CLEAN RIVERS PROGRAM BASIN HIGHLIGHTS REPORT

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GUADALUPE RIVER AND LAVACA-GUADALUPE COASTAL BASINS



Front Cover: Tubers on the Comal River, Courtesty of the City of New Braunfels

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Spring Run #3 at Landa Lake

INTRODUCTION

This report highlights the activities of the Clean Rivers Program (CRP) in the Guadalupe River Basin and the Lavaca-Guadalupe Coastal Basin. CRP is a statewide program managed by 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 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), carries out water quality management efforts in these basins under contract with TCEQ. The Watershed Association (WA) and the Meadows Center for Water and the Environment (MCWE) contribute monitoring data collected under the Guadalupe Basin CRP quality assurance project plan from the Blanco River and Cypress Creek watersheds. Funding allocated to this program is used by the partners to carry out monitoring efforts, perform quality assurance and data management, and produce education and outreach materials.

The 2025 Basin Highlights Report features a characterization of the Comal River watershed. Watershed characterizations include segment descriptions, land uses, potential stakeholders, descriptions of water quality concerns and impairments, major events, ongoing projects, and maps. This report also includes an article from the City of New Braunfels detailing their Watershed Protection Plan efforts in the Comal River and Dry Comal Creek, and an overview of the 2024 Texas Integrated Report for the Guadalupe River Basin.



Comal River at Landa Park

PARTNER HIGHLIGHTS

Upper Guadalupe River Authority (UGRA)

As the lead water resource planning agency for the Upper Guadalupe River basin in Kerr County, UGRA is responsible for preserving and protecting the health of the Upper Guadalupe River watershed. UGRA proactively partners with municipal and county governments, communities, civic groups, schools, and local citizens. Through these partnerships, we leverage resources, facilitate an understanding of water resource issues, and raise awareness of the role everyone in the community can play in maintaining the health of the watershed.

As Kerr County's population increases, the need to provide adequate protection of our water resources becomes more urgent. In response to that need, UGRA launched the Water Resources Preservation Grant Program in 2023 to provide cost share funding for the design and construction of stormwater management practices. Strategies like rainwater harvesting, vegetated filter strips, and permeable paving function to reduce the impact of development on the Guadalupe River. Over the last year, the UGRA Board has selected three new projects to be the first recipients of the grant, representing an over \$300,000 investment in preventing pollution from runoff from entering our waterways.

Above all, UGRA is a resource and advocate for the community on water quality, surface water, and the Guadalupe River. Central to our water monitoring programs is the nationally accredited UGRA Environmental Laboratory, a full-service laboratory serving the entire Hill Country. The laboratory is accredited according to the National Environmental Laboratory Accreditation Program and is one of the largest microbiological laboratories in the region. Please contact UGRA with comments, questions, or concerns at (830) 896-5445 or visit www.ugra.org.



UGRA Natural Resources Specialist Travis Linscomb conducts sampling in the Guadalupe River at Comfort | Photo taken by Matthew Wilkinson, UGRA

The Meadows Center for Water and the Environment & The Watershed Association

Following the conclusion of 319 federal funding for the Cypress **Creek Watershed Protection Plan in** 2023, stakeholders broadened their focus to include the Upper Blanco River, creating the Blanco-Cypress Watershed Protection Plan (BCWPP). This comprehensive effort addresses urgent concerns about water quality and sustained flows in the face of population growth and prolonged drought. Hays County, the city of Wimberley, the city of Woodcreek, the Watershed Association, and Texas State University's Meadows Center formed an interlocal agreement to maintain water monitoring through



the Clean Rivers Program and support a full-time Watershed Coordinator who leads initiatives in groundwater conservation, sustainable development, and stakeholder engagement.

In 2024, the BCWPP achieved key milestones, including the adoption of One Water resolutions by the cities of Wimberley and Woodcreek; educational outreach: and conservationfocused development. Projects such as the water-efficient expansion of the Wimberley Valley Library and the groundbreaking One Water Blue Hole Primary School have set new standards for sustainable infrastructure. Community programs, partnerships with conservation organizations, and robust water monitoring via the Clean Rivers Program, Wimberley Water Advisory Group, and Texas Stream Team community scientists have all supported policy-making and responsible watershed management. Looking ahead to 2025, priorities include stormwater planning, alternative water sourcing, improved public data access, and securing long-term funding-all reinforcing the BCWPP's mission to protect water resources through collaboration, innovation, and stewardship.

Delaney Hankins and Jonas Rosenthal measuring flow in Cypress Creek

BASIN OVERVIEW MAP





2024 TEXAS INTEGRATED REPORT OF SURFACE WATER QUALITY

TCEQ performs ongoing assessments of the water quality in all of the classified and many of the unclassified water bodies in the state of Texas that have sufficient monitoring data. Every two years, TCEQ completes a report detailing the results of these assessments that describe the designated uses and level of support for every water body assessed. The results of these assessments are used by TCEQ to determine if a water body will be listed on the 303(d) list of impaired water bodies. Table 1 identifies all water quality impairments and concerns TCEQ identified for the Guadalupe River Basin in the 2024 Texas Integrated Report. Highlighted segments indicate re-listings as of the 2024 report. These segments were listed as impaired on past Integrated Reports, subsequently delisted, and then relisted on the 2024 Report. Table 2 identifies delisted waterbodies according to the 2024 Texas Integrated Report. For the full 2024 Texas Integrated Report, please refer to the TCEQ website: <u>2024 Texas</u> <u>Integrated Report</u>.

Table 1: Impaired waterbodies in the Guadalupe River Basin according to the 2024 Texas Integrated Report.

Segment	Water Body	Impairment Concern		First Year Listed
1801	Guadalupe River Tidal	Bacteria (Recreation Use)	Nitrate in water	2022
1802	Guadalupe River Below San Antonio River	NA	Nitrate	NA
1803	Guadalupe River Below San Marcos River	NA	Nitrate	NA
1803A	Elm Creek	NA	Bacteria (Recreation Use), Chlorophyll-a	NA
1803B	Sandies Creek	Bacteria (Recreation Use), Depressed dissolved oxygen	Depressed dissolved oxygen	2002, 1999
1803C	Peach Creek	Bacteria (Recreation Use), Depressed dissolved oxygen	Cholophyll-a, Impaired macrobenthic community, Total phosphorus	2002, 2006
1804	Guadalupe River Below Comal River	Bacteria (Recreation Use)	NA	2020
1804A	Geronimo Creek	Bacteria (Recreation Use)	Nitrate	2006
1804D	Bear Creek	NA	Bacteria (Recreation Use)	NA
1805	Canyon Lake	Mercury in edible tissue	NA	2006
1806	Guadalupe River Above Canyon Lake	Bacteria (Recreation Use)	Impaired fish community, impaired habitat	2002

1807	Coleto Creek	NA	Chlorophyll-a	NA
1808	Lower San Marcos River	NA	Bacteria (Recreation Use)	NA
1810	Plum Creek	Bacteria (Recreation Use)	Impaired fish community, Impaired habitat, Impaired macrobenthic community, Nitrate, Total phosphorus	NA*
1810A	Town Branch	NA	Bacteria (Recreation Use), Depressed dissolved oxygen, Nitrate	NA
1811	Comal River	Bacteria (Recreation Use)	NA	2016
1811A	Dry Comal Creek	Bacteria (Recreation Use)	NA	2010
1814	Upper San Marcos River	Total dissolved solids	NA	2010
1815	Cypress Creek	Depressed dissolved oxygen	Impaired habitat	2020
1816	Johnson Creek	NA	Impaired habitat	NA
1817	North Fork Guadalupe River	Impaired fish community, Impaired macrobenthic community	Impaired habitat	2020
1818	South Fork Guadalupe River	Impaired fish community, Impaired macrobenthic community	Impaired habitat	2020

*Segment 1810 maintains 4b status and is not listed on the 303(d) list

Table 2: Delisted waterbodies in the Guadalupe River Basin according to the 2024 Texas Integrated Report.

Segment	Water Body	Impairment
1803A	Elm Creek	Depressed dissolved oxygen
1803B	Sandies Creek	Depressed dissolved oxygen
1806A	Camp Meeting Creek	Bacteria

COMAL RIVER WATERSHED SUMMARY



COMAL RIVER WATERSHED

Segment 1811 - Comal River Segment 1811A - Dry Comal Creek



Fountain Darter

Segment Summary

The Comal River (1811) is the shortest river in the state of Texas, at just 2.5 miles-long, and is located entirely within the city limits of New Braunfels in Comal County. This river is fed by Comal Springs, the largest natural spring in Texas based on average discharge. The springs draw water from the Edwards Aquifer, a large limestone karst aquifer that spans 11 counties in the south-central region of Texas.. Due to the influence of the springs, the Comal River typically experiences high clarity and a consistent water temperature of roughly 72* Fahrenheit throughout the year. Dark loamy to clay soil and limestone substrate are typical in this watershed. The Comal River provides habitat for several endangered species including the Fountain Darter (*Etheostoma fonticola*), Comal Springs Riffle Beetle (*Heterelmis comalensis*), Comal Springs Dryopid Beetle (*Stygoparnus comalensis*), and the Peck's Cave Amphipod (*Stygobromus pecki*).

Dry Comal Creek (1811A) is a 34.8-mile-long tributary of the Comal River with a 111-square-mile catchment area. This intermittent creek has several pools along its length which are not connected for most of the year. This watershed has historically been rural with agricultural and industrial uses, however urban development is growing in the area.



Comal Springs



The U.S. Drought Monitor depicts the location and intensity of drought across the country using 5 classifications: Abnormally Dry (D0), showing areas that may be going into or are coming out of drought, and four levels of drought (D1–D4). The U.S. Drought Monitor is a joint effort of the National Drought Mitigation Center, U.S. Department of Agriculture, and National Oceanic and Atmospheric Administration. Source(s): NDMC, NOAA, USDA

Source(s): NDMC, NOAA, USDA Data Valid: 01/07/25

Drought.gov

Figure 1: Drought Conditions in Comal County

Drought conditions have persisted in Comal County over the past several years. As of this report, 100% of Comal County is experiencing drought conditions, and over 98% of the county is experiencing extreme drought conditions (Figure 1). Comal Springs has a mean discharge of roughly 300 cubic feet per second (cfs) over the period of record; however, drought conditions have led to reduced flow levels. The mean annual discharge from Comal Springs was 356.7 cfs in 2019, decreasing to 123.6 cfs in 2024. With La Nina conditions favored through the next several months, drought conditions are expected to persist.



Comal River at Hinman Island Park

The Comal River has become an extremely popular destination for river tubing, drawing an estimated 300,000 – 400,000 tourists each year from Memorial Day through Labor Day. This heavy recreational use resulted in intense litter pollution in the river's downstream portion, negatively impacting water quality and the ecosystem. This led the city to pass an ordinance banning single use food and beverage containers on the river in 2012. This ban is still in effect and has led to a dramatic decrease in litter pollution in the river.

The Comal River watershed lies within the rapidly expanding Interstate 35 corridor and also contains vital aquatic habitat; as a result, this watershed is home to a diverse group of stakeholders including river outfitters and local businesses, housing developers, local governments, and state agencies. Several large housing developments and master planned communities are currently in progress to accommodate the growth in the area, including the 2,400 acre Veramendi development which drains into the Blieders Creek portion of the watershed. At full buildout, Veramendi will include multifamily units, more than 5,000 homes, multiple schools, and 500 acres of green space, as well as a town center with shops and dining, and a riverfront resort. In 2020, the Veramendi development also broke ground on a regional flood control dam project. The 800-foot long, 35-foot tall structure has the capacity to hold back 200 million cubic feet during a storm event.

The maps below show the increase in population in Comal County from 2010 to 2020. The rising population in Comal County, which has grown by nearly 80,000 over the past decade and is projected to increase by another 45,000 within five years, has amplified water demands for residential, commercial, and agricultural uses. This growth, coupled with recurring drought conditions, due in part to several years of less than average annual rainfall, underscores the urgent need for robust water management policies to ensure the long-term sustainability of vital resources.



Figure 2: Comal River Watershed Population Change from 2010 to 2020

IMPAIRMENTS AND DATA ANALYSIS

Dry Comal Creek and the lower portion of the Comal River (Assessment Unit 1811_01) have been impaired for bacteria since 2010 and 2016, respectively. In 2014, the City of New Braunfels secured Clean Water Act 319 funding to develop a Watershed Protection Plan (WPP) for Dry Comal Creek and the Comal River to address this impairment. Load duration curves for this watershed recommend a 50% reduction in bacteria loading on the Comal River and a 34% reduction on Dry Comal Creek. A bacterial source tracking study was subsequently performed; results showed that the majority of bacteria in both waterbodies came from wildlife like deer and non-native waterfowl, with smaller additional contributions from livestock, pets, and humans. Following the study, the City of New Braunfels began implementing best management practices (BMPs) in an attempt to reduce bacteria loading.

Those BMPs include a city ordinance banning the feeding of wildlife, campaigns to educate residents on the importance of picking up pet waste, and the removal of wildlife feces in targeted locations near the river. More information on the WPP and the City's other efforts to improve water quality can be found on page 15 of this report.

The Comal River is divided into two Assessment Units (AUs), 1811_01 and 1811_02. GBRA monitors the Comal River at one station in each AU, and at one station on Dry Comal Creek. Table 3 below summarizes assessment results from the 2024 Texas Integrated Report. 1811_01 and 1811A_01 continue to be impaired for *E. coli*. Eighty-two samples were collected at each station during the assessment period; their geometric means were 161.04 MPN and 456.46 MPN respectively, exceeding the assessment criteria of 126 MPN.

Station ID	Assessment Unit	Dissolved Oxygen	Biologicals	Bacteria	Temperature	Nutrients	Chlorophyll-a	
15082	1811_02	М	М	М	М	М	М	
12653	1811_01	М	М	I	М	М	М	
12570	1811A_01	М	М	I	М	М	М	

Table 3: Summary of the 2024 Texas Integrated Report / Segments 1811 & 1811A

M - Meets water quality standard

I - Impaired for water quality standard

Water quality data used for trend analyses were obtained from the TCEQ's Surface Water Quality Monitoring Information System. Data from January 1, 2014 through December 31, 2024 were included in the analysis. Data were divided by station and then by parameter. Datasets were evaluated for normality, and a log10 base transformation was added prior to the analysis for E. coli because this dataset was positively skewed with outliers. A logarithm-based transformation is the most commonly used transformation for analyses related to water resources and is often used to address issues with positively skewed data (Helsel et al. 2020). In the 2023 Basin Summary Report, data analysis showed decreasing trends in sulfate and dissolved oxygen, and an increasing trend in nitrate. Data used in that analysis were from September 1, 2012, through August 31, 2022. In the updated data set used in this report, no statistically significant trends were identified. An in depth review of the E. coli data analysis performed will be described here.

A multiple linear regression analysis was used to determine whether Log *E. coli* was changing over time. This analysis was used because it can determine the effects of *E. coli* over time after adjusting for total suspended solids and flow, which can also influence *E. coli* levels. Increased total suspended solids can influence *E. coli* levels in the water column because bacteria such as *E. coli* often adhere to solid particles suspended in water. Flow may also influence *E. coli* levels in two disparate ways; either decreasing *E. coli* levels by dilution resulting from streamflow increases associated with rainfall, or more commonly, increasing *E. coli* levels due to contaminants in runoff.

Multiple regression analysis results can be analyzed for significance by evaluating what is known as a "p-value". The lower the p-value, the greater the statistical significance of the observed difference. A critical p-value of 0.05 was used for these analyses. If the p-value for time was less than 0.05, then E. coli was determined to have changed significantly over time. Regression analyses indicated that total suspended solids and/or flow were significantly correlated with log E. coli at all sites (i.e. P-value<0.05) (Table 4). In regard to whether or not log E. coli values changed over time, P-values (0.900, 0.080, and 0.187) at the three sites were much higher than the 0.05 threshold, indicating that log E. coli did not change significantly over time at any of the sites (Figure 3). Continued monitoring and data analysis is valuable so that assessments such as this can be made to track trends and inform the direction of future management efforts.

Station	Overall F-value	Overall model p-value	Flow t-value	Flow p-value	TSS t-value	TSS p-value	Time t-value	Time p-value
12570	F(3,123)=19.15	<0.001	1.09	0.277	6.10	<0.001	0.126	0.900
12653	F(3,126)=21.88	<0.001	-3.16	0.002	5.97	<0.001	1.77	0.080
15082	F(3.123)=3.36	0.021	-2.677	0.008	1.096	0.275	-1.326	0.187

Table 4: Results of Multiple Linear Regressions for three stations in the Comal River Basin



Figure 3: Log. E. coli over time for 3 stations 12570, 12653, and 15082. The blue solid regression line is adjusted to account for effects from flow and TSS, which can influence E. coli levels. Multiple linear regressions indicated that log E. coli was not significantly changing over time for any of the sites (Dry Comal: Standard error <0.001, t value (3,123) = 0.126, p=0.900; Comal at Hinman: Standard error <0.001, t value (3,126) = 1.766, p=0.080; Comal River at Landa Park: Standard error <0.001, t value (3,123) = -1.326, p=0.187).

Literature Cited: Helsel, D.R., Hirsch, R.M., Ryberg, K.R., Archfield, S.A., and Gilroy, E.J., 2020, Statistical methods in water resources: U.S. Geological Survey Techniques and Methods, book 4, chap. A3, 458 p., https://doi.org/10.3133/tm4a3. R Core Team, 2021. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

CITY OF NEW BRAUNFELS WATERSHED MANAGEMENT EFFORTS

The City of New Braunfels is dedicated to 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 (MS4 stormwater program) and the Edwards Aquifer Habitat Conservation Plan.

As part of the Dry Comal Creek and Comal River WPP, the City implements bacteria management measures to reduce bacteria loading to these waterbodies. These efforts include, but are not limited to, outreach and education, stormwater management, and management of urban and nonnative wildlife. Specific activities that have been conducted as part of the WPP in 2023 and 2024 include:

- Digital Outreach Campaign The City of New Braunfels has elected to utilize several avenues of digital advertising to broadcast the educational messaging to the public. These efforts include:
 - Digital and printed quarterpage infographics published in the Herald-Zeitung and informational banners displayed on the Herald-Zeitung website;
 - Digital and printed half-page infographics published in the New Braunfels edition of the

Community Impact publication;

- A WPP video presented to the public as a video played prior to movies in two local theaters as well as a sponsored advertisement on YouTube that is presented to viewers between their selected videos;
- Sponsored posts and advertisements on Facebook utilizing infographics and text captions designed specifically for use on social media platforms;
- Search engine advertisement using Google Ads; this service provides viewers with specific links to WPP information when they search for terms such as 'tubing'or'Comal River'and their mobile device is located in the New Braunfels area.
- In-pipe Filtration of Stormwater -The City of New Braunfels finalized the design phase of an in-pipe stormwater filtration system to be tested as a pilot study. The city plans to install an in-line filtration system within an existing underground stormwater channel. The filtration system is designed to intercept the first flush of stormwater during a rain event to assist in removal of bacteria from the stormwater. This will be the first time the City of New Braunfels has implemented such a system. The City will be performing upstream and downstream water

quality monitoring to determine the effectiveness of the filtration system and if this type of technology would be a suitable fit for other locations. Construction of the filtration system is scheduled for early 2025 with water quality monitoring to follow. Two existing bioretention basins will also receive the same upstream and downstream water quality monitoring to gather additional information on the efficacy of those filtration systems as well.

White-tailed Deer Population Survey

 Early bacteria source tracking
 preformed during the planning phase
 of the WPP found that 60% - 75%
 of the bacteria found originated
 from the waste of wildlife. This
 knowledge, compounded with
 numerous reports from across the
 city of vehicle and property damages
 caused by white-tailed deer, has
 prompted the city of New Braunfels
 to further investigate the population
 of the deer in the New Braunfels
 urban area. The City worked with
 a team of wildlife biologists to

perform a detailed survey of the deer population. This population survey is intended to be repeated each year to quantify the urban population and influence the future decisions for the viability of management of the urban herd.

The City intends to continue efforts to implement 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.newbraunfels.gov/wpp.

The City also actively manages other forms of waste that makes its way to the rivers. Contractors are hired by the City with the sole purpose of removing solid waste left behind by animals from the banks of some of the parks along the Comal and Guadalupe Rivers. The City hosts an annual river and watershed cleanup called the Dos Rios Watershed Cleanup with the aim to bring residents to the rivers and parks to help remove litter from the green spaces within the city and to promote



Yellow-Crowned Night Heron at Comal Springs



Dos Rios Volunteers

positive stewardship of our natural resources. During the Dos Rios event in October 2024, over 300 volunteers removed approximately 1200 pounds of litter.

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:

- Education and outreach for topics such as illegal dumping, pet waste removal, and mindful use of items that typically contribute to nonpoint source pollution such as fertilizers and pesticides;
- 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 originating from cityowned facilities and capital improvement projects;

More information of the City's MS4 program and Stormwater Management Plan activities can be found on the City's website at <u>www.newbraunfels.</u> <u>gov/ms4.</u>

The City also continues to participate in the Edwards Aquifer Habitat Conservation Plan (EAHCP) that includes the implementation of spring flow 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 (Plecostamus sp.) and nutria;

 Design and construction of stormwater treatment facilities (i.e. - bioretention basins) within the Comal River watershed. As New Braunfels continues to grow and flourish, the City plans to maintain its efforts to improve the quality of our water resources. City leadership understands the importance in the continued effort to reduce nonpoint source pollution throughout the city and will promote water quality initiatives and programs that will best serve the community. Come visit the Comal and Guadalupe Rivers in New Braunfels and see first-hand the beauty and vigor these rivers bring to the community.



City Tube Chute in New Braunfels, Texas.

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

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Guadalupe-Blanco River Authority

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