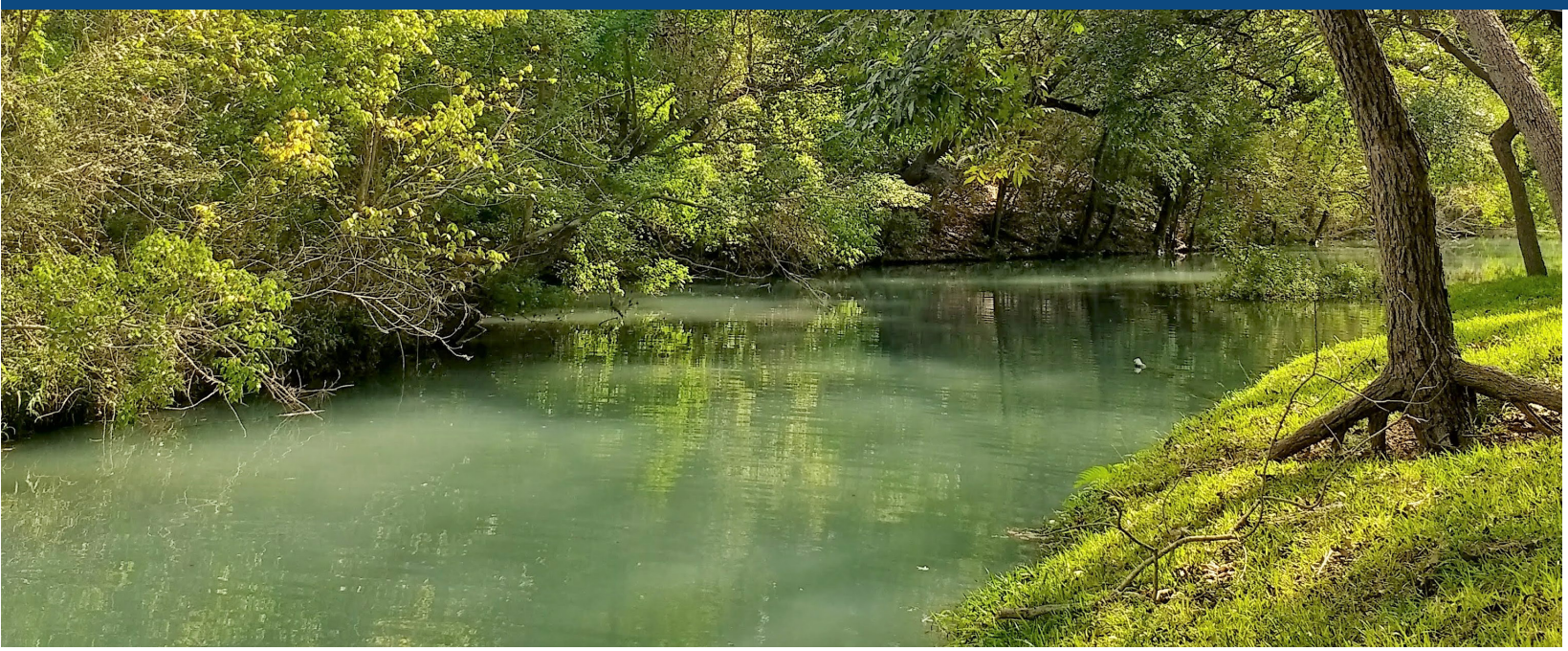


Figure 2: E.coli Bacteria Geometric Mean by Site from Cypress Creek and Ozona Creek

Future direction for this project will be to continue to monitor water quality including *E. coli* bacteria and field parameters using the Texas Stream Team protocols at all sites. The optical brightener "tampling" monitoring was suspended after phase I because all sites/treatments were exhibiting fluorescence with no discernable differences. As a follow-up to this project, we will be quantifying fluorescence using a handheld fluorometer alongside the "tampling" method to develop a colorimetric scale to help with interpretation of the visual observations.



Geronimo Creek at Haberle Road

Bacterial Source Tracking Analysis in Geronimo Creek

The nearly 70-square mile Geronimo and Alligator Creek watershed lies in Comal and Guadalupe Counties. Alligator Creek originates in southeastern Comal County and flows southeast through New Braunfels towards Seguin, joining Geronimo Creek about midway in the watershed (Figure 1). The ever-expanding growth and rapid conversion of open space into urban uses pose an increasingly significant stress on water quality in Geronimo and Alligator creeks.

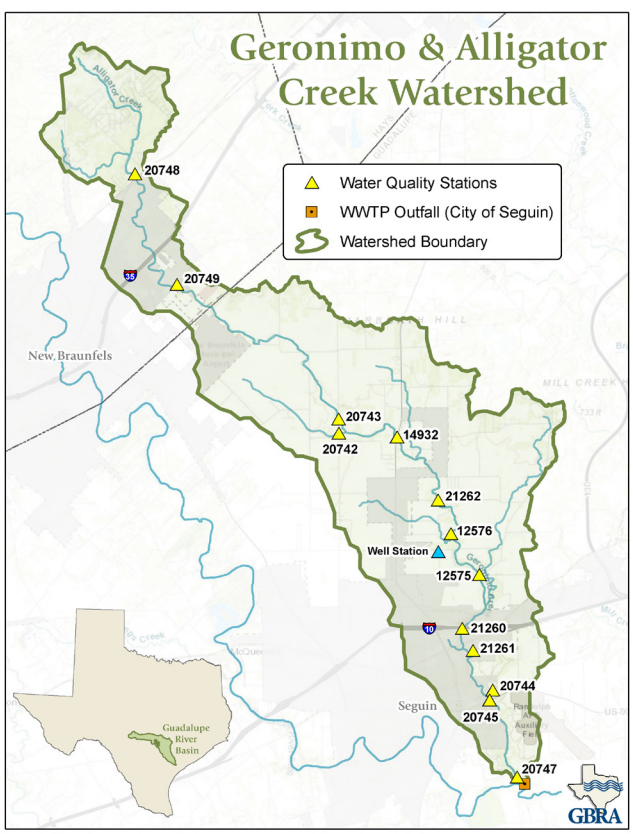


Figure 1: Water Sampling Locations in the Geronimo and Alligator Creeks Watershed

Since 2006, Geronimo Creek has been listed on the Texas 303(d) list due to elevated *E. coli* bacteria concentrations and nutrient enrichment concerns for nitrate-nitrogen. To address these issues, a Watershed Protection Plan (WPP) was developed, and since its acceptance by the Environmental Protection Agency in 2008, it has guided public outreach and education efforts to restore and protect water quality in Geronimo and Alligator Creeks. AgriLife Extension, GBRA, and Texas State Soil and Water Conservation Board continue to facilitate the implementation of the Geronimo and Alligator Creeks WPP. One of the most recent and significant achievements of this collective stewardship effort was the Bacterial Source Tracking Analysis (BST) conducted to better understand the sources of the bacterial impairment in Geronimo Creek.

Over a one-year time period, water samples from two locations along the creek – Haberle Road and Seguin Outdoor Learning Center - were collected every month and analyzed to

determine the origin of fecal bacteria found in the creek. Subsequently, *E. coli* isolates with identified origins were categorized into source groups based upon similarity of their physiology and potential management measures. Those isolates that did not match any particular source were categorized as "unidentified". Results from the two sites are discussed below.

Geronimo Creek at Haberle Road

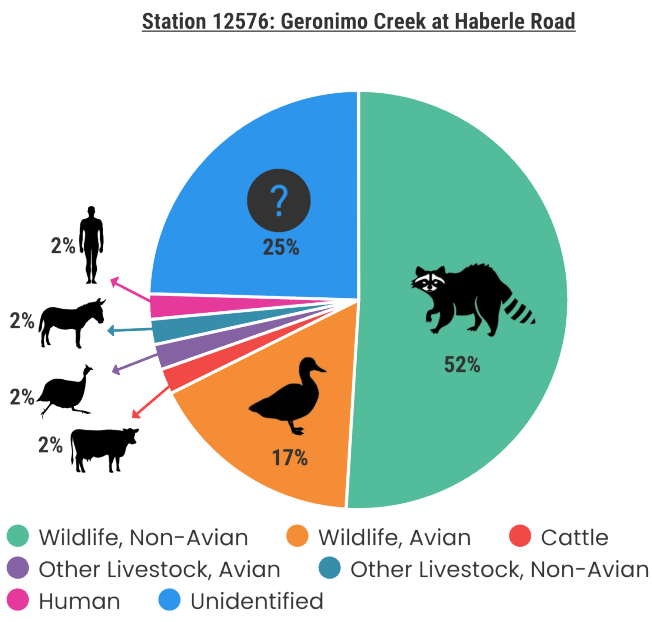


Figure 2: Origin of Fecal Bacteria at Station 12576

Water samples were collected from Geronimo Creek near Haberle Road, just north of Seguin (Figure 1, Station 12576). The results indicated that the majority of fecal bacteria detected at this site originated from non-avian wildlife, including feral hogs, deer, raccoons, foxes, coyotes, and other species. The *E. coli* contributions associated with the activity of these animals accounted for 52% of the total identified sources.

Avian wildlife such as ducks, turkeys, geese, grackles, and doves were found to be responsible for 17% of the identified sources of fecal bacteria. Cattle, avian and non-avian livestock (e.g., Guinea fowl, donkeys), and humans (e.g., malfunctioning septic systems) represented additional sources of *E. coli* in Geronimo Creek (Figure 2).

Geronimo Creek at Seguin Outdoor Learning Center

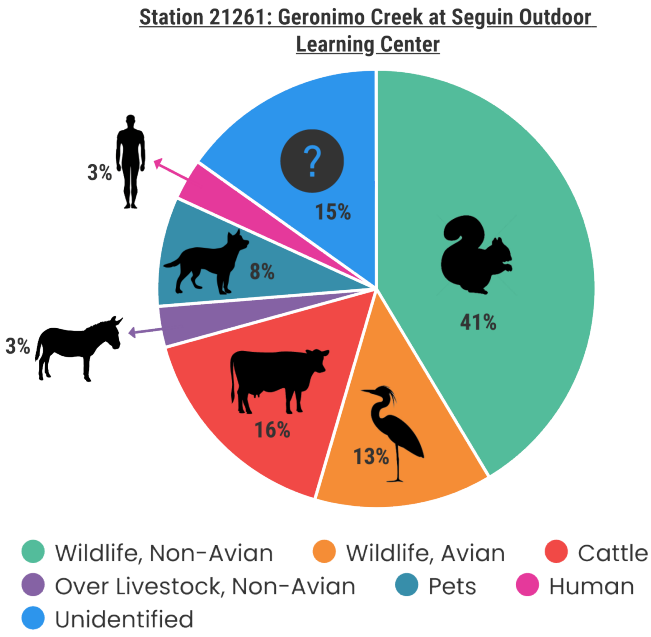


Figure 3: Origin of Fecal Bacteria at Station 21261

The other sampling site (Figure 1, Station 21261) was located at the Irma Lewis Seguin Outdoor Learning Center (SOLC) in Seguin. Similar to the Haberle Road location, the genetic analysis of *E. coli* isolates identified non-avian wildlife as the predominant source of fecal bacteria (41%), followed by cattle (16%), avian wild-life (13%), pets (8%), humans (3%), and non-avian livestock (3%) (Figure 3). Interestingly, pets (e.g., dogs and cats) did not emerge as a source of bacteria at the Haberle Road site located upstream from the SOLC.

Understanding what types of sources contribute fecal bacteria to Geronimo Creek is critical for effective implementation of the Geronimo and Alligator Creeks WPPs. AgriLife Extension is actively integrating these newly acquired data into the public outreach and education strategies to further promote local residents' awareness about water quality issues in Geronimo and Alligator creeks.

Updates from the Comal/Dry Comal Watershed Protection Plan

The City of New Braunfels is continuing to work toward protecting and improving the rivers and creeks within the portion of the Guadalupe River watershed located in and around New Braunfels. The City's water quality and watershed protection efforts are primarily associated with the Dry Comal Creek and Comal River Watershed Protection Plan (WPP), the City's Stormwater Management Program (a.k.a. the MS4 stormwater program) and the Edwards Aquifer Habitat Conservation Plan.

As part of the Dry Comal Creek and Comal River WPP, the City continues to implement bacteria management measures to reduce bacteria loading to these waterbodies. These efforts include, but are not limited to, management of urban and non-native wildlife, pet waste management and outreach/education. Specific activities that have been conducted as part of the WPP include:

- Implementation and enforcement of a wildlife feeding ordinance;
- Installation of "No-feed" educational signage at strategic locations to educate residents and visitors on the negative impacts of wildlife feeding and overabundant urban wildlife;
- Trapping, removal and management of non-native waterfowl populations in Landa Park;
- Installation of pet waste management signage at key locations;
- Installation of pet waste dispenser stations in City Parks, neighborhood green spaces and multi-family units;
- Education and outreach regarding the WPP and bacteria pollution prevention. Includes publication of education materials in local newspapers, classroom presentations and a part-time Watershed Educator staffed at the Headwaters at the Comal facility;
- Production of a watershed educational video to air at local movie theatres and on social media platforms; and
- Development of educational activities that can be utilized in conjunction with WPP-related curriculum and presentations, including two web-based games, a watershed visualization story map and a hands-on learning module where students can learn about growing bacteria cultures in a laboratory setting.

Watershed Outreach at the New Braunfels Dog Park

The City intends to continue implementing the Dry Comal Creek and Comal River WPP and further minimize bacteria loading to these waterbodies. More information on the Dry Comal Creek and Comal River WPP can be found on the City of New Braunfels webpage: www.nbtexas.org/wpp.

The City continues to mitigate stormwater pollution through the implementation of the City of New Braunfels Stormwater Management Plan (SWMP) and Municipal Separate Storm Sewer System (MS4) Program. Per the SWMP the City conducts stormwater pollution prevention activities that include but are not limited to:

- Annual screening of stormwater outfalls to identify possible pollutant discharges to the City's storm drain system and local waterways;
- Investigation of pollutant releases and pollution concerns;
- Oversight of active construction activities to ensure contractors are implementing appropriate erosion control and pollution prevention measures;
- Oversight of requirements for new developments that are intended to mitigate stormwater pollution from added impervious cover;
- Oversight of City operations to prevent and minimize stormwater pollution; and
- Education and outreach.

Restored Riparian Area in Landa Park

More information of the City's MS4 program and Stormwater Management Plan activities can be found on the City's website at www.nbtexas.org/ms4.

The City also continues to participate in the Edwards Aquifer Habitat Conservation Plan (EAHCP) that includes the implementation of springflow and habitat protection measures intended to protect the habitat of several federally-listed endangered species in the Comal River system. As part of the EAHCP, the City has been performing habitat restoration activities that include:

- Removal of non-native aquatic vegetation and planting of native aquatic vegetation within Landa Lake and the Comal River;
- Extensive removal of non-native riparian vegetation (i.e. - elephant ears, Ligustrum, Chinese tallow, etc.) along Landa Lake and the Comal River;
- Planting of native plants within the riparian zone of Landa Lake and the Comal River;
- Removal of non-native fish and animal species from the Comal River system that includes removal of tilapia, suckermouth catfish (*Plecostomus sp.*) and nutria; and
- Design and construction of stormwater treatment facilities (i.e. - bioretention basins) within the Comal River watershed.

2021 Dos Rios Watershed Cleanup Logo

In October 2021 the City held the annual Dos Rios Watershed Cleanup event to collect litter from local rivers, creeks, and contributing watershed areas within New Braunfels. The 2021 Dos Rios Watershed Cleanup event utilized the New Braunfels Utilities' Headwaters at the Comal facility as the event headquarters. A drive-through system was set up for participants to gather their supplies, t-shirts, and breakfast. Statistics for the 2021 Dos Rios Watershed Cleanup Challenge are listed below:

- Total Number of participants: 172
- Total estimated weight of litter collected: 1,200 lbs.

Since the initiation of the Dos Rios Watershed Cleanup in 2017, approximately 862 volunteers have helped to collect and remove over 7,800 lbs. of litter as part of this event.

Wimberly Valley Watershed Association Secures 74 Acres of Land for Recharge Protection

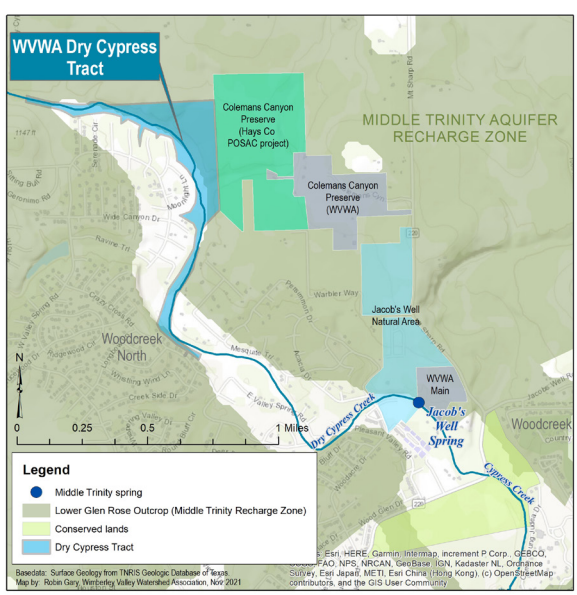
The Wimberley Valley Watershed Association finalized the purchase of 74 acres adjacent to the Colemans Canyon Preserve on Wednesday, November 10, 2021. This purchase secures critical recharge area for the Middle Trinity Aquifer and is within the catchment area for Jacob's Well.

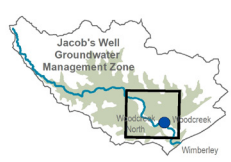
Dry Cypress Creek

"It has been a long-term plan of ours to expand conservation lands above Jacob's Well," explains David Baker, Founder and Executive Director of the Watershed Association. "With strong support from Hays County, our donors, members, partners and the community, we've been able to conserve an additional 250 acres of critical habitat that will immediately help protect wildlife and enhance recharge to the Middle Trinity Aquifer, our community's water supply, and protect flow at Jacob's Well and in Cypress Creek."

The Jacob's Well Natural Area, Colemans Canyon Preserve, and now the Dry Cypress tract protect nearly 2 miles of Dry Cypress Creek and 250 acres of critical recharge zone. Lower Glen Rose Limestone—the top layer of the Middle Trinity Aquifer—is exposed at the surface and is easily dissolved forming karst features like caves and sinkholes. Karst features along the creek and in the uplands provide a direct link to the groundwater system below.

This land conservation effort offers significant environmental benefits that include protecting sensitive recharge caves and karst features, improving the quality and quantity of groundwater recharge vital to keeping Jacob's Well and Cypress Creek flowing, preserving high-quality critical wildlife habitat, and could lessen flooding potential through strategically located green infrastructure projects. Limiting development through land conservation in the recharge area for Jacob's Well spring benefits all Hays County residents and visitors.





Location Map

Map of Newly Acquired Dry Cypress Tract

Highlights from Plum Creek Watershed Partnership

New Citizen Science Water Quality Monitoring Group

The Plum Creek Stewards is a new group monitoring the Plum Creek Watershed under Texas Stream Team. Our trained citizen scientists collect standard water quality parameters at one site monthly. The data include dissolved oxygen, air and water temperature, pH, water transparency, and field observations such as flow, weather, presence of algae, water surface and odor. The Stewards not only add to the state-wide database held by Texas Stream Team; they also serve as observers of Plum Creek, especially in the rapidly urbanizing areas which may be subject to swift changes in water quality that merit reporting.

Events: Trash and Trees

"Keep Lockhart Beautiful" Volunteers

The first weekend in November was a busy and beneficial time for the Plum Creek Watershed. Two successful volunteer events occurred: Keep Lockhart Beautiful Fall Cleanup and the Re-leaf Reforestation. The Keep Lockhart Beautiful 2021 Fall Clean and Green event was the first in-person cleanup event in the watershed since the onset of the pandemic. Over 120 volunteers collected nearly 1,000 pounds of trash in 6 parks across Lockhart, including Town Branch Creek. Thanks to a generous donation from Scenic Texas, 100 trees were given to cleanup participants. Volunteers were also fed breakfast tacos and received “Keep Lockhart Beautiful” reusable facemasks.

The Guadalupe-Blanco River Trust held its second Re-Leaf event at the Plum Creek Wetlands Preserve. The Preserve, located just north of Lockhart, contains 21 constructed wetland ponds, which attract a variety of wildlife including deer, amphibians, reptiles, and pollinators. The Re-leaf Reforestation project aims to return the 265-acre Preserve to its native vegetation. During the two-day event, 30 volunteers planted over 700 native trees. The event attracted volunteers from various organizations, such as the Lost Pines Master Naturalists, Guadalupe County Master Naturalists, Lockhart ISD, Texas A&M Forest Service, Guadalupe-Blanco River Authority, Plum Creek Watershed Partnership, Keep Lockhart Beautiful, and Texas State University.

Re-Leaf Tree Planting Event Volunteers

Invasive Species Removal and Other Watershed Protection Activities in the Upper San Marcos River

The second iteration of Implementation Phase I in the Upper San Marcos River Watershed Protection Plan has hit the ground running! This 319 funded project officially kicked off late 2020 and is a collaborative project with The Meadows Center for Water and the Environment, the San Marcos Greenbelt Alliance, the City of San Marcos, and the Mermaid Society of Texas. The main components of this grant include restoration work in the Sessom Creek Natural Area as well as extensive education and outreach programs. The watershed team is excited to share all the progress completed in year one of the project as well as what is to come!

Completed Vegetative Filter Strip in Sessom Creek Natural Area

The restoration portion of the Sessom Creek Natural Area project is spearheaded by the City. The Natural Area is in a crucial location in the watershed due to its upstream location in relation to the San Marcos River as the surrounding development makes it more susceptible to pollutants and the land elevation increases erosion from stormwater runoff. Restoration activities over the past year have included riparian restoration by removing invasive trees such as ligustrum, chinese tallow, and tree of heaven; native and canopy thinning to improve understory plant establishment; and completion of vegetative filter strips to remove sediment and other pollutants from runoff. Future restoration will include planting native vegetation and stream restoration. The natural area has already become an outside laboratory for Texas State University, improving the teaching and learning experiences for both students and professors.

In addition to the restoration work in the Sessom Creek Natural Area, the San Marcos Greenbelt Alliance spearheaded the development of a Community Trail Plan for the future of the natural area. The plan includes a nature trail, maintenance, and educational signage that will be integrated into the natural area once restoration work is complete. The educational signage will highlight unwelcome invasive vegetation, nonpoint source pollution, natural solutions for natural problems, the confluence of Sessom Creek and Windmill Tributary, and will also include a trailhead sign explaining revitalization efforts in the park.

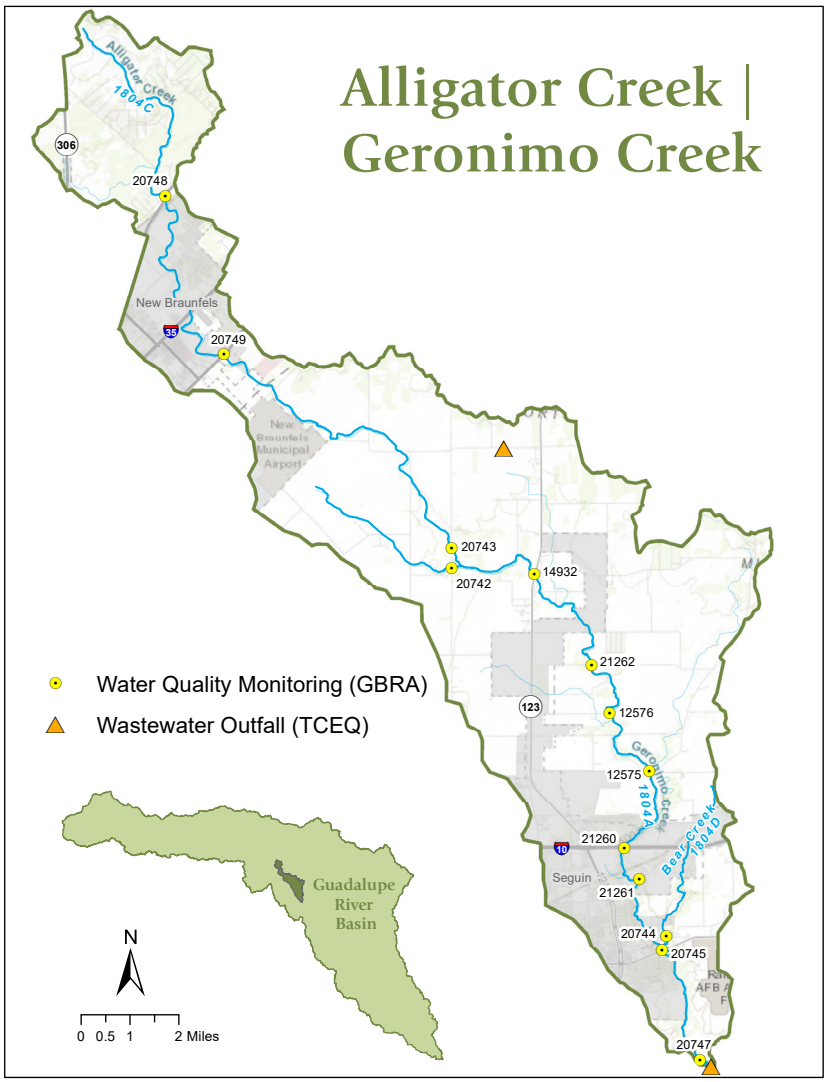
Invasive Species Removal in the Riparian Zone near Sessom Creek

The education and outreach portion of the project is mainly spearheaded by the Mermaid Society. Over the past year, the Mermaid Society worked to develop education curriculum and outreach materials that enhance the Mermaid Splash and Patch programs for the 2021-2022 school year. Both the Splash and Patch programs have now officially kicked-off in schools with Mermaid Maya, the programs mascot, already making her way into five elementary schools! Enhanced curriculum features the importance of preventing nonpoint source pollution and combines science with fantasy, encouraging youth to become environmental stewards in the community. Engagement with schools and the public will continue for the remainder of the project period.

Project implementation will continue until early 2023. The watershed team is dedicated to protecting the watershed and increasing awareness. For more information about the Upper San Marcos River Watershed Protection Plan please visit UpperSanMarcosRiver.org.

Mermaid Society School Outreach

Geronimo Creek Watershed

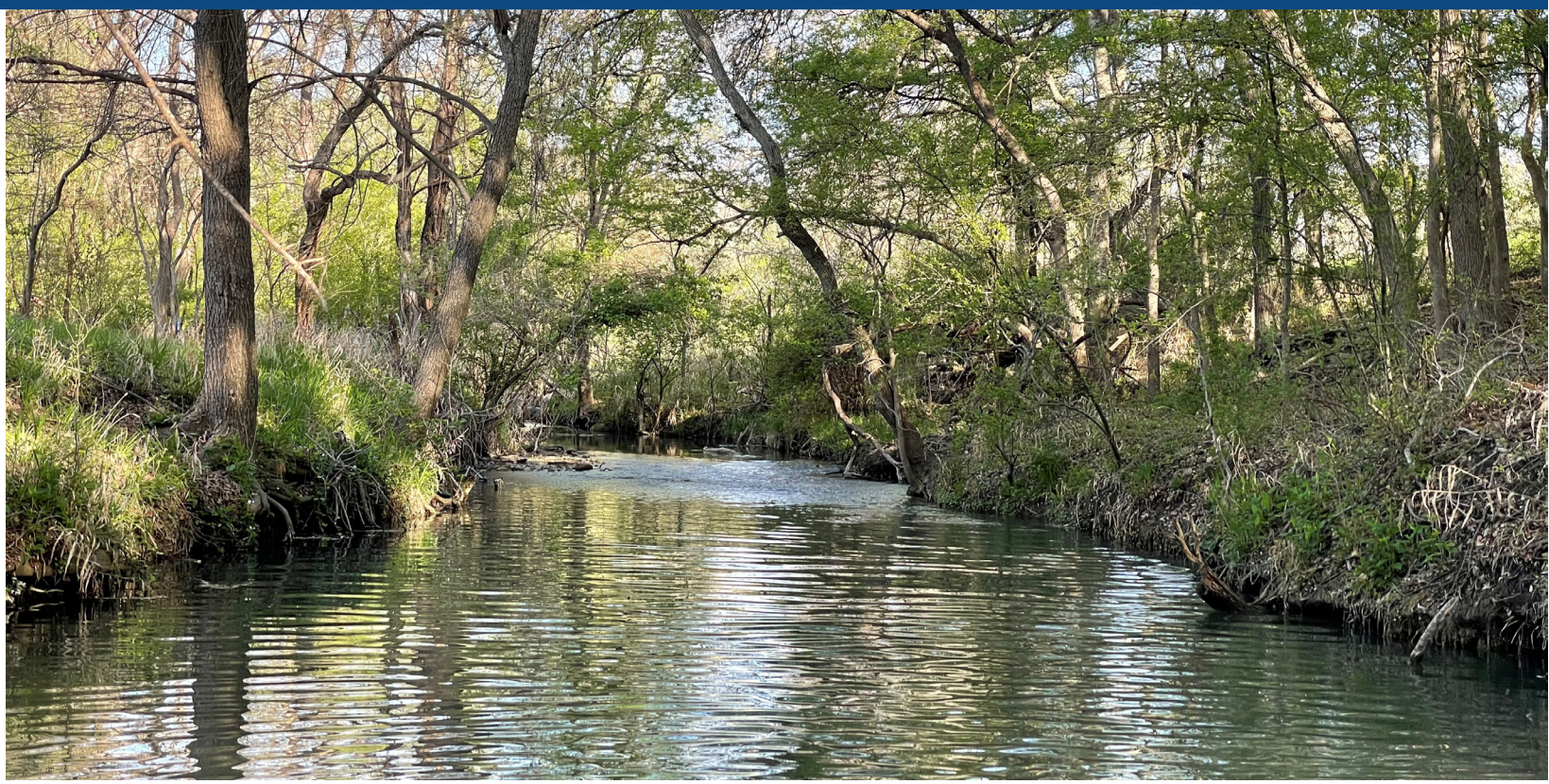


Description

Segment 1804A represents Geronimo Creek, a 17-mile tributary of the Guadalupe River. Geronimo Creek is contained within a 69 square mile watershed located in Comal and Guadalupe Counties, mostly within the Extra-Territorial Jurisdictions (ETJs) of New Braunfels and Seguin. Geronimo Creek's headwaters are located in southeast Comal County and are fed by two major springs, Timmermann Spring and an unnamed spring coming from the Leona Aquifer and alluvium. Like many other watersheds in the central Texas region, the land use has been predominantly agriculture, however there is a shift toward more urbanized areas as the region continues to attract new residents.

Facts and Features

Drainage Area	69 square miles
Length	17 miles
Tributaries	Alligator Creek (1804C), Bear Creek (1804D)
Aquifer	Edwards Balcones Fault Zone, Carrizo Wilcox
River Segments	1804A, 1804C, 1804D
Cities & Communities	New Braunfels, Seguin, Geronimo
Counties	Comal, Guadalupe
EcoRegion	Edwards Plateau, Texas Blackland Prairie
Climate	Average annual rainfall 34.48 inches, Average annual temperature 20.8°C
Land Uses	Urban, suburban sprawl, light industry and recreational
Water Body Uses	Aquatic life, contact recreation, general use, fish consumption, and agriculture
Soils	Dark, calcareous clay, clay with rocky outcrops



Geronimo Creek at Haberle Road

Segments 1804A, 1804C and 1804D

Concerns and Recommendations

Segment 1804A was first listed on the Texas 303(d) list of impaired water bodies in 2006. The entire waterbody was found to be impaired for contact recreation with an *E. coli* geometric mean of 162 MPN/100 mL, the state screening criteria level is 126 MPN/100 mL. The stream was also listed for concerns for Nitrate Nitrogen because measurements exceeded the 1.95 mg/L screening criteria level. In response to this, in 2008 the Texas State Soil and Water Conservation Board (TSSWCB), the GBRA, and Texas A&M AgriLife Extension began working with local stakeholders to develop a Watershed Protection Plan (WPP) for Geronimo Creek and its tributary, Alligator Creek. The TSSWCB also funded additional water quality monitoring to fill data gaps and help further facilitate WPP development, and supplement the existing monitoring under the Clean Rivers Program. In 2012 the WPP was accepted by the EPA, the third in the state of Texas. Pollutant sources identified in the watershed include urban runoff, domestic pets, septic systems, native and non-native wildlife, and agriculture. Best Management Practices (BMPs) have been recommended through the WPP, and the Geronimo and Alligator Creeks Watershed Coordinator is tasked with working with stakeholders in the watershed to educate and help implement these BMPs.

In 2020 a Bacterial Source Tracking (BST) study was conducted at two sites along Geronimo Creek, at Station 12576, Geronimo Creek near Haberle Road, and Station 21261 at the Irma Louis Seguin Outdoor Learning Center. Results from the study showed that most of the bacteria samples collected during the sampling events came from wildlife sources, and less than 3% came from sources that could be identified as human. For a more in depth description of this sampling and the results, please refer to the Geronimo and Alligator Creeks WPP update in this Report.

Segments 1804A, 1804C and 1804D
Concerns and Recommendations Continued

Beginning in 1996, the GBRA monitored 1804A as part of the CRP monitoring program at station 14932, near the confluence of Alligator Creek at state Highway 123. In 2003 that site was discontinued in favor of a new site downstream that was designated by the TCEQ as an ecoregion reference location. This AU has been routinely monitored since 2003 under the CRP at station 12576, located at the Haberle Road crossing, approximately four miles south of the confluence with Alligator Creek. This is currently the only monitoring station in the Geronimo Creek Watershed that is monitored under the CRP monitoring program. 1804C (Alligator Creek) and 1804D (Bear Creek), as well as multiple springs and wells in the watershed are monitored under the Geronimo and Alligator Creeks WPP monitoring program.

As of the 2020 Texas Integrated Report, 1804A is still impaired for *E. coli* with a geometric mean of 199.95 MPN/100 mL, an increase from the initial listing in 2006. Nitrate Nitrogen also continues to be a concern in this AU. Results from a nitrate isotope study, funded by TSSWCB, showed that the majority of nitrate nitrogen in the watershed resulted from a combination of nitrogen fertilizers and septic waste. BMPs focused on nitrate reduction should focus on educating commercial and residential fertilizer users about runoff as well as identifying and decommissioning failing septic systems.

In FY21, the GBRA conducted an Aquatic Life Monitoring Event (ALM) at station 12576 to survey the habitat, fish community, and macrobenthic community within this AU. An ALM event is comprised of two data collection days, one in the Index Period (March 15 – July 2), and one in the Critical Period (July 3 – September 24). Results from the ALM are

GBRA Staff on Geronimo Creek

GBRA Staff Electrofishing as Part of an Aquatic Life Monitoring Event

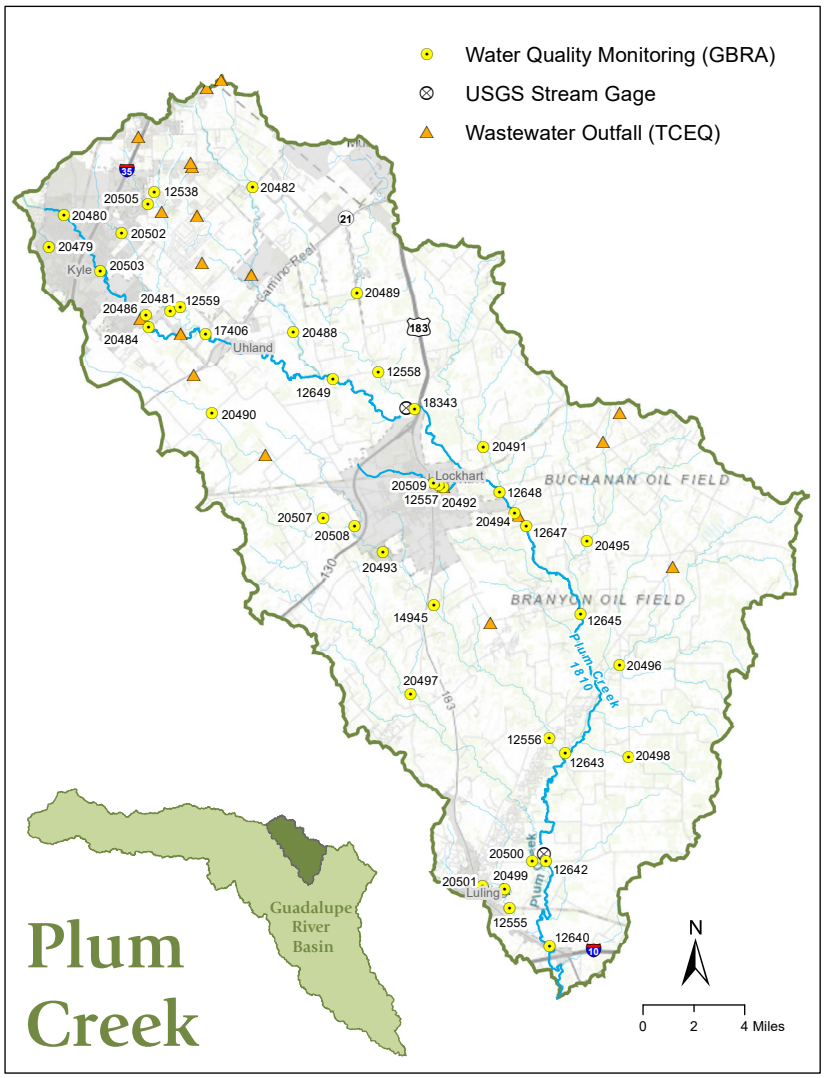
used to determine how the stream is currently ranking compared to the Aquatic Life Use Designation given by the TCEQ. Perennial streams are presumed to have a High aquatic life use designation, per the Texas Administrative Code (TAC) Rule §307.4. The AU's Aquatic Life Use Designation, the Currently Assessed Status, and the results of the ALM are presented in the table below:

Aquatic Life Monitoring Events	Fish Community	Macroinvertebrate Community	Habitat
Aquatic Life Use Designation	High (41-48)	High (29-31)	High (20-25)
Currently Assessed Status*	Intermediate (49)*	High (38)*	High (22)*
FY21 Index Period Score	High (45)	Exceptional (41)	High (22)
FY21 Critical Period Score	Exceptional (50)	Exceptional (39)	High (21)
FY21 Average	High (48)	Exceptional (40)	High (22)

Current Assessment Status Published in 2020 TCEQ Texas Integrated Report (12/1/2011 - 11/30/2018)

Results from this ALM show that this AU is meeting or exceeding its assessed status in all three categories. Notably, both fish community and macroinvertebrate community received an exceptional rating during the assessment made during the critical period, the time of year when the creek is typically under the most stress due to hot summer temperatures and dry conditions. The higher than average amount of rain that the watershed received in June and July 2021 could have contributed to this result.

Plum Creek Watershed

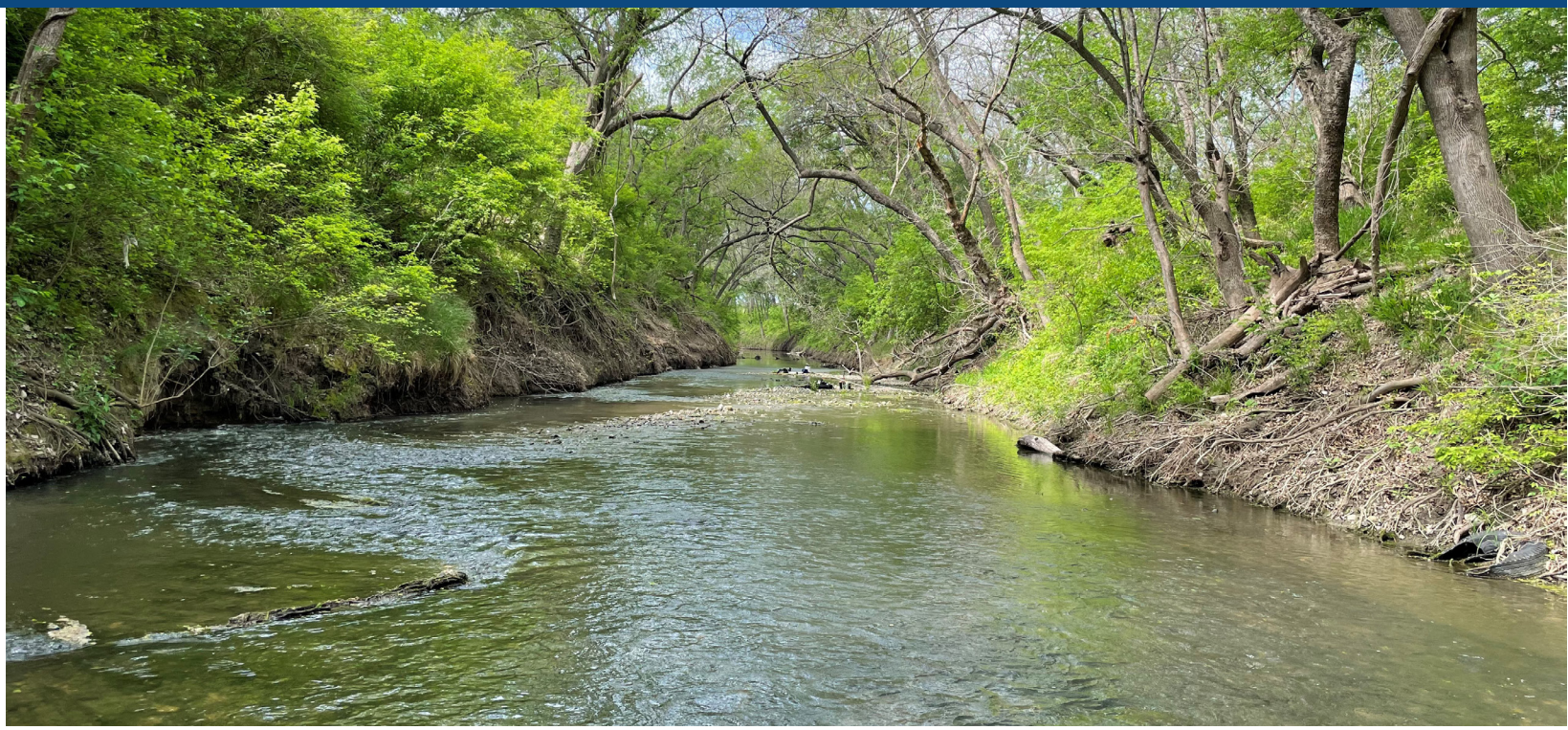


Description

Segment 1810 represents Plum Creek, a 52-mile tributary of the San Marcos River with a 389 square mile drainage area in the rapidly developing I-35 corridor. The major cities in this watershed include Buda, Kyle, Lockhart, Luling, and Uhland. Historically this area has been dominated by agricultural land use. However, like many other areas in central Texas, Plum Creek is experiencing rapid urbanization and a population boom. From 2000 to 2019 the overall watershed experienced an average population increase of 209%. However, a majority of the increase has occurred near the headwaters of Plum Creek in Buda, Kyle, and Uhland where populations have increased 528%, 760%, and 311% respectively in that time frame. As of 2019, 10% of the watershed is considered urban, an increase of 3.4% (12 square miles) since 2004.

Facts and Features

Drainage Area	389 square miles
Length	52 miles
Tributaries	Bunton Branch, Porter Creek, Andrew's Branch, Richmond Branch, Cowpen Creek, Brushy Creek, Elm Creek, Dry Creek, Town Creek (1810A), Clear Fork, West Fork
Aquifer	Edwards Balcones Fault Zone, Leona Aquifer, Carrizo-Wilcox Aquifer
River Segments	1810, 1810A
Cities & Communities	Buda, Kyle, Uhland, Lockhart, Luling
Counties	Hays, Caldwell
EcoRegion	Edwards Plateau, Texas Blackland Prairie, Post Oak Savannah
Climate	Average annual rainfall 34.43 inches, Average annual temperature 70.64°F
Land Uses	Urban, suburban sprawl, light industry, recreational, agriculture
Water Body Uses	Aquatic life, contact recreation, general use, fish consumption, and agriculture and ranching
Soils	Dark, waxy soil to sandy loam, limestone to black waxy chocolate and grey loam



Plum Creek near County Road 135

Segments 1810 and 1810A

Concerns and Recommendations

Segment 1810 was first listed on the Texas 303(d) list of impaired water bodies in 2004. The middle and upper end of the segment were found to be impaired for contact recreation, due to an *E. coli* geometric mean of 183 MPN/100 (the state criteria level is 126 MPN/100 mL). The stream was also listed for concerns regarding Nitrate + Nitrite Nitrogen levels above the criteria level of 1.95 mg/L.

As a result of the waterbody impairments, the Texas State Soil and Water Conservation Board, GBRA, and AgriLife Extension engaged local stakeholders to develop a Watershed Protection Plan, with the goal of addressing water quality concerns through increased water quality monitoring, public outreach, and the development and implementation of Best Management Practices (BMPs). This was the first WPP developed in the state of Texas as implementation began in 2008. In 2010 the TCEQ moved Plum Creek Watershed from category 5a, which requires Total Maximum Daily Loads (TMDLs) to address impairments, to category 4b, which allows the WPP to attempt to address the impairments. Because of this segment's 4b categorization, it is not listed on the 303(d) list for impaired waterbodies. Along with the WPP, Plum Creek has a Watershed Coordinator to spearhead education and outreach efforts and BMP implementation throughout the watershed. A group of stakeholders from within the watershed were brought together to serve as funding partners and Steering Committee Members to help guide the Coordinator in their efforts and provide local knowledge. This stakeholder group includes:

- GBRA
- Hays County
- City of Kyle
- City of Lockhart
- City of Uhland
- Polonia Water Supply
- Local landowners and businesses
- Plum Creek Conservation District (PCCD)
- Caldwell County'
- City of Buda
- City of Luling
- Hays County Soil and Water Conservation District #351
- Caldwell-Travis Soil and Water Conservation District #304

Segments 1810, 1810A
Concerns and Recommendations Continued

The headwaters of Plum Creek are fed by natural springs stemming from the Leona Aquifer with additional springs contributing throughout the watershed. However, wastewater effluent comprises much of the flow in Plum Creek. Currently, the creek receives effluent from 23 outfalls that are associated with 18 permitted wastewater treatment facilities, and there are an additional three wastewater permits currently pending in the watershed. Several of the wastewater treatment plants in the watershed strive to achieve 5-5-2-1 treatment levels (5 mg/L CBOD, 5 mg/L TSS, 2 mg/L NH3-N, 1 mg/L phosphorus), a voluntary measure recommended by the Plum Creek Watershed Protection Plan.

In 2016 a Bacterial Source Tracking (BST) study was conducted in the watershed by the GBRA and the Texas A&M University Soil and Microbiology Laboratory. Results from the study showed that most of the bacteria samples collected during the 12 month study came from wildlife sources, and less than 10% came from sources that could be identified as human. As of the 2020 Texas Integrated Report 1810 is listed as impaired for *E. coli*, and has concerns for fish community, habitat, Nitrate, Total Phosphorus, and Ammonia. The rapid urbanization in the watershed, leading to increased runoff, is a likely source for the continued increase in bacteria and nutrient loading in the creek. Continued engagement of the stakeholders in the watershed, and further BMP implementation is needed to mitigate bacteria and nutrient loading.

Segment 1810 is divided into three Assessment Units (AUs). Those AUs, associated monitoring sites, and major events in the AU will be described here. Assessment Unit 1810_01 represents the lower third of the watershed, from the confluence with the San Marcos River to 2.5 miles upstream of the Clear Fork Tributary. This AU is monitored at station 12640 at the County Road 135 crossing southeast of Luling, TX. This station was monitored by the TCEQ from 1983 until 1998 when monitoring duties were transferred to the GBRA under their CRP contract. This AU receives discharge from the Clear Fork, West Fork, and Salt Branch tributaries. Several wastewater treatment facilities contribute effluent to the flow in this AU, including Lockhart and Luling's Wastewater Treatment Plants. This AU is impaired for bacteria, and has concerns for fish community, habitat, nitrate, and total phosphorus. The 2020 Texas Integrated Report of Surface Water Quality reported that this AU had an assessed geometric mean of *E. coli* concentrations of 222.4 MPN/100 mL, an assessed value for fish of 39 out of 42, and an assessed value for habitat of 19 out of 20. Additionally, the AU has concentrations of nitrate and total phosphorus of 4.36 mg/L and a 1.03 mg/L, respectively; their screening criteria are 1.95 mg/L and 0.69 mg/L, respectively.

GBRA Staff Conducting a Fish Survey on Plum Creek

In FY21, the GBRA conducted an Aquatic Life Monitoring Event (ALM) at station 12640 to survey the habitat, fish community, and macrobenthic community within this AU. An ALM event is comprised of two data collection days, one in the Index Period (March 15 – July 2), and one in the Critical Period (July 3 – September 24). Results from the ALM are used to determine how the stream is currently ranking compared to the Aquatic Life Use Designation given by the TCEQ. Perennial streams are presumed to have a High aquatic life use designation, per the Texas Administrative Code (TAC) Rule §307.4. The AU's Aquatic Life Use Designation, the Currently Assessed Status, and the results of the ALM are presented in the table below:

Aquatic Life Monitoring Events	Fish Community	Macroinvertebrate Community	Habitat
Aquatic Life Use Designation	High (42-51)	High (30-34)	High (20-25)
Currently Assessed Status*	Intermediate (39)*	High (31)*	Intermediate (19)*
FY21 Index Period Score	Limited (34)	High (30)	High (22)
FY21 Critical Period Score	Intermediate (36)	High (30)	High (22)
FY21 Average	Limited (35)	High (30)	High (22)

Current Assessment Status Published in 2020 TCEQ Texas Integrated Report (12/1/2011 - 11/30/2018)

Results show that this AU is currently not meeting its aquatic life use designation for fish community, but is meeting for both macroinvertebrate community and habitat. During the ALM conducted in the Index period, an equipment malfunction occurred when the electroshocker used for fish collection became inoperable, causing the team to utilize twelve seine hauls to collect fish species rather than the typical 180 minutes of electroshocking paired with six seine hauls. This change in sampling could have contributed to the 'Limited' score for fish community at that event. Also at this ALM Event, the GBRA conducted a mussel survey to confirm native freshwater mussel population within the AU. The following five native mussel species were found during the event:

- *Cyclonaias necki*, Guadalupe Orb (Endangered Species Act Candidate)
- *Lampilis teres*, Yellow Sandshell
- *Lampilis hydiana*, Louisiana Fatmucket
- *Cyclonaias pustulosa*, Pimpleback
- *Quadrula quadrula*, Mapleleaf

Native Mussels Found in Plum Creek

Segments 1810, 1810A
Concerns and Recommendations Continued

Assessment Unit 1810_02 encompasses the middle portion of 1810, from 2.5 miles upstream of the Clear Fork tributary to 0.5 mile upstream of State Highway 21. Historically this AU has been monitored at station 12647 at the County Road 202 crossing southeast of Lockhart, TX. The TCEQ and its predecessor agencies monitored this station from 1981 unit 2005 when monitoring duties were transferred to the GBRA. This AU receives discharge from Brushy Creek, Dry Creek, and Town Creek (1810A) tributaries, as well as several wastewater treatment facilities including Lockhart Larremore, Shadow Creek, and Sunfield. This AU is impaired for bacteria, and has concerns for fish community, habitat, nitrate, and total phosphorus. The 2020 Texas Integrated Report of Surface Water Quality reported that this AU had an assessed geometric mean of *E. coli* concentrations of 326.18 MPN/100 mL, an assessed value for fish of 38 out of 42, and an assessed value for habitat of 19 out of 20. Additionally, the AU has concentrations of nitrate and total phosphorus of 5.87 mg/L and a 1.30 mg/L, respectively; their screening criteria are 1.95 mg/L and 0.69 mg/L, respectively.

Assessment Unit 1810_03 encompasses the uppermost portion of the watershed from 0.5 mile upstream of State Highway 21 to the upper end of the segment above FM 150 in the City of Kyle. This AU has been monitored at station 17406 on Plum Creek Road upstream of the city of Uhland by the GBRA under the Clean Rivers Program. This AU receives discharge from the Porter Creek tributary, which receives the wastewater discharge from the city of Buda. This AU also receives the effluent discharge from the city of Kyle. Due to the rapid growth and expansion in this segment, many wastewater treatment facilities are undergoing expansion projects. Notably, the Kyle Wastewater Treatment Facility is undergoing a major expansion project to keep up with demand. They were previously permitted to discharge 3.0 Million Gallons of effluent per Day (MGD). They are currently undergoing an expansion that will increase their discharge to 4.5 MGD, with future expansions planned that would increase discharge to 9 MGD, and a final planned expansion with a discharge rate of 12 MGD.

This AU is impaired for bacteria, and has concerns for macrobenthic community, ammonia, nitrate, and total phosphorus. The 2020 Texas Integrated Report of Surface Water Quality reported that this AU had an assessed geometric mean of *E. coli* concentrations of 516.27 MPN/100 mL. Additionally, the AU has concentrations of ammonia, nitrate, and total phosphorus of 1.77 mg/L, 10.53 mg/L and a 2.42 mg/L, respectively; their screening criteria are 0.33 mg/L, 1.95 mg/L and 0.69 mg/L, respectively.

Town Creek (1810A) is an unclassified tributary of Plum Creek that discharges into Plum Creek in AU 1810_02. 1810A is monitored at station 20509 in Lockhart City Park. This segment was assessed by the TCEQ and is impaired for bacteria with a concern for nitrate. The 2020 Texas Integrated Report of Surface Water Quality reported that this AU had an assessed geometric mean of *E. coli* concentrations of 229.41 MPN/100 mL, and an ammonia concentration of 10.73 mg/L. Town Creek is heavily influenced by spring flows from the Leona Aquifer which has historically high nitrate concentrations, and the *E. coli* concentrations are likely due to the dense wildlife population within Lockhart City Park.

Honey Creek at Guadalupe River State Park

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

Guadalupe-Blanco River Authority
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gbra.org