2024 Update to the

Plum Creek Watershed Protection Plan

Prepared by the
Plum Creek Watershed Partnership

http://plumcreekwatershed.org

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List of Acronyms

ALM	Aquatic Life Monitoring
AU	Assessment Unit
BST	Bacterial Source Tracking
CRP	Clean Rivers Program
CTFHTF	Central Texas Feral Hog Task Force
CWA	Clean Water Act
EPA	Environmental Protection Agency
GBRA	Guadalupe-Blanco River Authority
GBRT	Guadalupe-Blanco River Trust
IR	Integrated Report
MPN	Most Probable Number
NRCS	Natural Resource Conservation Service
OSSF	On-Site Sewage Facilities
PCPT	Plum Creek Page Turners
PCS	Plum Creek Stewards
PCW	Plum Creek Watershed
SWCD	Soil and Water Conservation District
TCEQ	Texas Commission on Environmental Quality
TMDL	Total Maximum Daily Load
TPDES	Texas Pollutant Discharge Elimination System
TSSWCB	Texas State Soil and Water Conservation Board
TST	Texas Stream Team
TWDB	Texas Water Development Board
TXDOT	Texas Department of Transportation
USDA	United States Department of Agriculture
WC	Watershed Coordinator
WPP	Watershed Protection Plan
WQMP	Water Quality Management Plans
WWTP	Wastewater Treatment Plant

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Overview

The 2024 Update to the Plum Creek Watershed Protection Plan (Update) details current events during the reporting period, October 2021 to October 2023. The Update also provides an analysis of water quality trends from June 2013 to June 2023, as well as changes during the reporting period. Data are collected monthly from seven sites, which include three sites on the main branch of Plum Creek and four sites on tributaries (Figure 1). In addition, data are collected on a targeted basis (twice per season, once under wet and once under dry conditions) at 30 sites across the watershed, which include nine sites on the main branch, three springs, and 18 sites on tributaries.

Despite the pandemic and the challenges since that time, the Plum Creek Watershed Partnership (Partnership) remains active. Quarterly meetings were held throughout the reporting period. In November 2022, Sean Melvin, was hired as the new Watershed Coordinator. Another new hire was Ashley Massie as the Caldwell-Travis Soil and Water Conservation District Technician.

This 2024 Update to the Watershed Protection Plan (WPP) functions as:

- a comprehensive progress report on efforts to implement the Plum Creek WPP since its initial release with a primary focus on activities and updates from October 2021 to October 2023, with water quality data through June 2023;
- a modification to the goals and strategies identified in the WPP; and
- an analysis of collected water quality data to ascertain interim progress in achieving water quality restoration goals.

Progress Toward Implementation Milestones

The Partnership began implementation of the Plum Creek WPP in February 2008 to guide the restoration and protection of water quality in Plum Creek and its tributaries with a 10-year initial project period. To support the implementation of the WPP, in 2011 an Interlocal Agreement was signed by 12 project partners and provided matching funds or in-kind services for a CWA §319(h) grant to support a Plum Creek Watershed Coordinator (WC) responsible for continued implementation of the WPP. The presence of a local WC was desired by the Partnership to enhance stakeholder participation in watershed projects, as well as to better understand and respond to the evolving needs and interests of local communities. The Interlocal Agreement was renewed by all partners in 2018 and a CWA §319(h) grant was secured to continue funding for the WC and WPP implementation through 2025.

Effective watershed management requires a long-term commitment to stewardship of the natural resources that characterize a watershed coupled with the adoption of adaptive management practices, which fit within the socioeconomic dynamics of the local communities. It is the people—not the plan—that will ultimately determine the success or failure of watershed goals. Systematic re-evaluation of prescribed management measures throughout the watershed is imperative. To maintain the greatest likelihood of success, the development, implementation, and revision of best management practices must consider both historic and newly acquired data along with observed social and ecological trends in the watershed.

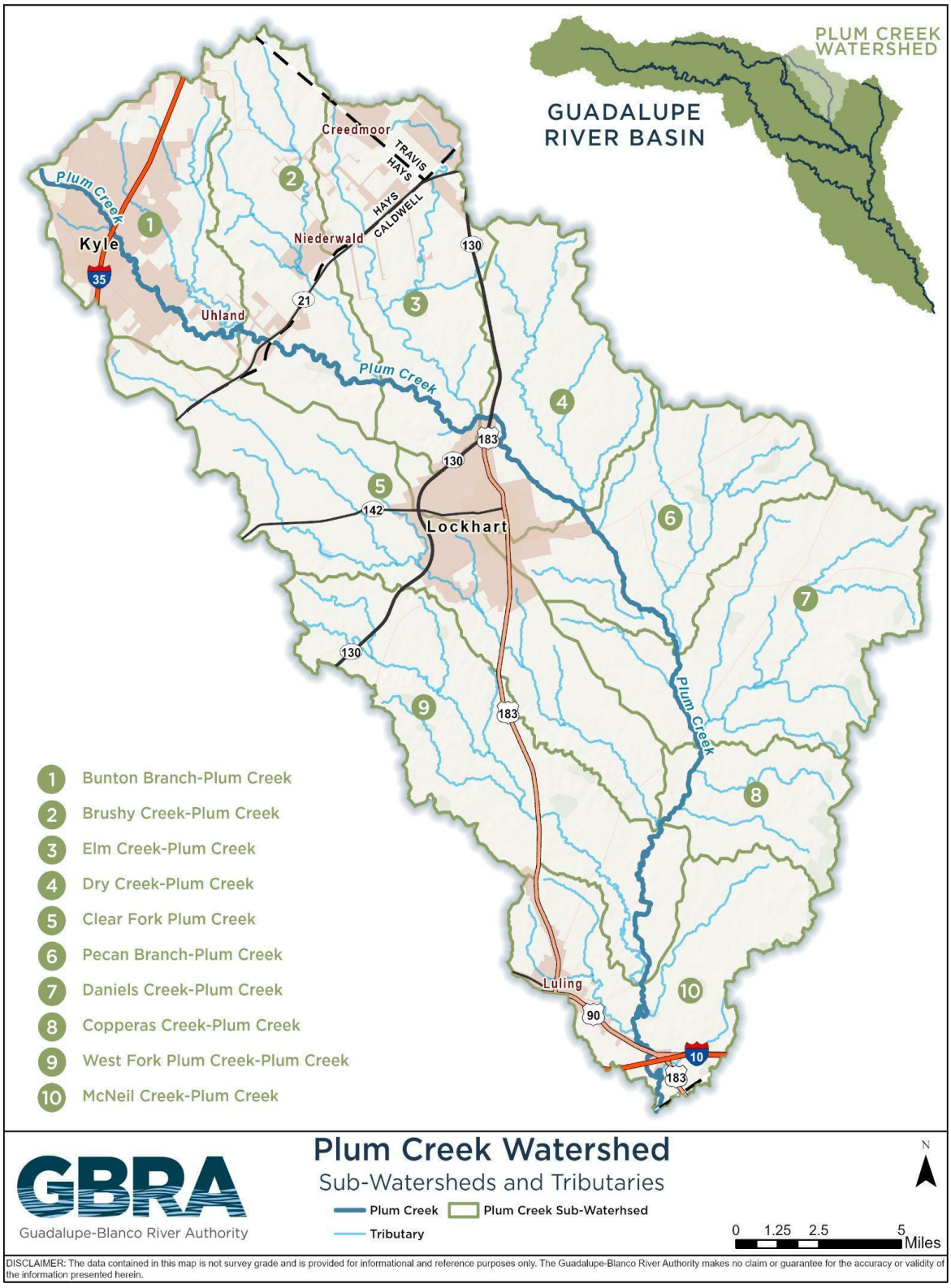

Figure 1. Plum Creek Watershed and Sub-watersheds

Land Use Change

Large portions of the Plum Creek Watershed (PCW) have been transformed by the construction of State Highway 130 and exponential residential and commercial growth along the IH-35 Corridor (Figure 2). Urban land use was up by 3.9%, for a current total of almost 11% of area developed. With the 2017 Agriculture Census, small farms were trending up in the watershed. These land use changes may be reflected in Figures 2-3 and Table 1 – as the percentage of Pasture/hay and Grasslands have both increased and decreased, respectively, denoting a changing landscape of the rural environment. Forest cover has also decreased by 9%. Urbanization is expected to continue to increase. Land use and land cover changes significantly affect the implementation of several management strategies identified in the WPP. Acknowledging and understanding changes in land use and environmental fluctuations in the PCW is essential for determining the adaptive management strategies that will enable continued progress toward the achievement of WPP goals and objectives.

Table 1. Land use changes in the Plum Creek Watershed by class

Land Use Class	2008 WPP (2004 data)	2019 Data	2021 Data
Urban	7%	10.4%	10.9%
Cultivated Crops	11%	11%	10.5%
Forest	24%	15%	15%
Pasture/Hay	17%	33.8%	33.5%
Grasslands/Scrub	38%	25.8%	26%

Urban Stormwater Management

Rapid urban development has continued in the PCW throughout the reporting period once again. Using data from 2001 to 2019, a land use change analysis shows Urbanization increased by 3.9% —or 12 square miles (Figure 2-3 and Table 1). Overall, 10.9% of the watershed is considered to be Urban. While the estimated percentage of impervious cover in "Urban" areas can vary, with low density residential development averaging 12% impervious cover, high density residential developments having 40% and roads and parking lots typically having 100% impervious cover The water quality of a stream is likely to be impaired when just 10% of the watershed is impervious cover and a watershed with 25% impervious cover is likely unable to support aquatic life (Center for Watershed Protection). With residential, commercial, and infrastructure expansion and development, impervious cover continues to spread across the watershed with a concentration near the headwaters.

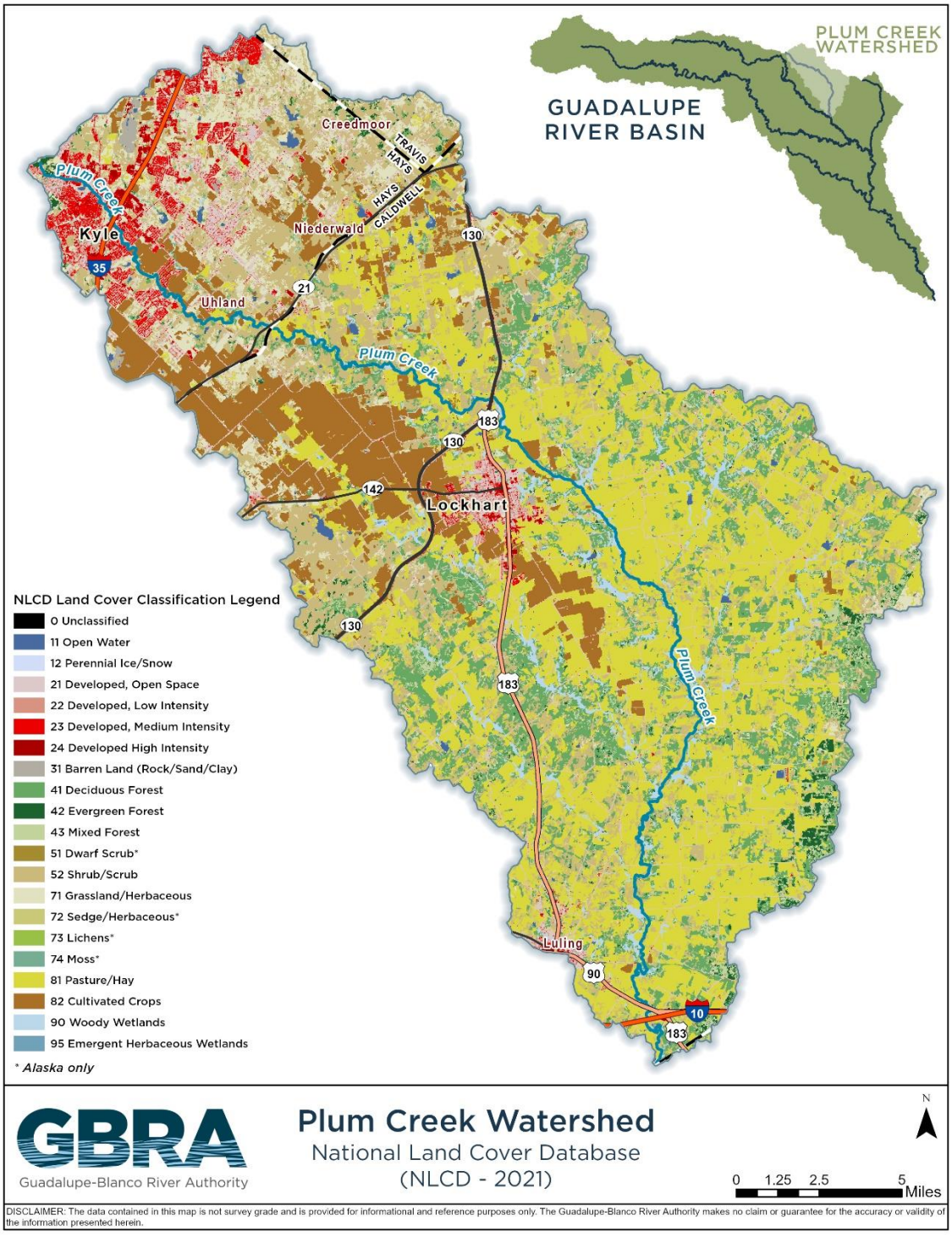

Figure 2. Land use change in Plum Creek Watershed

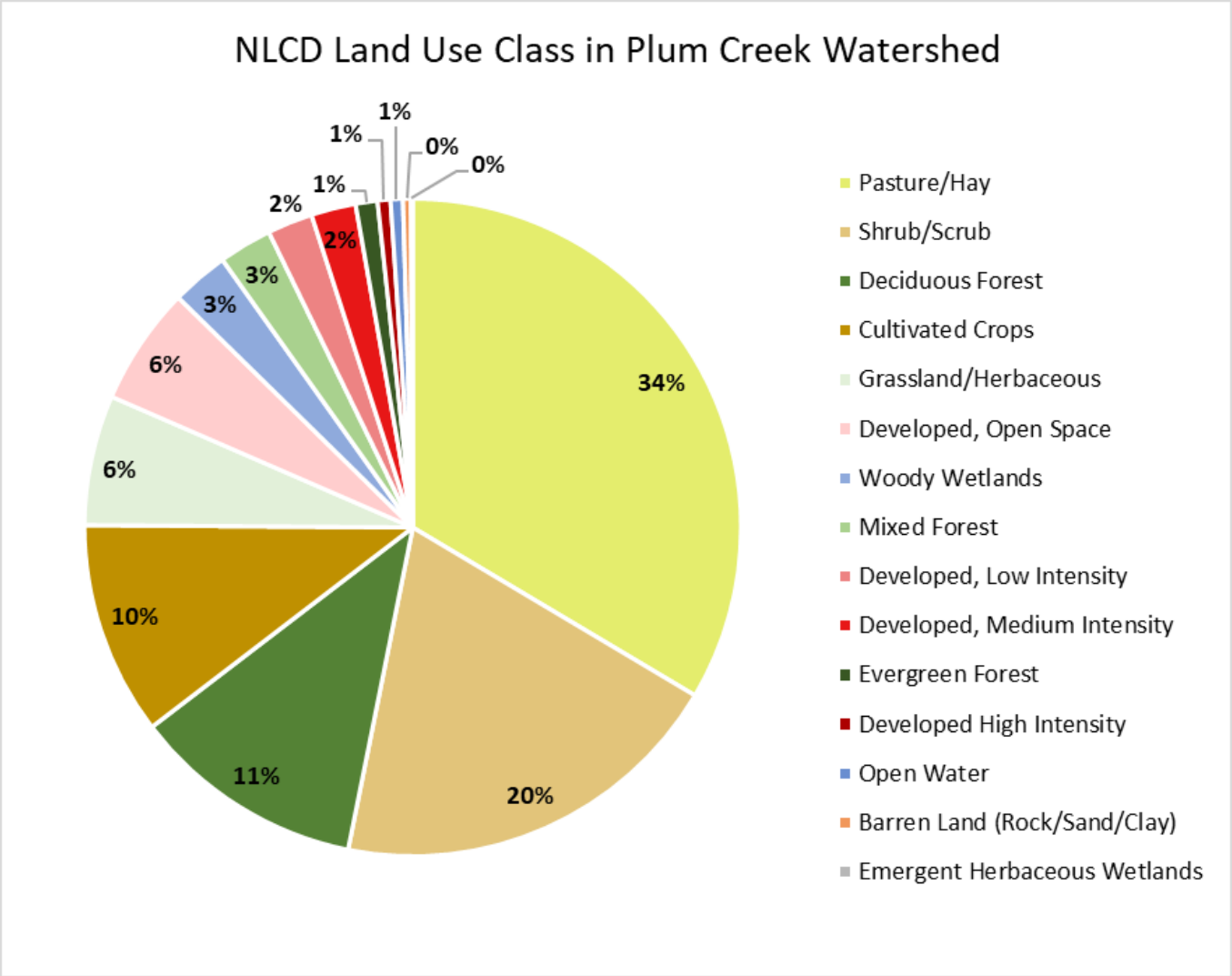

Figure 3. Land use by percent National Land Cover Database Class

Increased urbanization and impervious cover are the results of extreme population growth. As detailed in Table 2, population has increased over 200%in the watershed. A majority of the growth occured in the headwaters and upper reaches of Plum Creek. Specifically, the City of Kyle experienced exponential population growth (760%) from 2000 to 2020 as identified by the U.S. Census Bureau (Table 2). As such, sprawl encroaches, and rapid expansion of urban centers causes storm and wastewater infrastructure to struggle to maintain pace, greatly increasing the risk of significant water quality degradation. Figure 4 highlights this rapid expansion of urban centers from 2010 to 2020 (Figure 41 in the appendix shows this change over time). The Partnership recommends continued implementation of best management practices for low impact development in rapidly urbanizing areas.

Table 2. Population of incorporated cities completely or partially within the Plum Creek Watershed

City	2000 Census	2010 Census	% Change	2020 Census	% Change from 2010	% Change from 2000
Buda	2,404	7,295	203%	15,108	107%	528%
Kyle	5,314	28,016	427%	45,697	158%	760%
Uhland	386	1,014	163%	1,588	177%	311%
Lockhart	11,615	12,698	9%	14,379	755%	24%
Luling	5,080	5,411	7%	5,599	2878%	10%
Martindale	953	1,116	17%	1,235	938%	30%
Mountain City	671	648	-3%	622	-2492%	-7%
Mustang Ridge	785	861	10%	944	1037%	20%
Niederwald	584	565	-3%	668	549%	14%
Total	27,792	57,624	107%	85,840	204%	209%

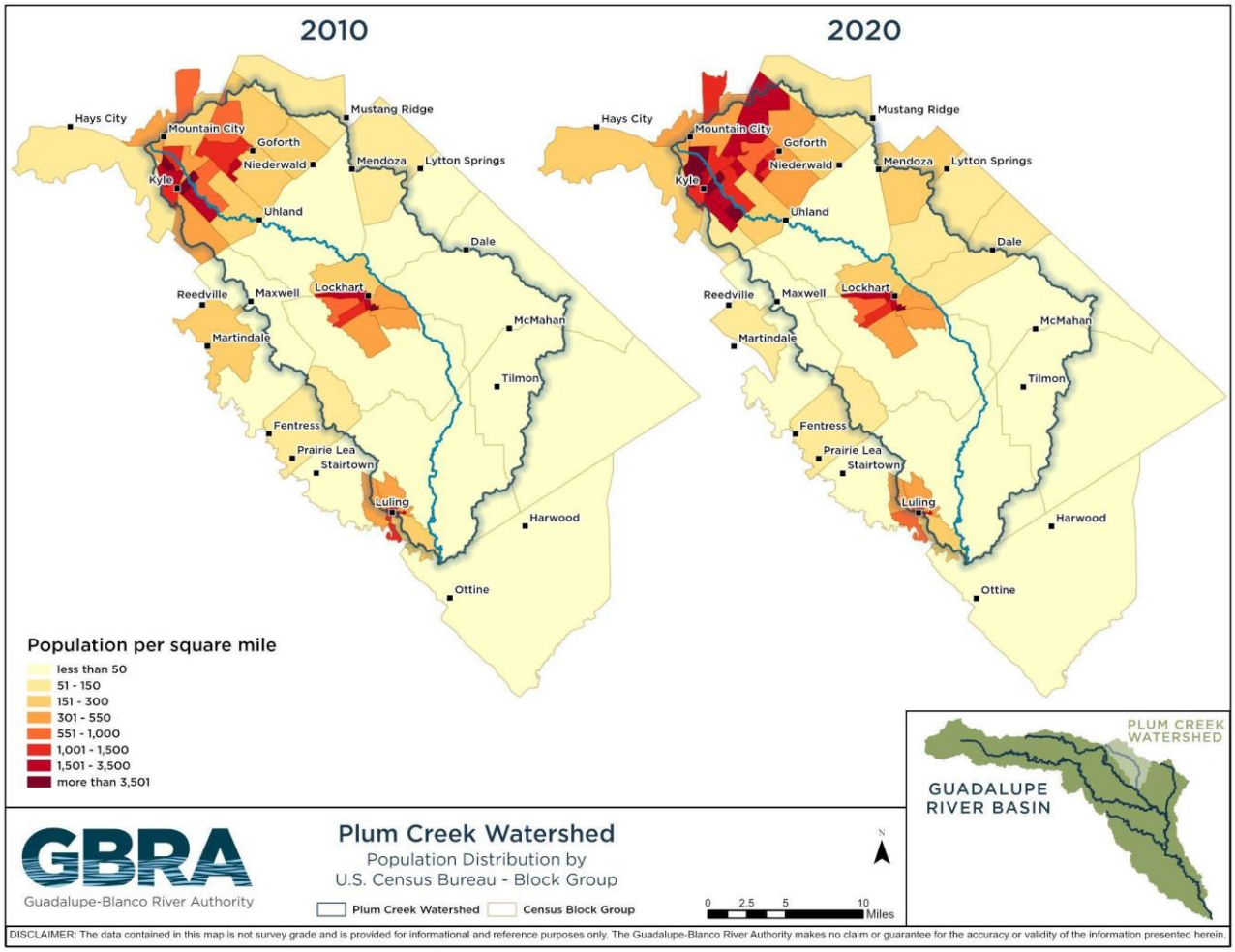

Figure 4. Population density by Census Group Block within watershed

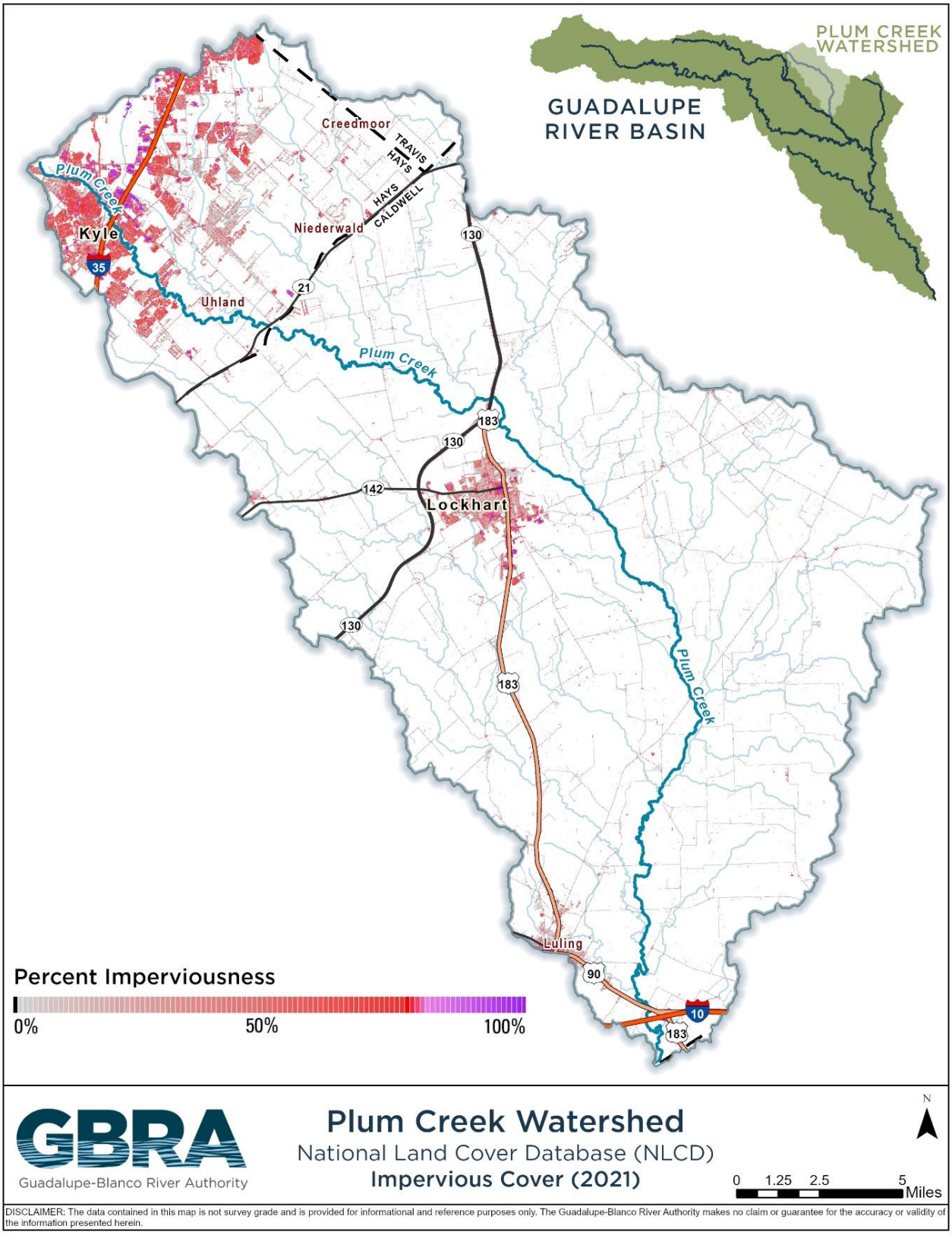

Figure 5. Percent of impervious cover

Pet Waste

Pet waste is generally considered dog waste left on the ground. With an increase in population, the number of dogs and dog waste in the watershed is also expected to increase. The Bacterial Source Tracking Study (BST) of 2018 found that domestic animals were responsible for 32% of *E. coli* sources (2020 Update, pg. 13). While the amount of bacteria is problematic, dog waste also contains nutrients that negatively impact the watershed. The Center for Watershed Protection found pet waste programs to be the "most cost-effective management practice for reducing nutrients in runoff" when compared to bioswales and pond retrofits.

Figure 6. Examples of pet waste stations: Bunton Creek Park (Kyle), Dr. Eugene Clark Library (Lockhart), and Downtown (Lockhart)

Pet waste programs are active throughout the watershed. The City of Kyle has approximately 10 pet waste stations in city-maintained public areas. The City of Buda has 21 Pet Waste Stations available. Lockhart added 2 new stations during the reporting period, for a total of 15. Also, during the last reporting period, Uhland installed their first pet waste station at a public park. The Partnership recommends that, in addition to pet waste stations, pet waste campaigns should occur frequently throughout the Watershed. Additionally, many new apartment developments within the watershed have included pet waste stations for their residents, but there has been no official count of these stations.

Wastewater Management

Several new developments in wastewater management have occurred in the last two years from improvements to treatment to new discharge permits. Two improvements to wastewater treatment and infrastructure are discussed. Additionally, new and pending discharge permits in the PCW are displayed in Table 3.

City of Buda Improvements

The City of Buda's Wastewater Treatment Plant (WWTP), which is managed by the Guadalupe-Blanco River Authority (GBRA), was expanded from 1.5 million gallons per day (MGD) to 3.5 MGD in late 2022. The expansion was needed to provide service to the City's rapidly growing customer base. The project more than doubled the daily capacity and represents the maximum capacity at the current location. The project also included the installation of approximately 6,000 linear feet of a 20" force main that will carry the treated discharge to the Plum Creek basin (City of Buda Capital Improvements Plan 2018-2022, pg. 24). Average discharge from this WWTF for the reporting period was roughly 2.14 MGD (Table 4).

Figure 7. Example of a WWTP provided in the City of Buda Capital Improvements Plan 2018- 2022, pg. 24.

City of Kyle Improvements

The City of Kyle owns and operates the Kyle WWTP, which was purchased from Aqua Texas in 2015. The existing WWTP has a rated capacity of 3.0 MGD, which discharges directly into Plum Creek. However, the WWTP saw an average daily flow exceeding its current permitted capacity by over 75 percent for more than five non-consecutive months within this reporting period.

In response, the City initiated engineering and financial planning for expansion of the plant per Texas Administrative Code (TAC), 30 TAC§305.126(a). The City of Kyle completed the first phase of expansion and improvements to their WWTP and has begun plans for the next phase of expansion.
The first phase of the Kyle WWTP expansion project increased the plant's capacity from 3.0 to 4.5 MGD. The over $33 million expansion project included a new operations building, headworks (screening and influent pumping), secondary treatment (aeration splitter box, aeration basins, and secondary clarifiers), tertiary treatment (aerobic digesters and Ultraviolet disinfection), and solids management (digestion) facilities to meet the 4.5 MGD permit (Wastewater Treatment Plant Expansion 2021). Since then, the City of Kyle has begun plans to expand the WWTP's capacity in two phases from 4.5 MGD to 12 MGD in response to a growing population. The first phase of this new expansion will increase the plant's capacity to 9.0 MGD by 2027. The City of Kyle has applied for an updated wastewater discharge permit with TCEQ, which is still pending as of this Update.

Figure 8. Progress of Kyle's WWTP expansion (2021).

Table 3. Current and pending wastewater permits in the Plum Creek Watershed

Facility Name WQ Permit # Expiration Date	Disinfection	Max Flow	CBOD Daily Avg 7-Day Avg Daily Max Single Grab Monitoring	DO	TSS Daily Avg 7-Day Avg Daily Max Single Grab Monitoring	Ammonia Nitrogen Daily Avg 7-Day Avg Daily Max Single Grab Monitoring	*E. coli* Daily Avg Daily Max Monitoring	Total Phosphorus Daily Avg 7-Day Avg Daily Max Single Grab Monitoring
Current Permits								
Kyle WQ0011041002 10/06/2023	UV	4.5	10 15 25 35 Two/week	5.0 Two/week	15 25 40 60 Two/week	2 5 10 15 Two/week	126 399 One/week	Parameter not measured
Lockhart #2 WQ0010210002 07/30/2025	UV	1.5	10 15 25 35 Two/week	5.0 Two/week	15 25 40 60 Two/week	3 6 10 15 Two/week	126 399 One/day	Parameter not measured
Lockhart #1 WQ001020001 04/15/2025	Chlorine	1.1	10 15 25 35 Two/week	5.0 Two/week	15 25 40 60 Two/week	3 6 10 15 Two/week	126 399 One/day	Parameter not measured
Buda WQ0011060001 12/21/2025	Chlorine	3.5	5 10 20 30 Two/week	6.0 Two/week	5 10 20 30 Two/week	1.1 5 10 15 Two/week	126 399 One/week	0.5 2 4 6 Two/week
Luling – North WQ0010582002 03/18/2025	Chlorine	0.9	10 15 25 35 One/week	5.0 One/week	15 25 40 60 One/week	3 6 10 15 One/week	126 399 Two/month	Blank
Ranch at Clear Fork Creek WQ0014439001 05/08/2025	Chlorine	0.7	10 15 25 35 One/week	4.0 One/week	15 25 40 60 One/week	2 5 10 15 One/week	126 399 Two/month	Blank
Railyard WQ0014060001 03/03/2025	Chlorine	0.12375	10 15 25 35 One/week	4.0 One/week	15 25 40 60 One/Week	3 6 10 15 One/week	126 399 One/month	Blank
GoForth WQ0013293001 03/17/2025	Chlorine	0.0424	10 15 25 35 One/week	4.0 One/week	15 25 40 60 One/week	3 6 10 15 One/week	126 399 One/week	Blank
Sunfield MUD/GBRA WQ0014377001 08/26/2024	Chlorine	4.0	5 10 20 30 One/week	5.0 One/week	5 10 20 30 One/week	1.7 4 10 15 One/week	126 399 Twice/month	0.5 1 2 3 One/week
North Hays County MUD 1 WQ0014431001 03/03/2025	Chlorine	0.611	5 10 20 30 One/week	5.0 One/week	5 10 20 30 One/week	2 5 10 15 One/week	126 399 Two/month	1 2 4 6 One/week

Table 3. Current and pending wastewater permits in the Plum Creek Watershed

Windy Hill WQ0015478001 05/08/2025	Chlorine	0.68	5 10 20 30 One/week	5.0 One/week	5 10 20 30 One/week	2 5 10 15 One/week	126 399 Two/month	1 2 4 6 One/week
Camino Real WQ0015323001 05/28/2025	Chlorine	0.42	5 10 20 30 One/week	4.0 One/week	5 10 20 30 One/week	2 5 10 15 One/week	126 399 One/month	1 2 4 6 One/week
Caldwell Valley WQ0015064001 10/23/2025	Chlorine	1.55	7 12 22 32 Two/week	6.0 Two/week	15 25 40 60 Two/week	2 5 10 15 Two/week	126 399 One/week	0.5 1 2 3 Two/week
Plum Creek Utility WQ0015635002 08/13/2025	Chlorine	0.15	10 15 25 35 One/week	5.0 One/week	15 25 40 60 One/week	3 6 10 15 One/week	126 399 One/month	1 2 4 6 One/week
McMahan WTF (Aqua WSC) WQ0015045001 08/10/2025	Parameter not measured	0.049	Parameter not measured	Parameter not measured	25 35 45 65 One/week	Parameter not measured	Parameter not measured	Parameter not measured
Dale Pump Station (Aqua WSC) WQ0014033001 03/03/2025	Parameter not measured	0.006	Parameter not measured	Parameter not measured	25 35 45 65 One/week	Parameter not measured	Parameter not measured	Parameter not measured
Dale Well 2A WTF (Aqua WSC) WQ0014033003 03/03/2025	Parameter not measured	0.004	Parameter not measured	Parameter not measured	25 35 45 65 One/week	Parameter not measured	Parameter not measured	Parameter not measured
Brownsboro WTF (Aqua WSC) WQ0014033002 03/03/2025	Parameter not measured	0.003	Parameter not measured	Parameter not measured	25 35 45 65 One/week	Parameter not measured	Parameter not measured	Parameter not measured
Continental Homes WQ0015940001 02/17/2027	Chlorine	0.495	7 12 22 32 One/week	6.0 One/week	15 25 40 60 One/week	2 5 10 15 One/week	126 399 One/month	0.5 1 2 3 One/week
Esperanza Ranch MHC, LLC WQ0016084001 10/14/2027	Chlorine	0.05	5 10 20 30 One/week	4.0 One/week	5 10 20 30 One/week	2 5 10 15 One/week	126 233 One/quarter	1 2 4 6 One/week
Pending Permits								
Studio Estates WQ0015933001 Pending	Chlorine	0.15	10 15 25 35 One/week	4.0 One/week	15 25 40 60 One/week	Parameter not measured	126 399 One/month	Parameter not measured
Kyle - Amendment WQ0011041002 Pending	UV	12.0	5 10 20 30 One/day	5.0 One/day	15 25 40 60 One/day	2 5 10 15 One/day	126 399 One/day	0.5 1 2 3 One/day
Greenwood Ventures LLC WQ0016148001 Pending	Chlorine	0.325	10 15 25 35 One/week	5.0 One/week	15 25 40 60 One/week	2 5 10 15 One/week	126 399 Two/month	1 2 3 4 One/week

Table 3. Current and pending wastewater permits in the Plum Creek Watershed

PHAU Lockhart WQ0016107001 Pending	Chlorine	0.499	10 15 25 35 One/week	4.0 One/week	15 25 40 60 One/week	3 6 10 15 One/week	126 399 One/month	0.5 1 2 3 One/week
Chisholm Hill LP WQ001617701 Pending	Chlorine	0.65	5 10 20 30 One/week	4.0 One/week	5 10 20 30 One/week	2 5 10 15 One/week	126 399 One/month	0.5 1 2 3 One/week
Tack Redwood, Development WQ0016220001 Pending	Chlorine	0.423	5 10 20 30 One/week	4.0 One/week	5 10 20 30 One/week	2 5 10 15 One/week	126 399 One/month	1 2 4 6 One/week
Paloma Meadows WWTP WQ0016293001 Pending	Data unavailable for update							

Plum Creek receives treated wastewater from 24 outfalls that are associated with 19 different Texas Pollutant Discharge Elimination System (TPDES) permits located in the watershed (Figure 9 and Table 3). While there are still eight permits pending, this reporting period shows an increase from the 2022 Update, which stated 23 outfalls with 18 permits. Based on the daily maximum flow allowances from Table 3, Plum Creek has the potential to receive an approximate range of 9.8 to 19.8 million gallons of effluent daily. The Partnership strongly recommends that WWTPs discharging into Plum Creek and its tributaries 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). The Partnership recommends maintaining open communication with WWTPs to achieve optimal treatment levels.

On-Site Sewage Facilities

In addition to increasing amounts of effluent, Plum Creek also receives untreated or poorly treated wastewater generated in rural areas where On-Site Sewage Facilities (OSSF), or septic, maintenance is inadequate. The BST Study revealed human sources, i.e., leaking septic systems, account for approximately 4% of *E. coli* sources in the watershed (2020 Update, pg., 13). For example, the community of Hillside Terrace in the upper watershed suffers from chronic septic failures. For years, the Partnership has worked with Hays County and the City of Buda to find a means to connect the 264-home subdivision to central sewer service. Hillside Terrace is located in Hays County and is in the Buda Extraterritorial Jurisdiction (ETJ). This subdivision has been identified by local citizens and city and county staff as a site of chronically failing septic systems on small lots and is located in a critical subwatershed identified in the watershed planning process as having a high likelihood of impacting water quality. An unnamed tributary of Andrews Branch passes through and drains much of this neighborhood before it flows into Andrews Branch and Porter Creek that meets with Bunton Branch just before entering Plum Creek upstream of the Uhland water quality monitoring site. As of this update, Hays County is continuing to look for ways to fund and promote improvements for county OSSFs for places like Hillside Terrace.

Efforts to enhance wastewater management for private septic systems have seen some noteworthy progress since implementation of the Plum Creek WPP began in 2008. While improved management of septic systems continues to be hampered by limited inspection and enforcement capabilities, state

agencies and local municipalities in the PCW have taken significant steps to provide much needed funding and incentives for the purpose of reducing the potential for pollutant loading from OSSFs. The Partnership also works to educate the public and owners of OSSFs through workshops.

The 2020 Update stated a central database of OSSFs being repaired, replaced, or connected to central sewage treatment facilities was in the works with Hays County Department of Economic Development. However, based on the response to the information requested for this 2024 Update, such information is still not captured by Hays or Caldwell counties. Without a central database on septic information for either county, data were not readily available to understand the scope of septic improvements needed for the WPP implementation. Information on the number of new septic permits was available through Public Records Request. From October 1, 2021 to October 5, 2023, Hays County reported approximately 90 new OSSF permits within the PCW while Caldwell County had approximately 65 new permits in the entire county, which mostly contains the PCW.

Wastewater Effluent Monitoring

Water quality monitoring of WWTPs has continued and progress toward treatment improvements for centralized systems in the watershed has occurred. The Partnership strongly recommends that WWTPs discharging into Plum Creek and its tributaries strive to achieve 5-5-2-1 treatment levels (5 mg/L CBOD, 5 mg/L TSS, 2 mg/L NH3-N/Ammonia-N, 1 mg/L Total Phosphorus). The Partnership suggests that efforts to achieve WPP goals for wastewater management may require additional financial or other incentives to encourage voluntary adoption of higher treatment levels for WWTPs in the PCW. While the implementation of WPP recommendations for WWTPs in the watershed is completely voluntary, TPDES permit limitations and requirements are enforceable under State law. Table 4 details water quality monitoring from seven WWTPs in the watershed (Figure 9).

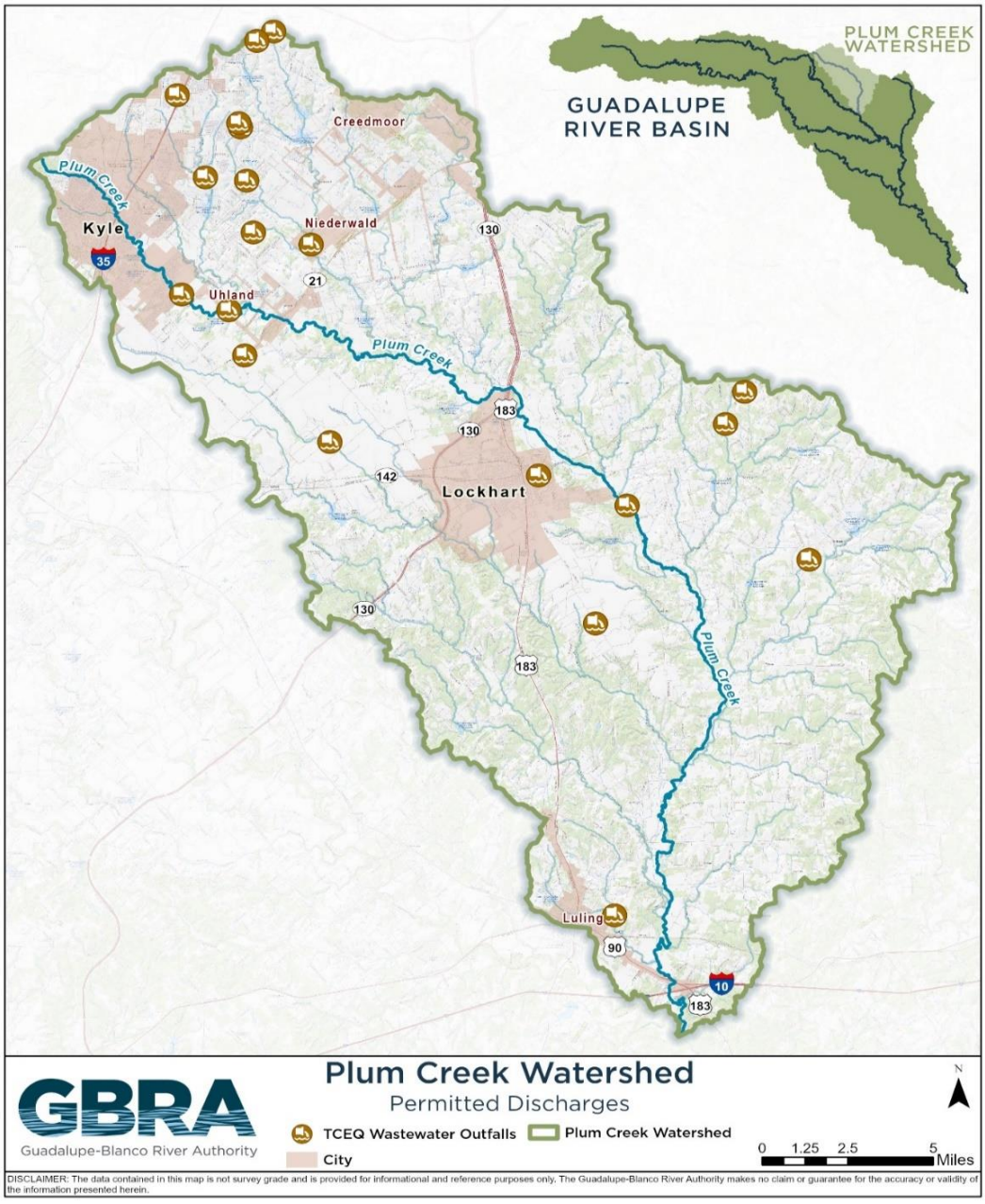

Figure 9. Wastewater outfalls in the Plum Creek Watershed

The Kyle WWTP discharges into Plum Creek just upstream of the Plum Creek at Heidenreich Lane (20484) targeted monitoring station. The Lockhart 1 facility discharges into the Town Branch tributary of Plum Creek, which merges with Plum Creek upstream of the Plum Creek at CR 186 (12648) targeted monitoring station. The Lockhart 2 facility discharges into Plum Creek upstream of the Plum Creek at CR 202 (12647) CRP monitoring station. The Luling North WWTP discharges into the Salt Branch Tributary of Plum Creek before it merges with Plum Creek upstream of the Plum Creek at CR 135 (12640) CRP monitoring station. The Buda WWTP discharges into the Andrew's Branch of Porter Creek, which merges with Plum Creek just upstream of the Plum Creek at Plum Creek Road (17406) CRP monitoring station. The Sunfield and Shadow Creek facilities discharge into the Brushy Creek Tributary of Plum Creek, which merges with Plum Creek just upstream of the Plum Creek at CR 233 targeted monitoring station (12649). Parameters are reported as means (mg/L) unless otherwise indicated. In Table 4, water quality parameters that have an average concentration greater than the Plum Creek WPP recommendation are marked in red. All WWTP sites this reporting period on average had one or more parameters with a concentration greater than the Plum Creek WPP recommended permit limits. Ammonia-N at all sites was on average above the recommended 2 mg/L limit.

Table 4. Wastewater treatment plant water quality monitoring results for the reporting period (exceedance marked in red)

PC WQM	Flow (CFS)	*E. coli* (MPN/100ml)	Dissolved Oxygen	TSS	BOD	CBOD	NH3-N	Total P
20486 Kyle	4.02	152.1	8.4	7.1	3.6	3.3	8.35	3.054
20492 Lockhart 1	0.65	6.1	8.4	2.04	1.9	1.8	20.45	3.466
20494 Lockhart 2	1.88	14.3	8.4	7.19	1.5	1.3	5.73	2.663
20499 Luling	0.06	132.1	7.3	11.52	1.5	1.6	19.9	4.621
99923 Buda	2.14	2	8.1	1.2	1.2	1.3	14.2	0.430
99936 Shadow	0.56	30.35	8.1	0.99	1.1	1.05	33.3	0.493
99937 Sunfield	0.90	25.1	8.2	1.17	1	1.2	11.9	0.454

Agricultural Nonpoint Source Management

The Caldwell-Travis Soil and Water Conservation District (SWCD), in cooperation with the Hays County SWCD, received a TSSWCB CWA §319(h) nonpoint source grant in October 2008 to provide technical assistance for development of TSSWCB-certified Water Quality Management Plans (WQMPs). The grant has continued to be renewed, providing technical assistance and financial incentives to implement certain BMPs prescribed in the WQMPs throughout the reporting period of this WPP Update. The Caldwell-Travis SWCD technician works closely with TSSWCB and USDA-Natural Resources Conservation Service (NRCS) to provide technical assistance to landowners. An update of WQMPs is in Table 13.

Wildlife and Non-Domestic Animal Management

In the State of Texas, feral hogs cause a variety of problems including agricultural damage, predation of livestock, pets, and wildlife, transmission of disease and parasites, and extensive environmental damage. Further, a Bacterial Source Tracking Study (2018) confirmed that wildlife (feral hogs, small mammals, deer, and birds) are a significant source of bacteria and nutrients in the PCW (Figure 10).

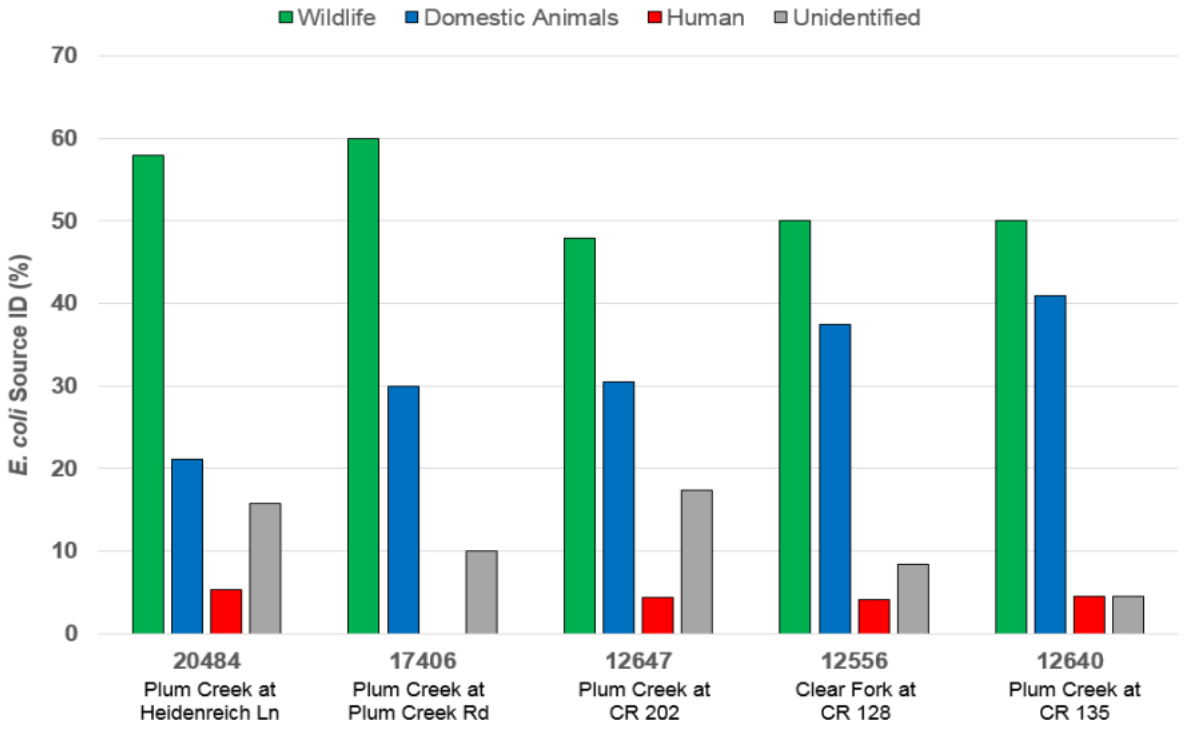

Figure 10. Bacterial Source Tracking Results

Feral Hog Control in the Watershed

Plum Creek Watershed stakeholders have taken on the challenge of controlling feral hog populations directly. As the statewide feral hog population continues to increase, landowners in Caldwell and Hays County, with guidance and support from the Partnership, have come together with local government officials, professional trappers, recreational hunters, agricultural organizations, environmental groups, wildlife management associations, outdoor enthusiasts, multiple state agencies, a private helicopter

company, a toll road operator, and river authority to implement an innovative program that seeks to take this part of Central Texas back from the feral hogs.

The Central Texas Feral Hog Task Force (CTFHTF) was established in 2013 as the Caldwell County Feral Hog Task Force but was renamed in 2018 as the Central Texas Feral Hog Task Force with a broader vision. The Task Force is a collaborative regional effort to track and abate the extensive ecological and economic damage associated with invasive feral swine (*Sus scrofa*). Major components of the Task Force's feral hog program include the feral hog bounty collection, trapping equipment vouchers, workshops and webinars, and county damage assessments.

Figure 11. Central Texas Feral Hog Task Force Logo

The Central Texas Feral Hog Task Force continued to receive funding from 2021 to 2023, and Caldwell County has applied for FY 2024 grant applications. As of 2022, Hays County has stopped participation in the feral hog bounty program. Yearly program results for Hays and Caldwell counties are presented in Table 5, followed by a total tally of feral hog harvests in the watershed (Figure 12).

Table 5. Output of recent programming for CTFHTF

	FY 2022	FY 2023
Bounty Program	1,122	291
Trapping Kits	49	No new additions
Aerial Gunning	No activity	No activity
Surveys	Available online – newly updated	Available online
Outreach and Education	2 events	1 event
Additional	4 Wireless Traps used in Caldwell and Hays County	No additional activity

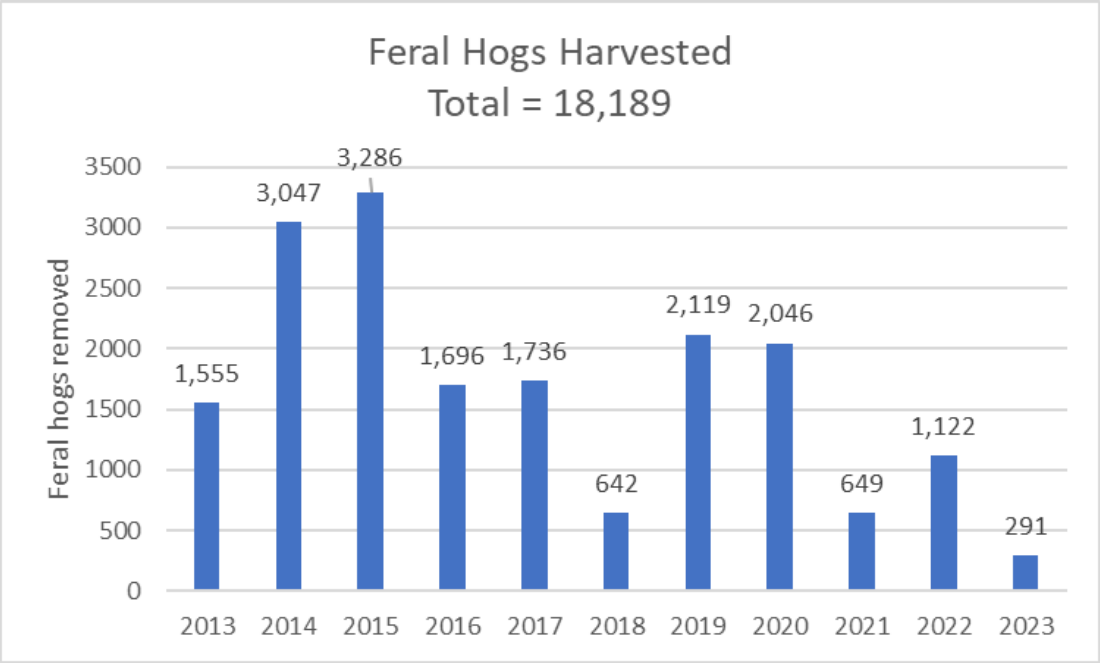

Figure 12. Central Texas Feral Hog Task Force's total number of hogs removed.

Feral hog programming within this reporting period was affected by COVID-19 and personnel changes Caldwell County and the Partnership seek to revive and revamp all programs in the next year. Despite a marked slowdown in feral hog harvesting in 2018,2021, and 2023 the total number of feral hogs removed from the PCW greatly exceeded the average annual rate in four out of the last nine years of data collection. As shown in Figure 12, the Task force has removed approximately 18,189 invasive hogs from Hays and Caldwell counties since 2013.

Outreach and Education Strategies

Public Outreach

Education of citizens in the watershed to increase awareness and facilitate involvement in the Plum Creek WPP process continues to be of tremendous significance in the push to reduce nonpoint source pollution. The WC coordinates quarterly stakeholder meetings and regularly makes site visits to assist or consult watershed landowners and municipal officials with project planning. At times, the WC has also served as a liaison between landowners and regulatory agencies when questions or concerns arise about possible violations and impacts to water quality. Informal one-on-one or small group meetings facilitated by the WC have also provided many opportunities for new partnerships, enhanced cooperatives, and innovative solutions for water quality concerns in the watershed.

Plum Creek Watershed Protection Plan

The Plum Creek WPP is a 176-page document that can be found electronically on the Plum Creek Website at https://plumcreekwatershed.org/protection-plan/. Copies have been distributed throughout the watershed at Partnership Meetings, city council and county commissioner court meetings, field days, workshops, and other events as of the reporting period. The 2018 WPP Update and original WPP were distributed at local and statewide meetings, workshops and events. The 2022 WPP Update is available electronically and was not distributed as a hard copy. PDFs of these documents may also be downloaded from the website at https://plumcreekwatershed.org/protection-plan/.

Contact List and Targeted Outreach

Over the years, the Partnership has made great strides in engaging stakeholders through enhanced electronic communication protocols defined by a targeted outreach approach focusing on the delivery of user-specific content. There are many ways to sign up for our communications, including our website, Instagram, and sign-up sheets available at numerous state and local events attended and/or coordinated by the WC. In addition to general contact information, individuals are asked to identify any related professional or volunteer organizations with which they are affiliated, as well as to prioritize specific Plum Creek WPP components for which they would like to receive additional information including:

- Feral hog programs
- Water Quality Management Plans
- Volunteer opportunities

As of October 2023, the Partnership's stakeholder contact list has grown to over 1,900 contacts with 1,464 subscribers. Further, the delivery of project-specific materials, meeting announcements, RSVPs, and updates can now be directed toward designated audiences and critical stakeholders using a Constant Contacts account managed by the WC. The targeted approach to outreach has been applied to selected Partnership meetings and other watershed programs. One key objective for the WC was to ascertain and strive to understand local concerns and attitudes toward issues with the potential to impact the watershed. The Partnership website, Facebook and Instagram pages provide additional outreach tools and are maintained and updated regularly by the WC.

Newsletters

The watershed coordinator sends quarterly updates to all interested parties via *The Plum Creek Current*, the Partnership's newsletter. Between October 2021 and October 2023, the following editions of *The Plum Creek Current* were published and distributed via Constant Contact email marketing platform.

- Winter 2022 — 2022 WPP Update, Environmental Enforcement
    - 31.3% open rate
- Spring 2022 — Letter to Stakeholders, Feral Hog Bounty Program
    - 32.8% open rate
- Summer 2022 — Farewell from Watershed Coordinator, Texas Stream Team, Workshops
    - 32.1% open rate
- Winter 2022/2023 — New Watershed Coordinator, Upcoming Events, Updates
    - 36.2% open rate
- Summer 2023 — Feral Hog Abatement Program, Watershed Steward Workshop, Volunteers
    - 34.7% open rate

Social Media: Instagram and Facebook

As maintaining public interest and expanding the reach of WPP programs to new audiences are critical to Partnership sustainability and WPP success, two social media platforms are utilized: Facebook and Instagram. The Facebook page was constructed in October of 2020 and the Instagram page was created in June of 2021. Figure 13 provides an overview of the current number of Page "likes" and "followers" followed by a breakdown of the demographics of each page. Both pages are followed by a majority of women within the 25-44 age range. However, since Facebook and Instagram allow cross-posting and are connected, the same individual may follow both social media accounts.

As of September of 2023, both pages have reached over 36,000 individuals (Figure 13). The WC maintains both pages and regularly posts news, programs, current events, or other WPP related topics. Approximately 64 Facebook and 54 Instagram posts have occurred in this reporting period.

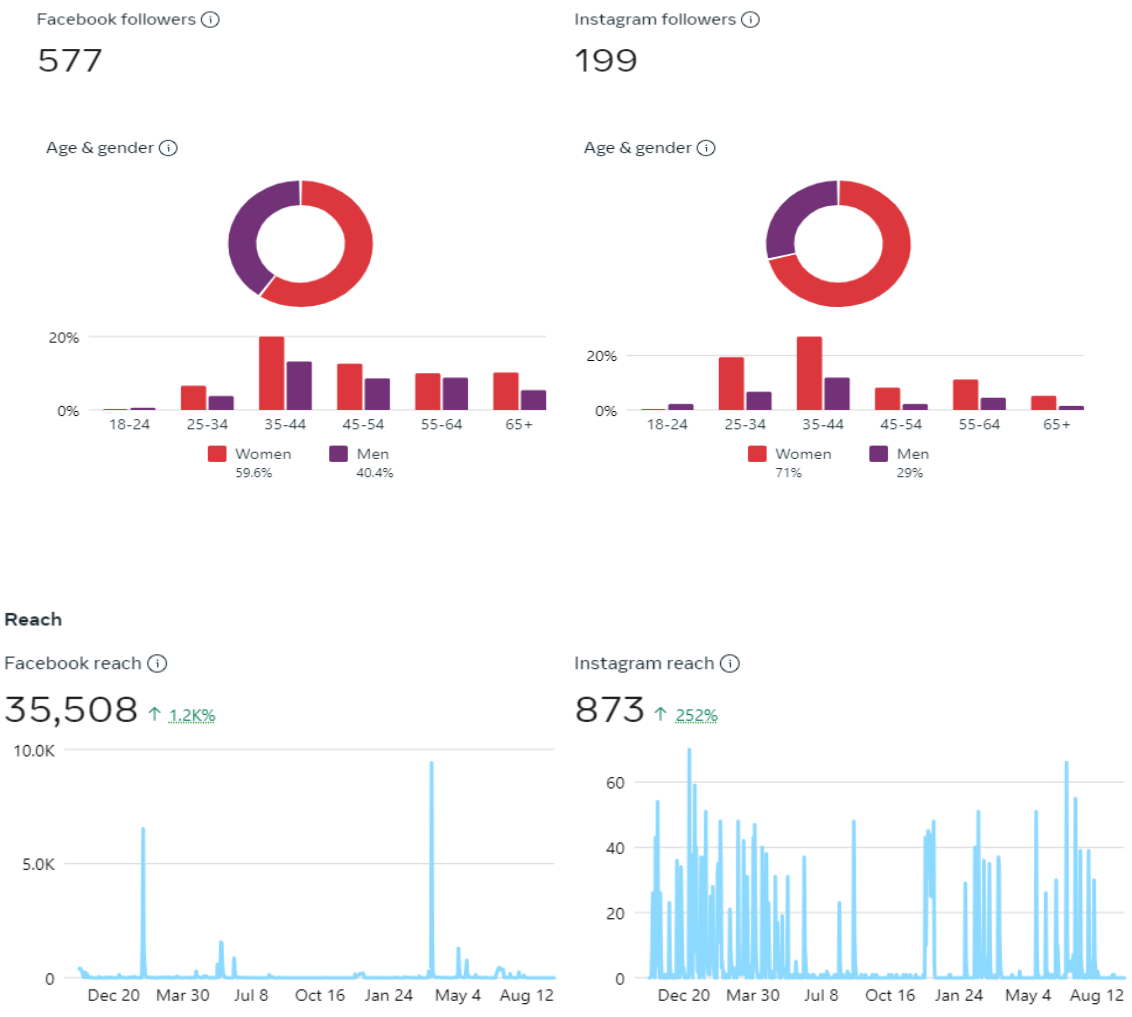

Figure 13. Social media reach

Website

The Partnership website (plumcreekwatershed.org) is hosted by WaterPR and maintained by the WC. The site includes information about the PCW, background on the WPP and the Partnership, links to updated water quality data, information on feral hog control and other management programs, descriptions of outreach efforts, a list of upcoming events, a library of resources developed for the Partnership, and links to project partners and related sites. New additions to the website during this reporting period are the Get Involved tab, which included information about the Fall Cleanup, the Plum Creek Stewards, and the Plum Creek Page Turners.

Figure 14. Screengrab of website – plumcreekwatershed.org

Texas Stream Team

Texas Stream Team (TST) is an environmental education and monitoring program administered by Texas State University-San Marcos funded through a Clean Water Act §319 grant from TCEQ. TST is a network of trained volunteers collecting water quality data on lakes, rivers, streams, wetlands, and estuaries across the state. In addition to their trainings regularly held in San Marcos, TST has provided numerous educational opportunities for watershed stakeholders.

In 2021, the WC formed a new monitoring group called the Plum Creek Stewards (PCS). PCS currently has 3 volunteers monitoring several sites in the watershed (Figure 15). Most sites monitored are in the upper portion of the watershed. The WC is working to grow the group to include more monitors in the mid- to lower-portions of the watershed.

PCS has two Standard Core test kits provided by TST; they are currently housed at the Lockhart Library and the Kyle Library. The Standard Core test kits include the following parameters: conductivity, air and water temperature, pH, dissolved oxygen, water transparency and depth. Also included are field observations: flow severity, algae cover, water color, water clarity, water surface, water conditions, water odor, present water, days since last significant rainfall, and inches of rainfall in the last 3 days.

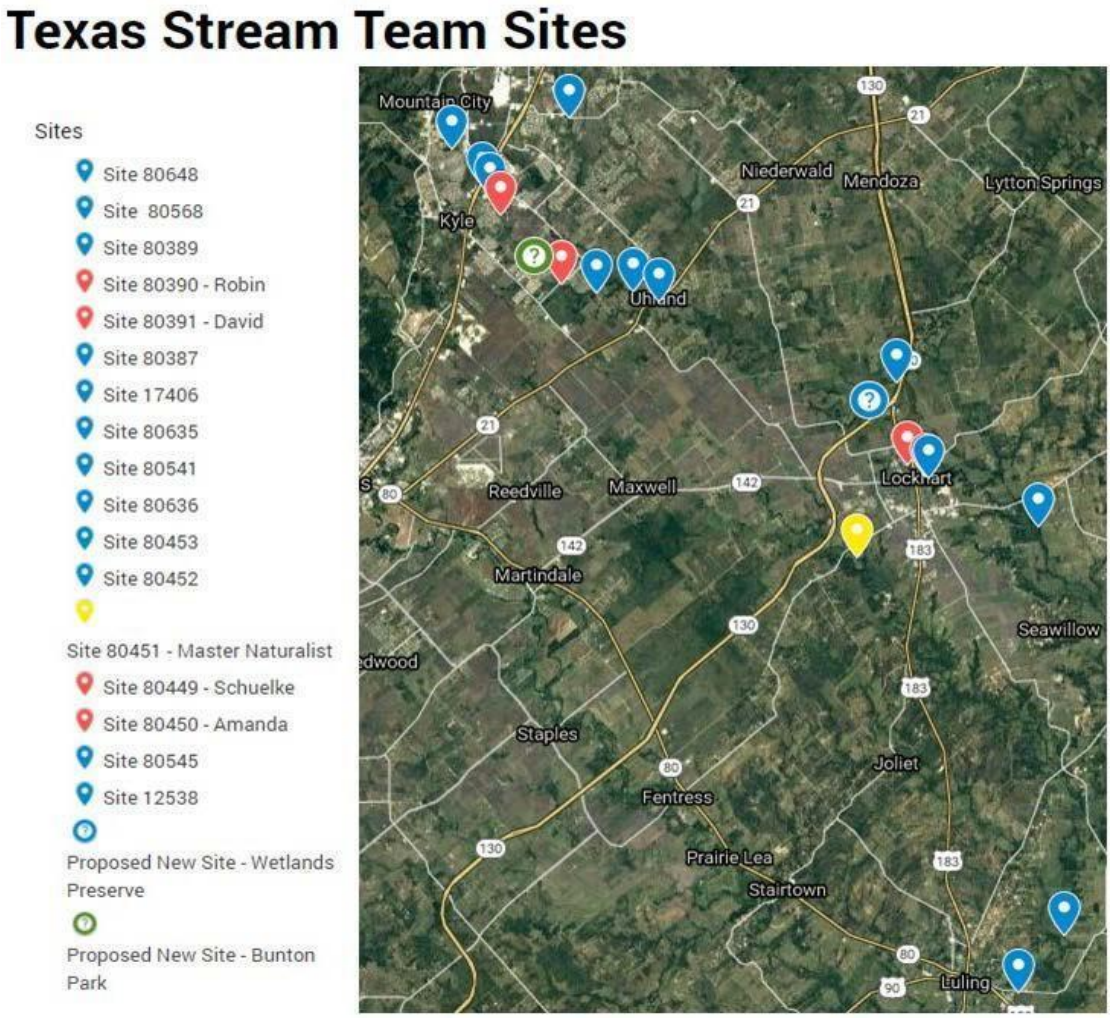

Figure 15. Texas Stream Team monitoring sites in the PCW

Plum Creek Page Turners Book Club

The Plum Creek Page Turners Book Club (PCPT) was developed by the WC and Alexandra Walker, President of Dig Together USA, an environmental education non-profit based in Lockhart. The purpose of the book club is to bring together like-minded individuals to learn, read, reflect, and share information about environmental issues by reading a series of environmental non-fiction books.

Starting in late 2021 with 10 members, the PCPT voted on their first book: *Restoration Agriculture: Real- Word Permaculture for Farmers* by Mark Shepard (2013) (Figure 16). The second book the PCPT voted to read was *Braiding Sweetgrass* by Robin Wall Kimmerer (2015). The book club met on a regular basis until the departure of the outgoing WC in June 2022. The Partnership will look into restarting the Plum Creek Page Turners

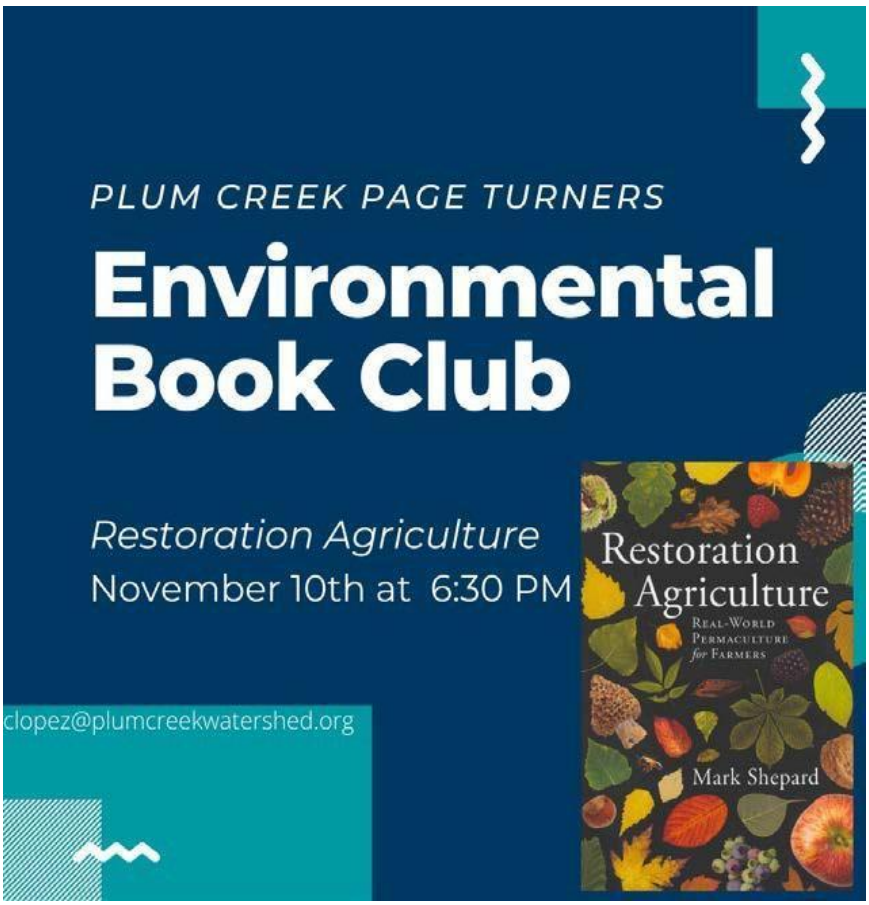

Figure 16. Plum Creek Page Turner's flyer for past meeting

Workshops and Meetings

The outbreak of COVID-19 continued to have an impact on the Partnership's ability to host workshops and meetings throughout the beginning of this reporting period. The last in-person Public Stakeholder meeting prior to this reporting period was in December of 2019. The WC held the latest Public Stakeholder meeting in July of 2023. Going forward, the Partnership plans to bring back the Public Stakeholder meeting on a regular biquarterly schedule. Table 6 details all workshops and meetings in the reporting period, as well as their location.

Table 6. Workshops and events from October 2021 to October 2023

Date	Workshop/Event	Location
November 6, 2021	Clean & Green – 14th Annual Keep Lockhart Beautiful Fall Cleanup	Lockhart, TX
December 1, 2021	Low Impact Development Seminar	Seguin, TX
December 9, 2021	Plum Creek Steering Committee Meeting	Lockhart, TX
February 2, 2022	Lone Star Health Streams – Joint Watershed Event	Seguin, TX
February 16, 2022	Plum Creek Page Turners – Environmental Book Club	Lockhart, TX
March 3, 2022	Texas Well Owner Network Event	Luling, TX
February - July, 2022 (6 Bounty Claims total)	Caldwell County Feral Hog Bounty Claim	Smith Supply in Lockhart, TX
March 5, 2022	37th Annual Great Texas River Cleanup	Kyle, TX
March 16, 2022	Plum Creek Page Turners – Environmental Book Club	Lockhart, TX
March 24, 2022	Plum Creek Steering Committee Meeting	Kyle, TX
March 31, 2022	Trash Mob – Keep Lockhart Beautiful	Lockhart, TX (downtown)
April 23, 2022	Earth Day Celebration	Kyle Public Library in Kyle TX
May 12, 2022	Texas Riparian and Stream Ecosystem Training	Lockhart State Park in Lockhart, TX
June 1, 2022	Lone Star Healthy Streams - Joint Watershed Event	Seguin TX
June 3, 2022	Plum Creek Steering Committee Meeting	Kyle, TX
December 19, 2022	On-Site Septic Facility Workshop	Virtual/ Zoom

Table 6. Workshops and events from October 2021 to October 2023

January 12, 2023	Plum Creek Steering Committee Meeting	Lockhart, TX
March 4, 2023	38th Annual Great Texas River Cleanup	Kyle, TX
March - July, 2022 (5 Bounty Claims total)	Caldwell County Feral Hog Bounty Claim	Smith Supply in Lockhart, TX
April 25, 2023	Plum Creek Steering Committee Meeting	Kyle, TX
July 13, 2023	Plum Creek Public Stakeholder/ Steering Committee Meeting	Lockhart, TX
July 25, 2023	Feral Hog Management Roundtable	Lockhart/Virtual
August 15, 2023	Texas Watershed Steward Workshop	Cabela's in Buda, TX
October 19, 2023	Plum Creek Steering Committee Meeting	Luling, TX

Illegal Dumping and Litter Prevention Campaigns

Caldwell County Community Cleanup

With funding from the Capital Area Council of Government's Regional Solid Waste Grants Program, Caldwell County held four community collection events and one tire-only event from October 2021 through October 2023. All five events were held within the watershed (Dale, Maxwell, Luling, and Lockhart) At the four community cleanup events, approximately 46 volunteers helped to collect 110 tons of debris and refuse. At the one tire only event in Maxwell, over 2,600 tires were collected. These community collection events help reduce the amount of debris bound for the Plum Creek and beyond.

Lockhart Annual Household Hazardous Waste Dropoff Events

The City of Lockhart held two events to collect Household Hazardous Waste during the reporting period. Items accepted included cleaning products, household batteries, paints, and varnishes. Tires, medical waste, and commercial waste were among the items not accepted. The first event, held March 26, 2022, had 125 households participate. The next event, April 1, 2023, had participation from approximately 137 households.

City of Kyle Community Cleanup

On May 21, 2022, the City of Kyle hosted a community cleanup event, enabling citizens to drop off unwanted materials. The city filled ten 40-yard roll-offs with landfill waste and one 40-yard roll-off with recyclable metals. A second community cleanup was held on August 7, 2022 for tires and electronic

waste. In all, 35 tires and 1,422 pounds of electronics were sent to Green Guy Recycling. Residents who participated in the Cleanup received handouts with information about Green Guy Recycling services, the Hays County Hazardous Waste drop-off location, and a summary of Texas Disposal System services.

2022 Keep Lockhart Beautiful Fall Cleanup

The WC served as event coordinator for the 2022 Fall Cleanup for Keep Lockhart Beautiful on October 26, 2022. The event provided free breakfast tacos, coffee, and shirts with the Keep Lockhart Beautiful logo to participants. The Saturday morning event attracted more than 53 volunteers who collected over 500 pounds of trash across 6 city parks.

37th & 38th Annual Great Texas River Cleanup

On the first Saturday of March, the Annual Great Texas River Cleanup brings hundreds of volunteers together for one of the largest cleanup events in the State. The Partnership assisted the City of Kyle with a section of Plum Creek that runs through their city's parks. The City of Kyle participated on March 5, 2022 and March 4, 2023. In March of 2022, Kyle had 83 volunteers, including two city council members. Approximately 2,840 pounds of trash were collected along with 170 pounds of recyclable materials and one tire. In March of 2023 (Figure 17), Kyle had 68 volunteers and collected approximately 1,740 pounds of trash and 90 pounds of recyclable material along with one tire.

Figure 17. 38th Annual Great Texas River Cleanup (2023)

Measures of Success

TCEQ Integrated Report

Texas Commission on Environmental Quality (TCEQ) compiles the Texas Integrated Report of Water Quality (IR) on a biennial basis to identify impaired water bodies and summarize water quality conditions throughout the State. In 2004, TCEQ identified Plum Creek on the 303(d) list of impaired waterbodies due to high *E. coli* concentrations. The issuance of the 2010 Texas Integrated Report reclassified the entirety of Plum Creek as a *Category 4b* stream and removed all segments from the 303(d) list.

While Plum Creek continues to exceed the *E. coli* contact recreation standard of 126 organisms per 100 mL throughout its upper-, middle-, and lower-reaches, TCEQ is not currently considering a total maximum daily load (TMDL) study for implementation as "other control requirements are reasonably expected to result in the attainment of all standards" — i.e., watershed protection plan implementation.

In May 2022, TCEQ issued the 2022 IR, which included a reassessment of data collected in Plum Creek. The FY2022 IR reported evaluations of impairments and concerns for the three Plum Creek segments monitored through the Clean Rivers Program (CRP). This regulatory assessment divides Plum Creek into three distinct stream segments based upon hydrological features and availability of monitoring data (Table 7). Each of the three stream segments is associated with a historical TCEQ CRP monitoring station. TCEQ used data collected during the seven-year reporting period from December 1, 2013 through November 30, 2020 to compile their assessment.

Table 7. Current impairments and concerns in Plum Creek as described in the 2022 Texas Integrated Report

Assessment Unit	**Parameter**	**Status**
1810_01 Confluence with San Marcos River to approximately 2.5 miles upstream of the confluence with Clear Fork Plum Creek.	*E. coli* geometric mean	Nonsupport (4b)
	Nitrate	Screening Level Concern
	Total Phosphorus	Screening Level Concern
	Fish Community	Use Concern – impaired fish community in water
	Habitat	Screening Level Concern – impaired habitat in water
1810_02 From approximately 2.5 miles upstream of confluence with Clear Fork Plum Creek to approximately 0.5 miles upstream of SH 21.	*E. coli* geometric mean	Nonsupport (4b)
	Nitrate	Screening Level Concern
	Total Phosphorus	Screening Level Concern
	Fish Community	Use Concern – impaired fish community in water
	Habitat	Screening Level Concern – impaired habitat in water

1810_03 From approximately 0.5 miles upstream of SH 21 to upper end of segment.	*E. coli* geometric mean	Nonsupport (4b)
	Nitrate	Screening Level Concern
	Total Phosphorus	Screening Level Concern
	Ammonia	Screening Level Concern
	Fish Kill Reports	Use Concern
	Macrobenthic community	Use Concern – impaired macrobenthic community in water
1810A_01 *Town Branch* Perennial stream from the confluence of Plum Creek upstream of US 183 in the City of Lockhart.	*E. coli* geometric mean	Use Concern
	Nitrate	Screening Level Concern
	Dissolved Oxygen	Screening Level Concern

Upper Assessment Unit (Uhland & Kyle Stations)

The most upstream regulatory assessment unit (AU) of Plum Creek represents the portion of the stream from the headwaters to 0.5 miles upstream of State Highway 21 in the city of Uhland (1810_03). This portion of the watershed is located where the Edwards Plateau ecoregion transitions to the Blackland Prairie and is located in the rapidly developing IH 35 Corridor. TCEQ CRP monitoring station 17406 is located 0.4 miles downstream of the confluence with the Bunton Branch tributary of Plum Creek that receives influences from the City of Buda and the Plum Creek main stem that conveys discharges associated with the City of Kyle.

A large portion of the stream flow in this segment comes from point source discharges and the nonpoint source influences in this segment are more closely associated with urban land uses than in the downstream segments. This portion of Plum Creek is currently impaired for *E. coli* geometric mean (MPN/100 mL) above the regulatory standard.

The upper AU also has water quality concerns for Nitrate-Nitrogen (Nitrate-N), total phosphorus, ammonia nitrogen, and impaired macrobenthic community, and fish kill in water.

The trend analysis for this AU shows that while *E. coli* concentrations in this portion of the watershed remain relatively unchanged with a potential decreasing trend, they are also consistently higher than the lower portions of the watershed. For example, the geometric mean for October 2021 to June 2023 at Upper AU was 309 (MPN/100 mL) while the Middle and Lower AU were 242 and 213, respectively. Moreover, Nitrate-N is on a significant downward trend, though the mean over the last two years (6.73) is still well above the screening criteria of 1.95 (mg/L). Total phosphorus is also on a downward trend though it is not significant at this time with an average of 1.87 mg/L for this reporting period.

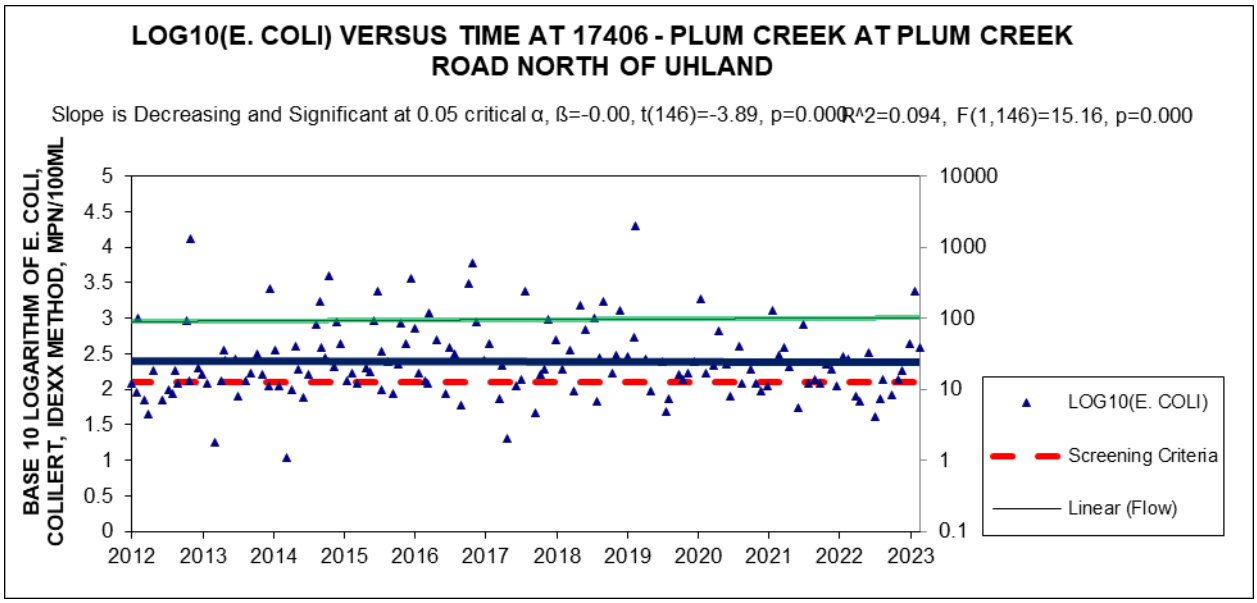

Figure 18. *E. coli* over time – 17406

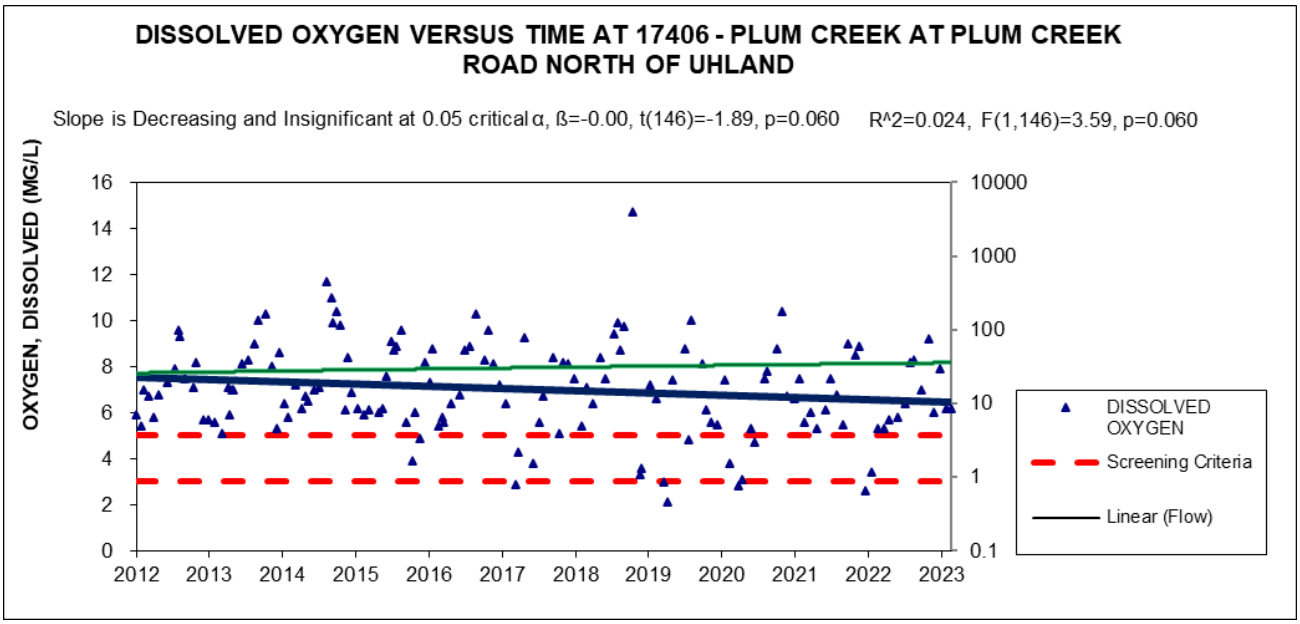

Figure 19. Dissolved Oxygen over time - 17406

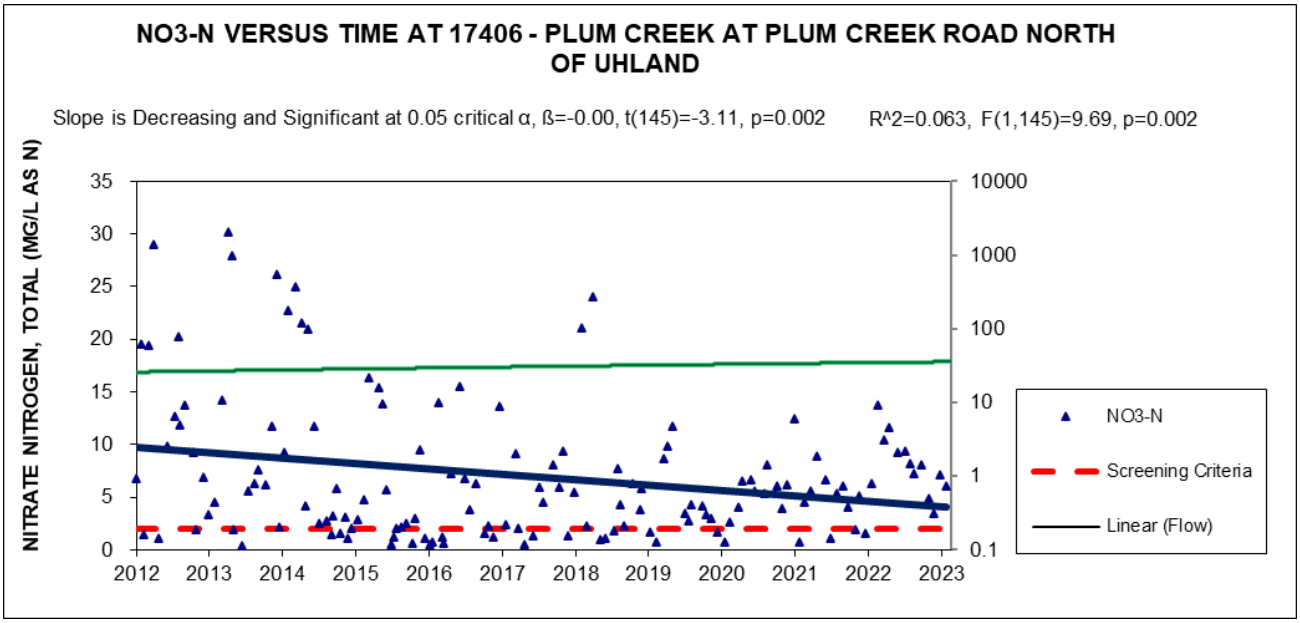

Figure 20. Nitrate-N over time – 17406

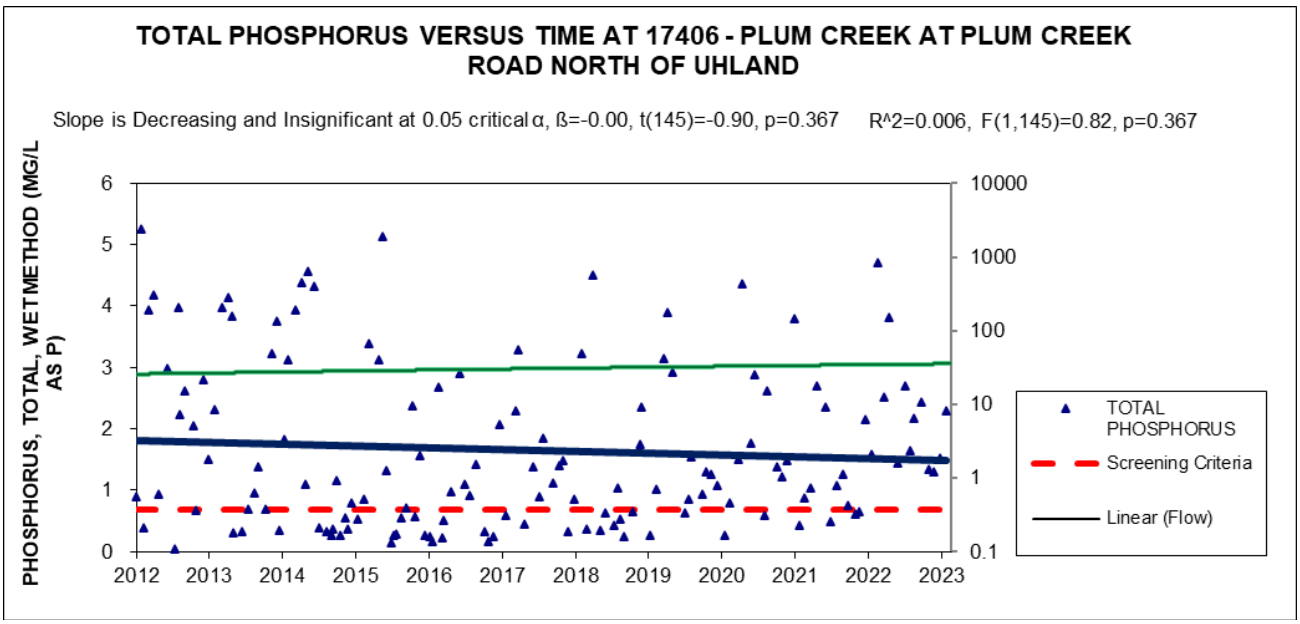

Figure 21. Total Phosphorus over time - 17406

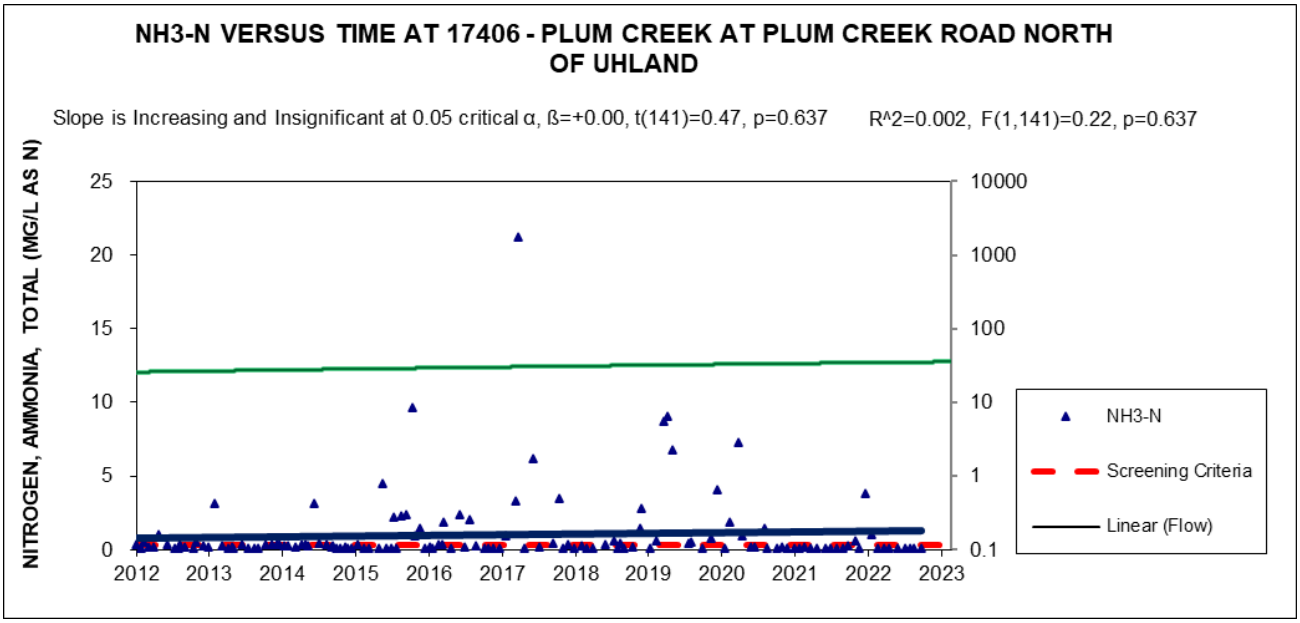

Figure 22. Ammonia over time - 17406

Middle Assessment Unit (Lockhart)

The middle Plum Creek AU is located in the Blackland Prairie Ecoregion of Caldwell County and the fertile agricultural lands from 0.5 miles upstream of SH21 and 2.5 miles upstream of the confluence with the Clear Fork tributary of Plum Creek. This portion of Plum Creek receives point and nonpoint source influences from the City of Lockhart and the City of Uhland. Significant tributaries in this portion of the watershed include the intermittent Elm Creek, Brushy Creek, and Dry Creek tributaries and the perennially spring-fed Town Branch in the City of Lockhart.

TCEQ CRP monitoring station 12647 is located 1.0 miles downstream of Farm to Market Road 20 in Lockhart. The middle AU is impaired for *E. coli* geometric mean (MPN/100 mL) above the regulatory standard (126 MPN/100 mL); for the reporting period (October 2021 to June 2023) the geometric mean was 242 (MPN/100 mL). Concerns exist for Nitrate-N, total phosphorus, and fish and aquatic communities. Figure 23 shows the total amount of precipitation which may help reflect on why some water quality parameters during this reporting period (October 2021 to October 2023) are lower.

Trend analyses shows *E. coli* may be slightly decreasing with time; Nitrate-N and total phosphorus are trending upward, though with no significance (Figures 24-28). Ammonia nitrogen, which is a new concern for the upper segment, is trending well below screening criteria in this AU.

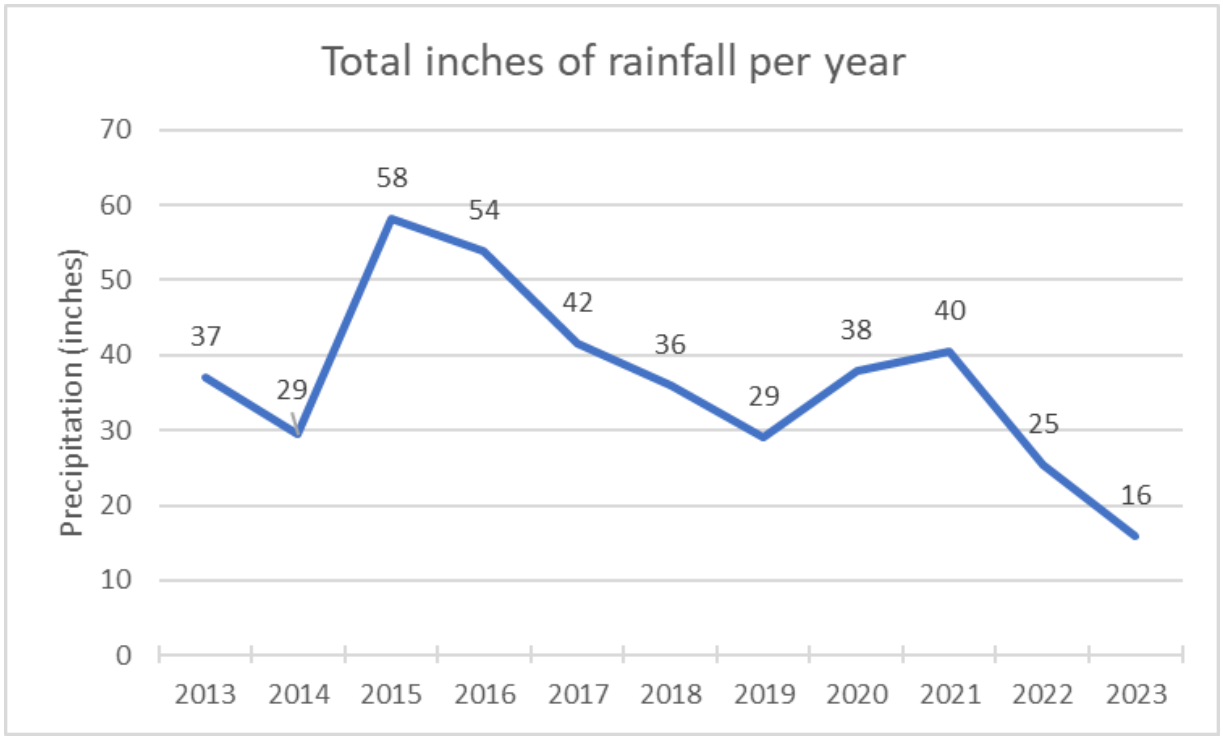

Figure 23. Total annual precipitation for Austin-Bergstrom Airport Area, Texas from the National Weather Service.

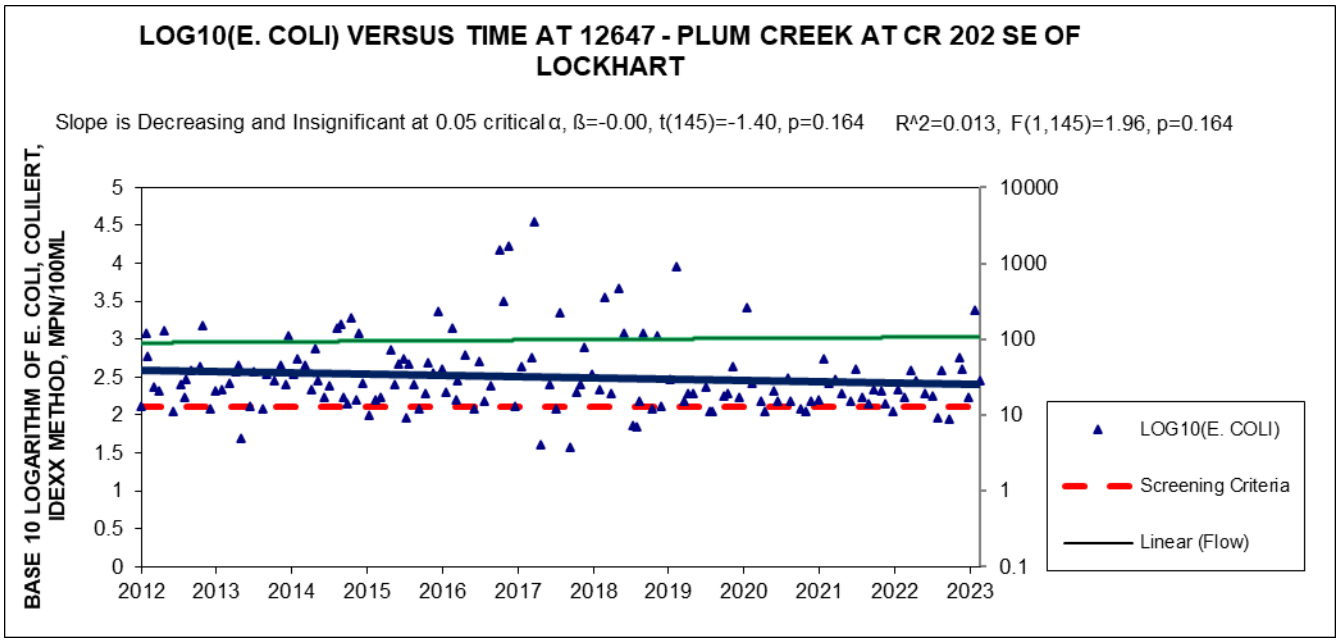

Figure 24. *E. coli* over time - 12647

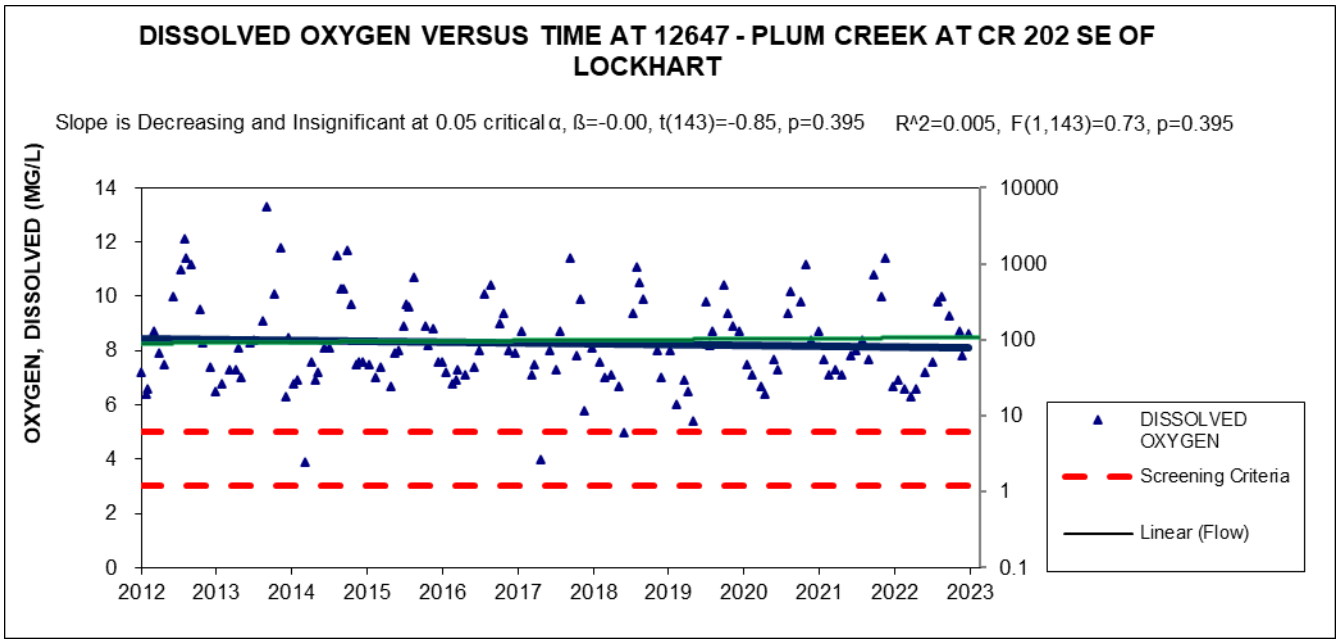

Figure 25. Dissolved Oxygen over time – 12647

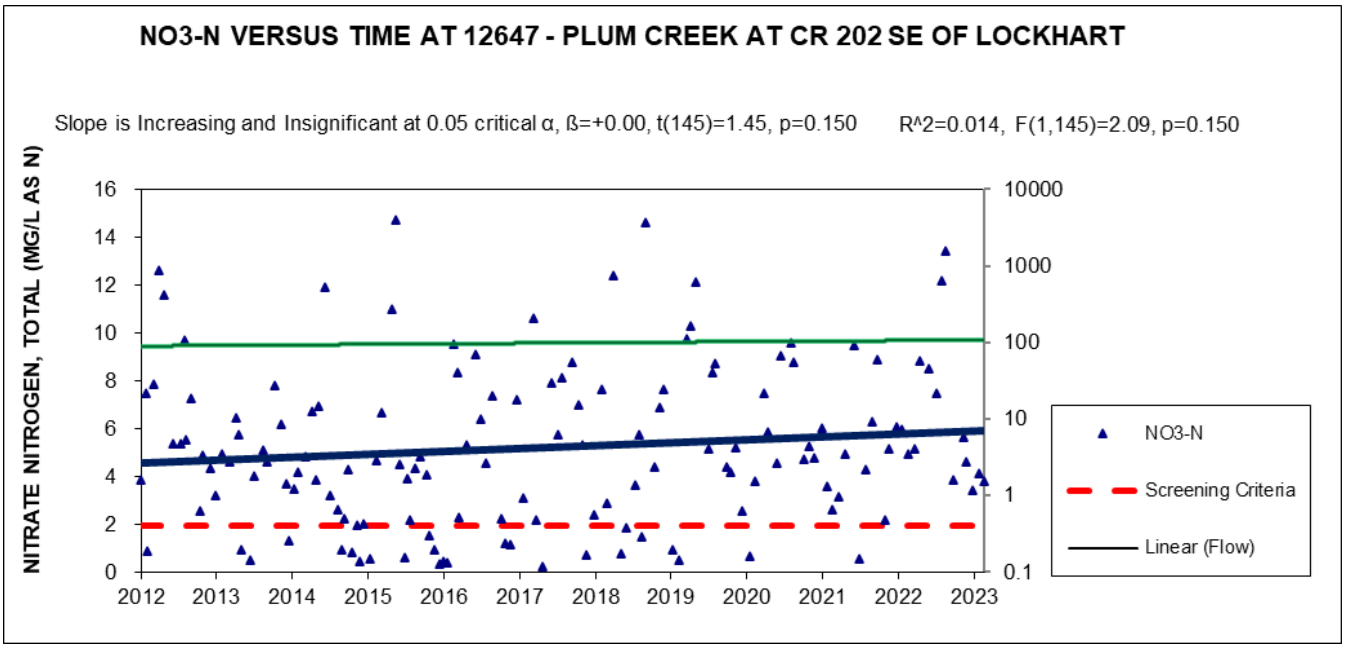

Figure 26. Nitrate-N over time - 12647

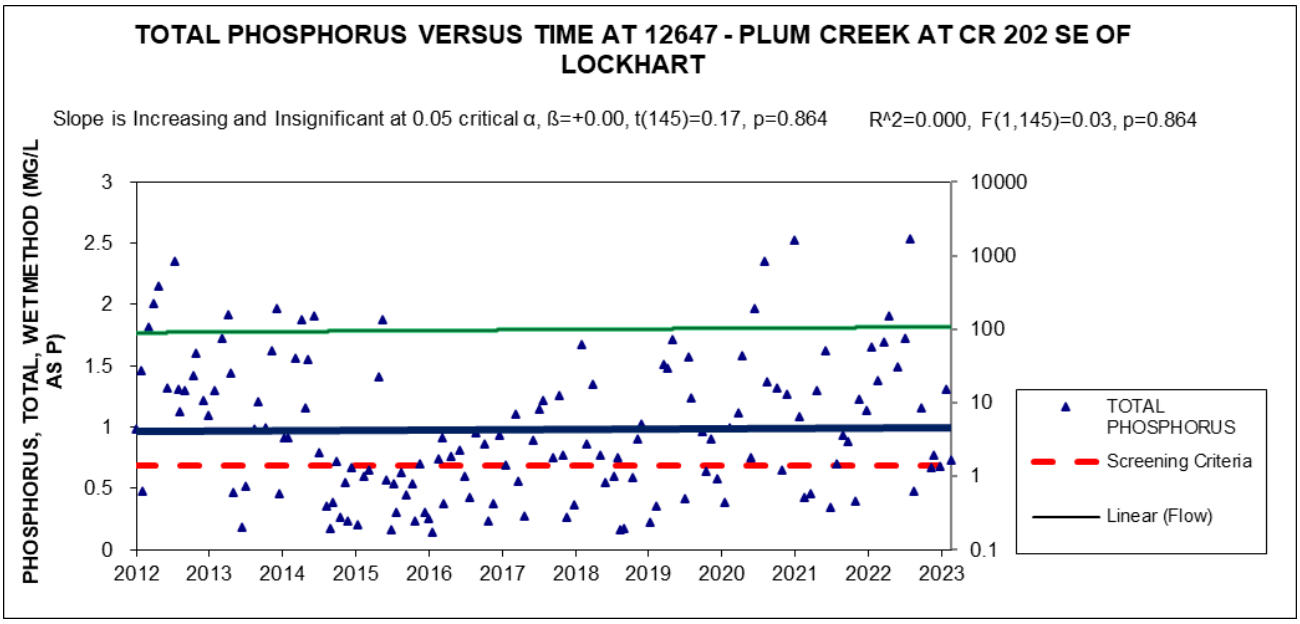

Figure 27. Total Phosphorus over time – 12647

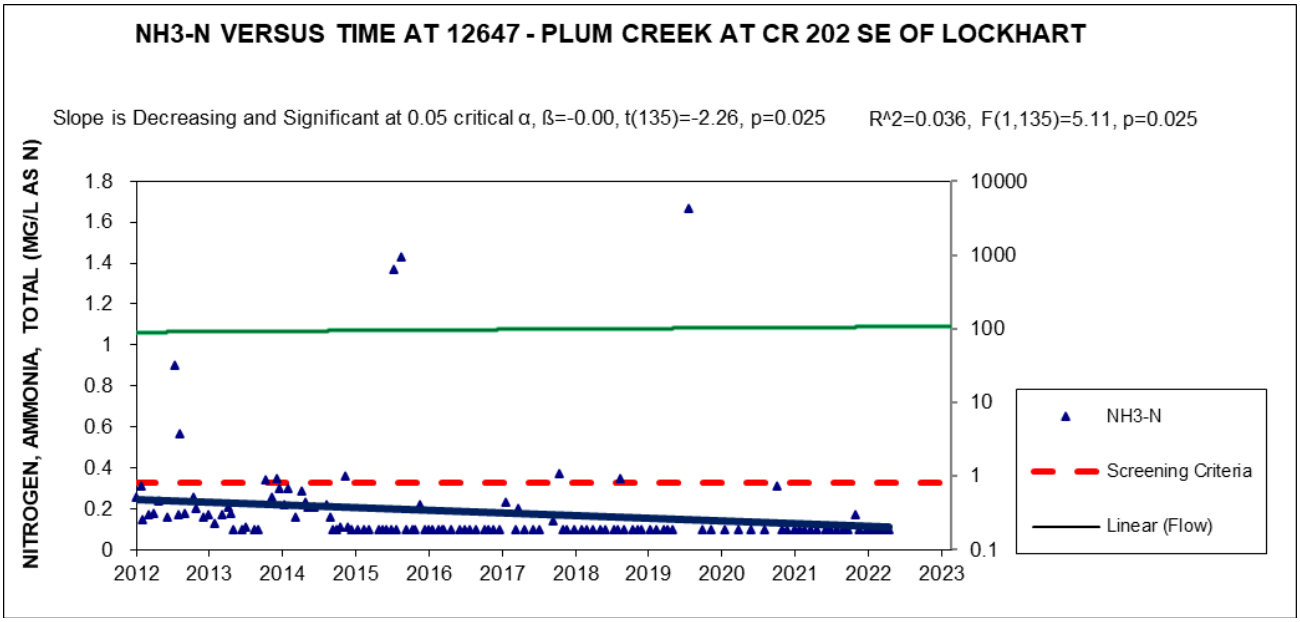

Figure 28. Ammonia-N over time – 12647

Also in this AU is the Town Branch (1810A_01) tributary, which has concerns for *E. coli* geometric

mean, Nitrate-N and dissolved oxygen in the 2022 IR. Figures 29 and 30 show trend analyses for this segment. Trend analyses show an insignificant increase over time of *E. coli*, with averages well over the screening criteria, while Nitrate-N shows a significant trend of consistent increase over time.

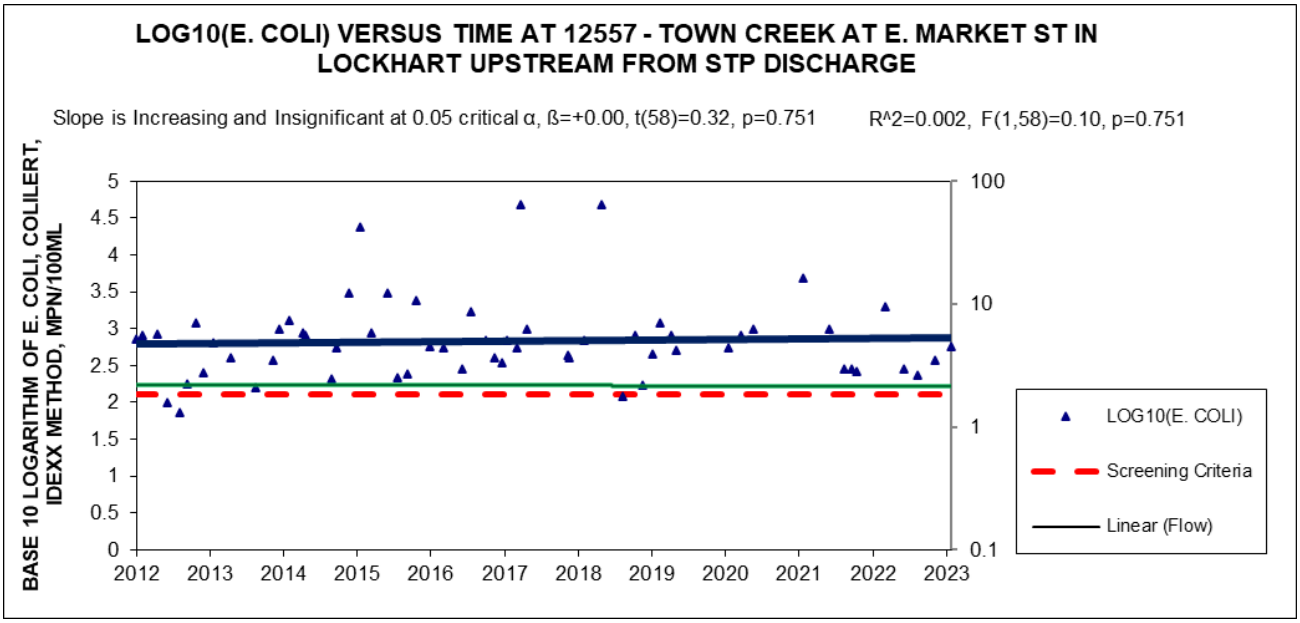

Figure 29. *E. coli* over time – 12557

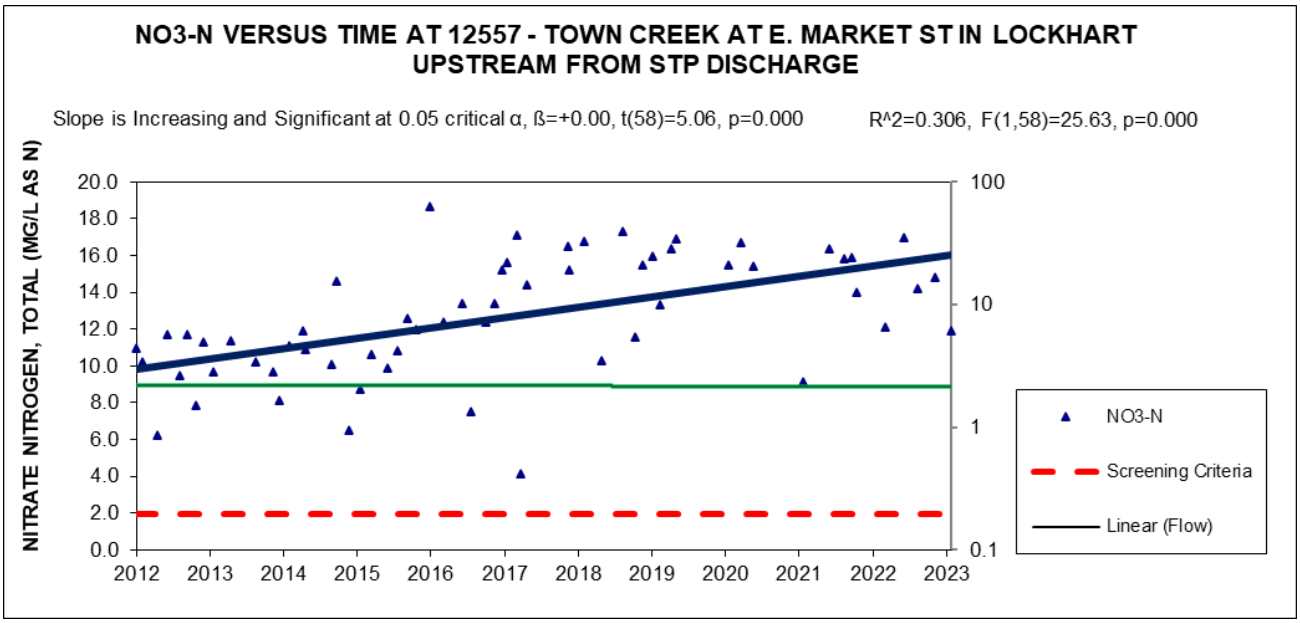

Figure 30. Nitrate-N over time – 12557

Lower Assessment Unit (Luling)

The downstream AU in Plum Creek transitions from the fertile agricultural soils of the Blackland Prairie Ecoregion at a point 2.5 miles upstream of the confluence with the Clear Fork tributary to the sandy soils of the Post Oak Savannah Ecoregion near the confluence with the San Marcos River. This portion of Plum Creek receives point and nonpoint source influences from the City of Luling and receives the significant drainages of the Clear Fork, West Fork, and Salt Branch tributaries.

The TCEQ Clean Rivers Program (CRP) monitoring station 12640 is located 1.0 miles downstream of the confluence with the Salt Branch Tributary that conveys influences from the City of Luling and 3.0 miles upstream of the confluence with the San Marcos River. This AU is currently impaired for *E. coli* geometric mean (MPN/100 mL) above the regulatory standard and had a geometric mean of 203.3 (MPN/100 mL) for the reporting period. Concerns for Nitrate-N, total phosphorus, fish community, and aquatic habitat are included in the 2022 IR.

Trend analyses of CRP data show an insignificant decrease in *E. coli* over time, a significant increase of Nitrate-N, and slow increase in total phosphorus (Figures 31-35.)

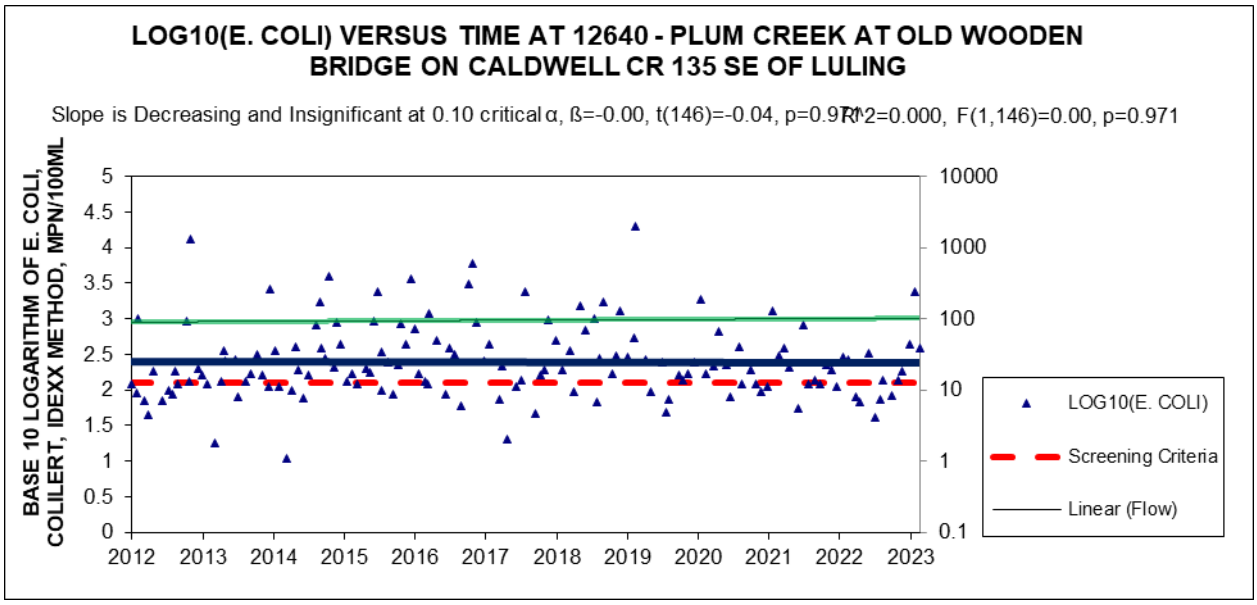

Figure 31. *E. coli* over time – 12640

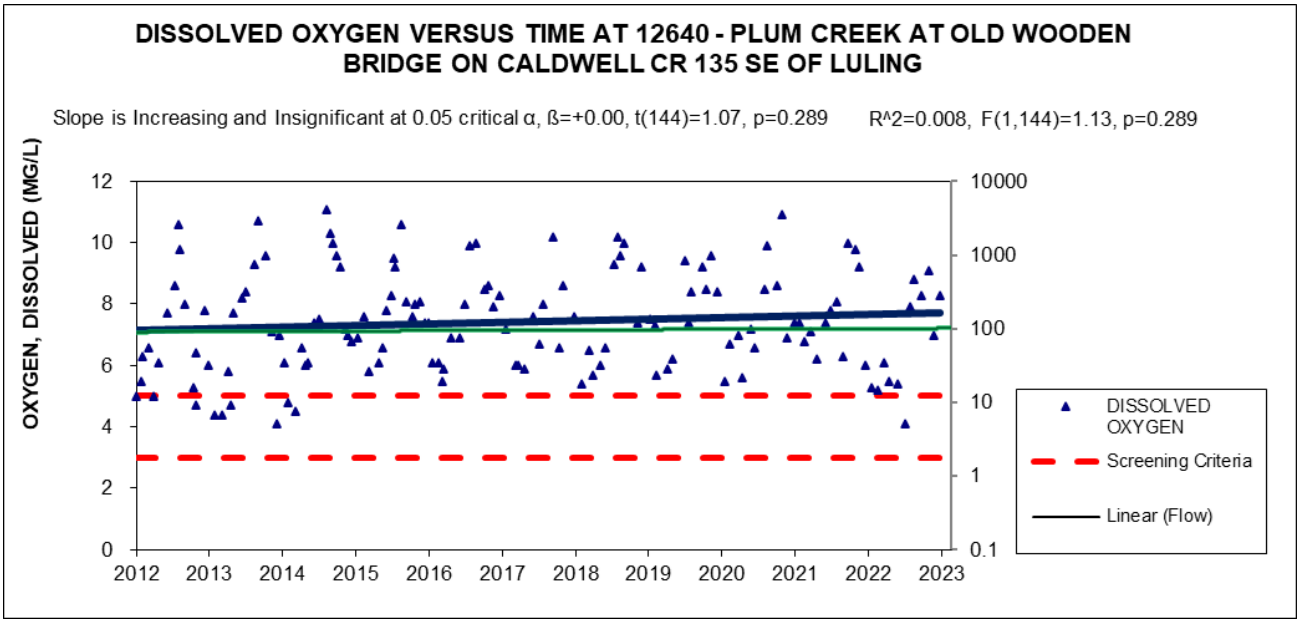

Figure 32. Dissolved Oxygen over time – 12640

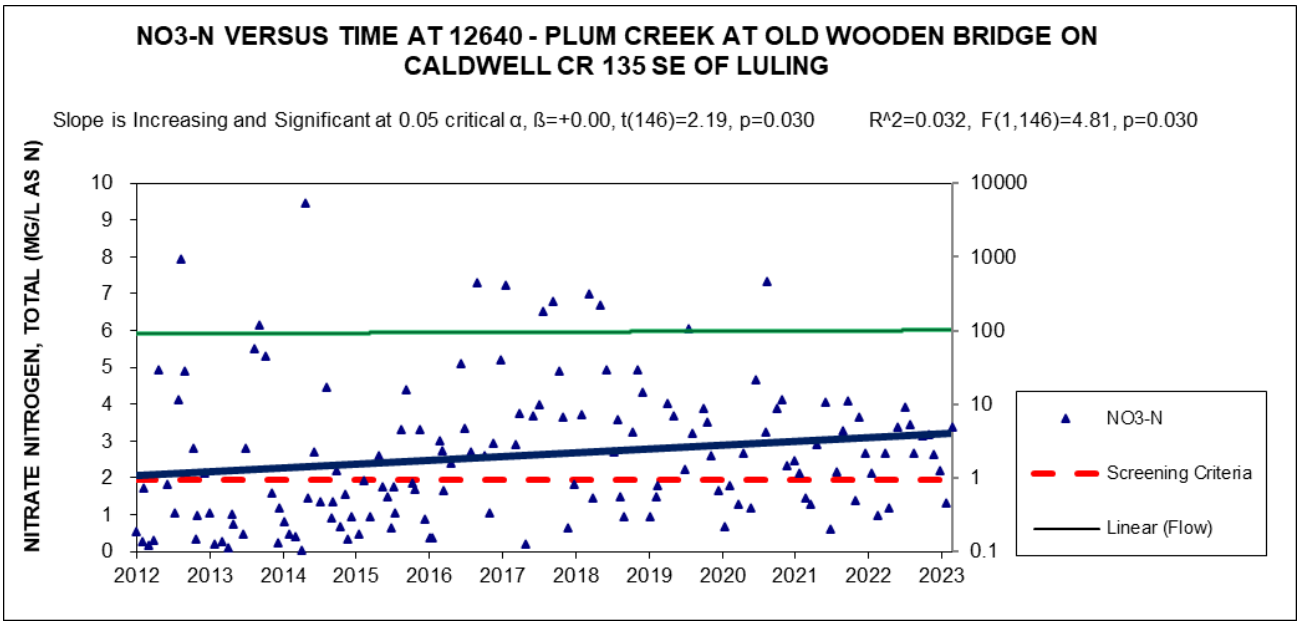

Figure 33. Nitrate-N over time – 12640

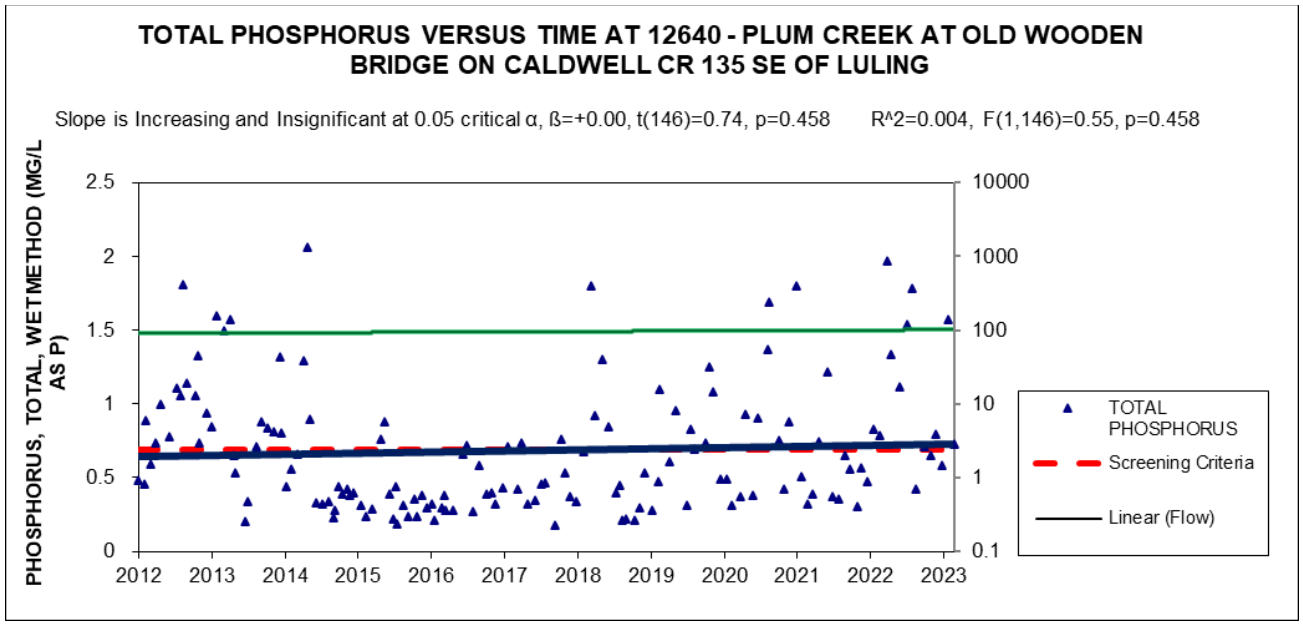

Figure 34. Total Phosphorus over time - 12640

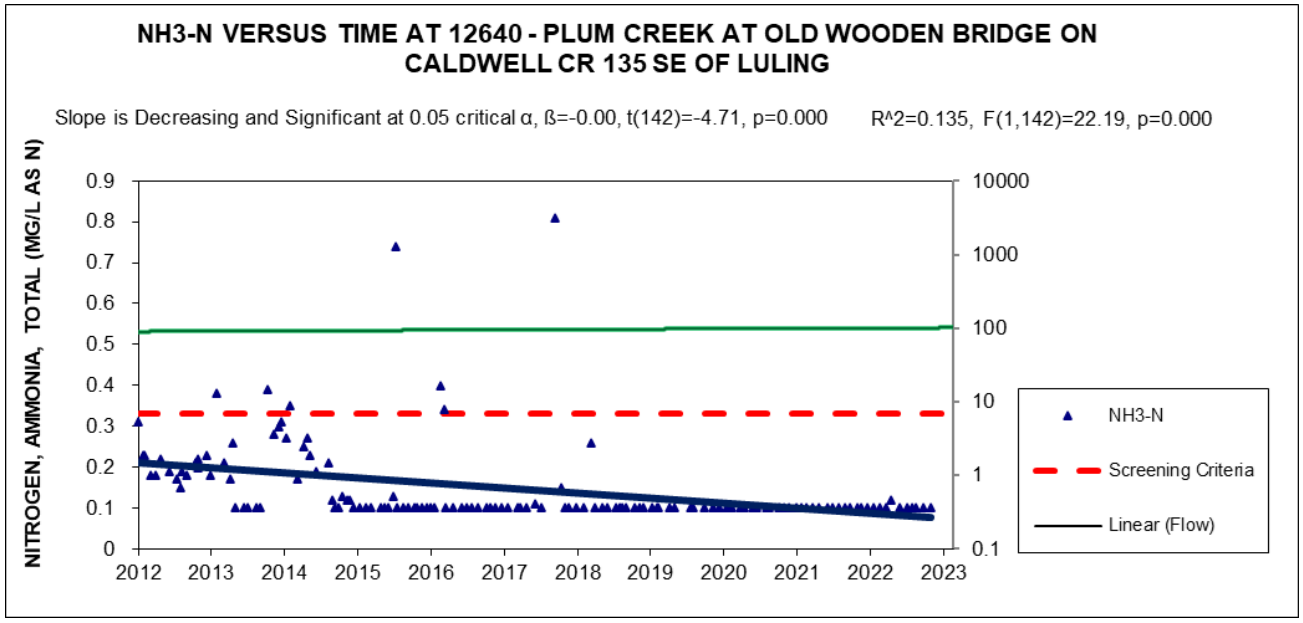

Figure 35. Ammonia-N over time – 12640

Figure 36. Water Quality Monitoring Sites

GBRA Routine Monitoring Results

Analysis of Water Quality Trends at Clean Rivers Program Stations

GBRA collected monthly water quality parameters at seven sites in the PC Watershed. Three sites are on the main stem of Plum Creek, referenced to as the Assessment Units (AU) in the preceding section, and four are tributaries to Plum Creek: West Fork (20500), Clear Fork (12556), Elm Creek (12558), and Brushy Creek (20488).

The preceding section described water quality trends at the AU, which are akin to the three main stem CRP sites. ANOVA (Analysis of Variance) was used to analyze water quality trends over time (June 2013 to June 2023). ANOVA is similar to a linear regression that provides tests of significance for data and additionally, can be used to predict future outcomes. An F-test is produced from ANOVA and the significance of the F-test value (nearly equal to the p-value of a linear regression) determines if a trend over time is significant. A significance of F-test value equal to or less than 0.05 is considered statistically significant. That is to say, the test statistic helps determine if indeed a trend exists (either increasing or decreasing). A P-critical value of 5% was used for the analysis. In Tables 8-12, significant trend interpretations are either marked in red, indicating an environmental negative trend, or marked in green, indicating an environmental positive trend.

Table 8. Descriptive statistics and ANOVA results for three main stem stations (June 2013 to June 2023)

Site	Water Quality Parameter	Overall Mean	Reporting Period Mean	Difference	Significance of F-test	Interpretation
12640 Plum Creek at CR 135	E. coli	688	213	-69%	0.9705	No significant trend
	Dissolved Oxygen	7.41	7.26	-2%	0.2885	No significant trend
	Nitrate -N	2.62	2.58	-2%	0.0299	Increasing trend
	Total Phosphorus	0.68	0.86	26%	0.4583	No significant trend
	Ammonia-N	0.15	0.11	-27%	0.0000	No significant trend
	Flow	95	32.18	-66%	0.8711	No significant trend
12647 Plum Creek at CR 202	E. coli	978	242	-75%	0.1639	No significant trend
	Dissolved Oxygen	8.25	8.24	0%	0.3954	No significant trend
	Nitrate -N	5.19	5.97	15%	0.1503	No significant trend
	Total Phosphorus	0.98	1.14	16%	0.8640	No significant trend
	Ammonia-N	0.18	0.1	-44%	0.0254	Decreasing trend
	Flow	97.59	30.96	-68%	0.8067	No significant trend

Table 8. Descriptive statistics and ANOVA results for three main stem stations (June 2013 to June 2023)

17406 Plum Creek at Plum Creek Rd	E. coli	843	309	-63%	0.0002	Decreasing trend
	Dissolved Oxygen	7.02	6.61	-6%	0.0602	No significant trend
	Nitrate -N	7.01	6.73	-4%	0.0022	Decreasing trend
	Total Phosphorus	1.65	1.87	13%	0.3671	No significant trend
	Ammonia-N	1.02	0.42	-59%	0.6369	No significant trend
	Flow	30.32	2.17	-93%	0.8130	No significant trend

*Though not necessarily a water quality parameter, flow is included to show how discharge affects pollutant loads as well as the possible effects of effluent discharge coupled with increased impervious cover.

In each AU, *E. coli* has either shown no significant trend or has shown a decreasing trend during the June 2013 to June 2023 period. Nitrate-N has significantly increased in the Lower AU while having significantly decreased in the Upper AU; and Ammonia is increasing only in the Upper AU.

Table 10 denotes changes in water quality parameters over the course of the WPP, as well as during the reporting period for four routine tributary sites: West Fork, Clear Fork, Elm Creek, and Brushy Creek. All routinely tested tributaries, except West Fork, showed no significant trend in relation to *E. coli* over time during the WPP implementation. Clear Fork is experiencing increased concentrations of Nitrate-N and Total Phosphorus over time.

Water quality in the remaining tributaries may be improving, or at least not deteriorating with time. In West Fork, E. coli, Nitrate-N, Ammonia-N show a pattern of decreasing concentrations over time. Elm Creek water quality appears stable, with a slight increase in dissolved oxygen. Brushy Creek data shows a decrease in Ammonia-N.

Table 9. Descriptive statistics and ANOVA results for routine tributaries (June 2013 to June 2023)

Site	Water Quality Parameter	Overall Mean	Reporting Period Mean	Difference	Significance of F-test	Interpretation
12556 Clear Fork at 128	E. coli	734	575	-22%	0.8168	No significant trend
	Dissolved Oxygen	7.53	6.75	-10%	0.3334	No significant trend
	Nitrate -N	1.73	1.34	-23%	0.0322	Increasing trend
	Total Phosphorus	0.09	0.12	33%	0.0335	Increasing trend
	Ammonia-N	0.15	0.17	13%	0.0234	Decreasing trend
	Flow	9.5	0.92	-90%	0.5047	No significant trend

Table 9. Descriptive statistics and ANOVA results for routine tributaries (June 2013 to June 2023)

12558 Elm Creek at CR 233	E. coli	1441	659	-54%	0.6359	No significant trend
	Dissolved Oxygen	7.38	6.46	-12%	0.3408	No significant trend
	Nitrate -N	0.19	0.09	-53%	0.0414	Decreasing trend
	Total Phosphorus	0.17	0.17	0%	0.2656	No significant trend
	Ammonia-N	0.14	0.1	-29%	0.0000	Decreasing trend
	Flow	4.83	0.18	-96%	0.1921	No significant trend
20488 Brushy Creek at Rocky Rd	E. coli	940	305	-68%	0.3245	No significant trend
	Dissolved Oxygen	6.71	6.96	4%	0.3816	No significant trend
	Nitrate -N	0.55	1.52	176%	0.0001	Increasing trend
	Total Phosphorus	0.11	0.1	-9%	0.9439	No significant trend
	Ammonia-N	0.16	0.1	-38%	0.0009	Decreasing trend
	Flow	5.01	0.15	-97%	0.8353	No significant trend
20500 West Fork at Biggs Rd	E. coli	905	113	-88%	0.0071	Decreasing trend
	Dissolved Oxygen	5.53	4.7	-15%	0.3468	No significant trend
	Nitrate -N	0.19	0.1	-47%	0.0396	Decreasing trend
	Total Phosphorus	0.37	0.4	8%	0.6121	No significant trend
	Ammonia-N	0.14	0.1	-29%	0.0406	Decreasing trend
	Flow	0.78	0	-100%	0.5924	No significant trend

GBRA Targeted Monitoring Results

GBRA conducts an intensive targeted monitoring project to supplement data collected for TCEQ assessment purposes. In addition to expanding the number of routine monthly monitoring stations from three to eight sites monthly, 30 sites are sampled twice per season during both dry and wet weather conditions; seven WWTPs are sampled once per season and three springs are sampled seasonally. After the initial period of funding (May 2007 through March 2010), TSSWCB utilized state general revenue to continue the mainstem and tributary portions of this monitoring regime through December 2023. GBRA continued this comprehensive monitoring regime with additional CWA §319(h) grant funds from the TSSWCB. This increased monitoring strategy provides a higher level of understanding of the spatial and temporal trends of pollutant loading, serves to refine the focus of management efforts, and helps

track the performance of ongoing implementation activities. Because this is a critical part of adaptive management in the PCW, the targeted monitoring will play a key role in future watershed efforts and should continue.

Tables 10-12 provide data summaries from nine stations on the main stem of Plum Creek, 18 sites on tributaries, and three springs. The data reported spans from June 2013 to June 2023. Previous WPP updates reviewed data from the entirety of WPP implementation, from 2008. For the 2024 Update, the June 2013 to June 2023 window was chosen to show more recent trends over time in the watershed. Because targeted site data are collected less often than routine, the reporting period means are not offered as an indicator of water quality changes, as they are only four data records.

Main Stem Stations

Nine monitoring sites on the main stem of Plum Creek are monitored on a targeted basis. These sites (Table 11) are sequenced in downstream to upstream order. Total Phosphorus tends to decrease at all sites except the upper two most sites: Lehman Rd and Heidenreich. The Lehman Rd site has a significant upward trend in Total Phosphorus. Total Phosphorus was found at the highest concentration at the Heidenreich site (2.6 mg/L), which may indicate dilution is occurring. It is noteworthy to mention the Heidenreich site is downstream from the City of Kyle WWTP. The Heidenreich site also had the highest averages of *E. coli* and Nitrate-N across all targeted sites.

Table 10. Descriptive statistics and ANOVA results for targeted main stem sites (June 2013 to June 2023)

Site	Water Quality Parameter	Overall Mean	Reporting Period Mean	Difference	Significance of F-test	Interpretation
12556 Clear Fork at 128	E. coli	734	575	-22%	0.8168	No significant trend
	Dissolved Oxygen	7.53	6.75	-10%	0.3334	No significant trend
	Nitrate -N	1.73	1.34	-23%	0.0322	Increasing trend
	Total Phosphorus	0.09	0.12	33%	0.0335	Increasing trend
	Ammonia-N	0.15	0.17	13%	0.0234	Decreasing trend
	Flow	9.5	0.92	-90%	0.5047	No significant trend
12558 Elm Creek at CR 233	E. coli	1441	659	-54%	0.6359	No significant trend
	Dissolved Oxygen	7.38	6.46	-12%	0.3408	No significant trend
	Nitrate -N	0.19	0.09	-53%	0.0414	Decreasing trend
	Total Phosphorus	0.17	0.17	0%	0.2656	No significant trend
	Ammonia-N	0.14	0.1	-29%	0.0000	Decreasing trend
	Flow	4.83	0.18	-96%	0.1921	No significant trend

Table 10. Descriptive statistics and ANOVA results for targeted main stem sites (June 2013 to June 2023)

20488 Brushy Creek at Rocky Rd	E. coli	940	305	-68%	0.3245	No significant trend
	Dissolved Oxygen	6.71	6.96	4%	0.3816	No significant trend
	Nitrate -N	0.55	1.52	176%	0.0001	Increasing trend
	Total Phosphorus	0.11	0.1	-9%	0.9439	No significant trend
	Ammonia-N	0.16	0.1	-38%	0.0009	Decreasing trend
	Flow	5.01	0.15	-97%	0.8353	No significant trend
20500 West Fork at Biggs Rd	E. coli	905	113	-88%	0.0071	Decreasing trend
	Dissolved Oxygen	5.53	4.7	-15%	0.3468	No significant trend
	Nitrate -N	0.19	0.1	-47%	0.0396	Decreasing trend
	Total Phosphorus	0.37	0.4	8%	0.6121	No significant trend
	Ammonia-N	0.14	0.1	-29%	0.0406	Decreasing trend
	Flow	0.78	0	-100%	0.5924	No significant trend

Tributaries

Targeted data are collected at 17 sites across multiple tributaries of Plum Creek. Table 11 shows data from an upstream to downstream sequence. In the Upper portion of the watershed, *E. coli* showed no trends except for Andrew's Branch at CR 131, and all sites were above the screening criteria. The reporting period mean for Nitrate-N was below the screening criteria at all Upper portion sites with a decreasing trend at Andrew's Branch at CR 131. Total Phosphorus at all sites was not above the screening criteria. It was, however, found to be significantly increasing at Cowpen Creek. Ammonia-N was above screening criteria at Andrew's Branch. Ammonia-N showed no trends of increase at any site. Additionally, Ammonia-N appears to be decreasing at Brushy Creek at FM 2001.

In the Middle portion of the watershed, *E. coli* has an increasing trend at Town Branch and is above screening criteria at all sites. Nitrate-N showed an increasing trend for Clear Fork at PR 10 but there was no trend observed at Clear Fork at Farmers Rd. Nitrate-N was above screening criteria at Clear Fork at PR 10 and Town Branch. No sites were over screening criteria for Total Phosphorus and there were no trends exist for Total Phosphorus. Ammonia-N showed a decreasing trend at Clear Fork at PR 10 and all sites, other than Dry Creek at FM 713, were below the screening criteria.

Finally, the Lower portion's sites all measured above the screening criteria for *E. coli*, though no trends were found. Nitrate-N was above the screening criteria at Clear Fork at Old Luling Rd accompanied

with an increasing trend for this site. Nitrate-N showed a decreasing trend at Salt Branch at FM 1322. Total Phosphorus was above the screening criteria at Salt Branch at FM 1322. However, there is a decreasing trend in Total Phosphorus at Salt Branch at FM 1322. Ammonia-N was above screening criteria at Salt Branch at FM 1322. Ammonia-N was not found to be increasing at any site, rather, the data showed a decreasing trend at Clear Fork at Old Luling Rd and Tenney Creek at Tenney Creek Rd.

Table 11. Descriptive statistics and ANOVA results for targeted tributary sites (June 2013 to June 2023)

Site	Water Quality Parameter	Overall Mean	Reporting Period Mean	Difference	Significance of F-test	Interpretation
Upper Portion of Watershed						
12538 Andrew's Branch at CR 131	E. coli	694	304	-56%	0.0399	Decreasing trend
	Dissolved Oxygen	5.86	0.36	-94%	0.0000	Decreasing trend
	Nitrate -N	8.38	0.83	-90%	0.0000	Decreasing trend
	Total Phosphorus	0.24	0.36	50%	0.6286	No significant trend
	Ammonia-N	0.22	0.52	136%	0.5061	No significant trend
	Flow	1.73	0.6	-65%	0.2396	No significant trend
12559 Porter Creek at 128	E. coli	665	463	-30%	0.4470	No significant trend
	Dissolved Oxygen	8.14	7.9	-3%	0.0614	No significant trend
	Nitrate -N	0.88	0.9	2%	0.8626	No significant trend
	Total Phosphorus	0.11	0.1	-9%	0.0893	No significant trend
	Ammonia-N	0.16	0.1	-38%	0.0001	Decreasing trend
	Flow	9.23	1	-89%	0.5781	No significant trend
20481 Bunton Branch at Heidenreich Lane	E. coli	575	610	6%	0.2626	No significant trend
	Dissolved Oxygen	8.7	8.67	0%	0.3633	No significant trend
	Nitrate -N	3	0.55	-82%	0.9296	No significant trend
	Total Phosphorus	0.1	0.05	-50%	0.9504	No significant trend
	Ammonia-N	0.2	0.1	-50%	0.2536	No significant trend
	Flow	3.5	1.8	-49%	0.7454	No significant trend

Table 11. Descriptive statistics and ANOVA results for targeted tributary sites (June 2013 to June 2023)

20482 Brushy Creek at FM 2001	E. coli	446	225	-50%	0.1654	No significant trend
	Dissolved Oxygen	20.1	18.6	-7%	0.3376	No significant trend
	Nitrate -N	0.2	0.3	50%	0.8914	No significant trend
	Total Phosphorus	0.1	0.09	-10%	0.4258	No significant trend
	Ammonia-N	0.1	0.1	0%	0.0074	Decreasing trend
	Flow	5.6	1.3	-77%	0.8508	No significant trend
20489 Cowpen Creek at Schuelke Rd	E. coli	3163	5600	77%	0.0265	Increasing trend
	Dissolved Oxygen	8.32	9.73	17%	0.4981	No significant trend
	Nitrate -N	0.45	0.25	-44%	0.0915	No significant trend
	Total Phosphorus	0.28	0.45	61%	0.0009	Increasing trend
	Ammonia-N	0.21	0.1	-52%	0.4475	No significant trend
	Flow	8.55	6.34	-26%	0.6979	No significant trend
20502 Bunton Branch at Dacy Lane	E. coli	399	498	25%	0.5890	No significant trend
	Dissolved Oxygen	6.73	6.87	2%	0.0233	Decreasing trend
	Nitrate -N	0.32	0.27	-16%	0.4276	No significant trend
	Total Phosphorus	0.08	0.04	-50%	0.4068	No significant trend
	Ammonia-N	0.14	0.1	-29%	0.0019	Decreasing trend
	Flow	1.07	0.41	-62%	0.4806	No significant trend
20505 Richmond Branch at Dacy Lane	E. coli	743	815	10%	0.9634	No significant trend
	Dissolved Oxygen	6.84	7.03	3%	0.9821	No significant trend
	Nitrate -N	0.5	0.37	-26%	0.6490	No significant trend
	Total Phosphorus	0.07	0.04	-43%	0.1725	No significant trend
	Ammonia-N	0.28	0.1	-64%	0.1482	No significant trend
	Flow	0.36	0.14	-61%	0.3591	No significant trend

Table 11. Descriptive statistics and ANOVA results for targeted tributary sites (June 2013 to June 2023)

Middle Portion of Watershed						
12557 Town Branch at E Market St	E. coli	2754	536	-81%	0.8589	No significant trend
	Dissolved Oxygen	8.84	9.13	3%	0.1381	No significant trend
	Nitrate -N	12.62	14.46	15%	0.0000	Increasing trend
	Total Phosphorus	0.1	0.06	-40%	0.9843	No significant trend
	Ammonia-N	0.17	0.1	-41%	0.0016	Decreasing trend
	Flow	2.17	0.51	-76%	0.9956	No significant trend
20490 Clear Fork at Farmers Road	E. coli	264	465	76%	0.7019	No significant trend
	Dissolved Oxygen	8.06	7	-13%	0.0219	Decreasing trend
	Nitrate -N	6.29	0.65	-90%	0.6112	No significant trend
	Total Phosphorus	0.1	0.31	210%	0.3520	No significant trend
	Ammonia-N	0.13	0.1	-23%	0.7925	No significant trend
	Flow	0.28	0	-100%	0.6406	No significant trend
20493 Clear Fork at PR 10	E. coli	681	558	-18%	0.1316	No significant trend
	Dissolved Oxygen	8.43	8.82	5%	0.8196	No significant trend
	Nitrate -N	4.58	5.75	26%	0.0002	Increasing trend
	Total Phosphorus	0.09	0.08	-11%	0.1450	No significant trend
	Ammonia-N	0.17	0.11	-35%	0.0011	Decreasing trend
	Flow	6.52	1.34	-79%	0.9042	No significant trend
20495 Dry Creek at FM 713	E. coli	4353	1286	-70%	0.2864	No significant trend
	Dissolved Oxygen	6.19	4.48	-28%	0.0052	Decreasing trend
	Nitrate -N	0.17	0.06	-65%	0.0023	Decreasing trend
	Total Phosphorus	0.24	0.26	8%	0.8881	No significant trend
	Ammonia-N	0.28	0.47	68%	0.0728	No significant trend
	Flow	4.15	0.1	-98%	0.2193	No significant trend

Table 11. Descriptive statistics and ANOVA results for targeted tributary sites (June 2013 to June 2023)

Lower Portion of Watershed						
12555 Salt Branch at FM 1322	E. coli	1323	355	-73%	0.6252	No significant trend
	Dissolved Oxygen	4.99	3.25	-35%	0.0652	No significant trend
	Nitrate -N	11.04	1.39	-87%	0.0499	Decreasing trend
	Total Phosphorus	2.17	1.39	-36%	0.0081	Decreasing trend
	Ammonia-N	0.31	0.34	10%	0.8736	No significant trend
	Flow	1.475	0.15	-90%	0.8857	No significant trend
14945 Clear Fork at Old Luling Rd	E. coli	514	439	-15%	0.1324	No significant trend
	Dissolved Oxygen	7.9	8.81	12%	0.2334	No significant trend
	Nitrate -N	3.1	3.54	14%	0.0085	Increasing trend
	Total Phosphorus	0.1	0.08	-20%	0.3983	No significant trend
	Ammonia-N	0.1	0.1	0%	0.0000	Decreasing trend
	Flow	6.6	1.15	-83%	0.2782	No significant trend
20496 Tenney Creek at Tenney Creek Rd	E. coli	1953	713	-63%	0.0670	No significant trend
	Dissolved Oxygen	7.54	7.63	1%	0.3937	No significant trend
	Nitrate -N	0.32	0.34	6%	0.5786	No significant trend
	Total Phosphorus	0.33	0.33	0%	0.9378	No significant trend
	Ammonia-N	0.12	0.1	-17%	0.0267	Decreasing trend
	Flow	8.16	1.33	-84%	0.2273	No significant trend
20497 WEST Fork at FM 671	E. coli	1721	2034	18%	0.5393	No significant trend
	Dissolved Oxygen	7.09	5.42	-24%	0.0842	No significant trend
	Nitrate -N	0.31	0.49	58%	0.3437	No significant trend
	Total Phosphorus	0.23	0.51	122%	0.0191	Increasing trend
	Ammonia-N	0.1	0.1	0%	0.1447	No significant trend
	Flow	1.31	0.4	-69%	0.3346	No significant trend

Table 11. Descriptive statistics and ANOVA results for targeted tributary sites (June 2013 to June 2023)

20498 Copperas Creek at Tenney Creek Rd	E. coli	2503	1340	-46%	0.3748	No significant trend
	Dissolved Oxygen	7.65	11.5	50%	0.0077	Increasing trend
	Nitrate -N	0.21	0.08	-62%	0.3510	No significant trend
	Total Phosphorus	0.81	0.14	-83%	0.0977	No significant trend
	Ammonia-N	0.95	0.1	-89%	0.1998	No significant trend
	Flow	0.46	0.01	-98%	0.1749	No significant trend
20501 Salt Branch at Salt Flat Rd	E. coli	2536	1729	-32%	0.9467	No significant trend
	Dissolved Oxygen	4.7	4.44	-6%	0.3060	No significant trend
	Nitrate -N	0.2	0.14	-30%	0.6275	No significant trend
	Total Phosphorus	0.2	0.22	10%	0.4017	No significant trend
	Ammonia-N	0.3	0.17	-43%	0.0887	No significant trend
	Flow	0.5	0.04	-92%	0.3712	No significant trend

Springs

Data collected from Boggy Springs, Lockhart Springs, and Clear Fork Springs are in Table 12. These data show Nitrate-N significantly increasing in all springs, and Dissolved Oxygen significantly decreasing in Boggy and Clear Fork Springs. Highlighted values exceed the TCEQ stream standard or screening criteria for Plum Creek.

Table 12. Descriptive statistics and ANOVA results for Springs

Site	Water Quality Parameter	Overall Mean	Reporting Period Mean	Difference	Significance of F-test	Interpretation
20507 Clear Fork Springs at Borchert Loop	E. coli	412	214	-48%	0.6439	No significant trend
	Dissolved Oxygen	8.55	7.64	-11%	0.0040	Decreasing trend
	Nitrate -N	8.39	9.24	10%	0.0000	Increasing trend
	Total Phosphorus	0.04	0.04	0%	0.7280	No significant trend
	Ammonia-N	0.12	0.1	-17%	0.0001	No significant trend
	Flow	2.13	0.41	-81%	0.7688	No significant trend

Table 12. Descriptive statistics and ANOVA results for Springs

20508 Boggy Creek Springs at Boggy Creek Rd	E. coli	469	977	108%	0.0532	No significant trend
	Dissolved Oxygen	7.37	6.6	-10%	0.0623	Decreasing trend
	Nitrate -N	8.46	11.39	35%	0.0000	Increasing trend
	Total Phosphorus	0.05	0.03	-40%	0.7566	No significant trend
	Ammonia-N	0.23	0.24	4%	0.4183	No significant trend
	Flow	0.31	0.11	-65%	0.4378	No significant trend
20509 Lockhart Springs	E. coli	452	686	52%	0.6050	No significant trend
	Dissolved Oxygen	9.09	8.49	-7%	0.0723	No significant trend
	Nitrate -N	13.52	15.33	13%	0.0000	Increasing trend
	Total Phosphorus	0.05	0.04	-20%	0.5757	No significant trend
	Ammonia-N	0.13	0.1	-23%	0.0085	No significant trend
	Flow	1.02	0.33	-68%	0.6312	No significant trend

Adaptive Management

Adaptive management is an approach to natural resource management in which decisions are made as part of an ongoing science-based process with empirical data and community feedback. As such, adaptive management involves testing, monitoring, and evaluating applied strategies, and incorporating new knowledge into management approaches that are based on scientific findings, coupled with the needs of the community. Results are used to modify management policies, strategies, and practices.

Historically, the Partnership has been committed to adaptive management of the Plum Creek WPP. The PCW is extremely diverse in terms of land use, land cover, and socioeconomic characteristics with rapid development in the headwaters and a predominantly rural setting in the lower reaches of the watershed.

Over the course of project implementation, instream monitoring data provided by GBRA were compared with interim milestones and water quality criteria to determine progress in achieving water quality standards. The Plum Creek WPP Update report is a document that will continue to be developed and approved to be published approximately every two years. This biennial report will contain updates on tracking the progress of implementation, outreach activities, and water quality monitoring in the watershed. The report will document and provide updates and any issues or adaptive management decisions on all of the measures within the WPP and any modifications to the goals and strategies identified in the WPP. In addition, it will include an analysis of current water quality data to determine progress in achieving water quality restoration.

Implementation Schedule and Milestones

The original WPP was published in 2008 and projected a 10-year time frame. Table 13 details updates to each Management Measure proposed in the 2008 WPP. Additional tables in this section outline the Outreach Activities accomplished during the WPP implementation and reporting period.

Table 13. Management Measures

Management Measure	Entity	Progress since implementation began (2008)
Urban Stormwater Management Measures		
Pet Waste Collection Stations	City of Kyle	11 pet waste stations
	City of Lockhart	25 pet waste stations, 2 of which were installed during this reporting period
	City of Luling	6 pet waste stations
	City of Buda	23 pet waste stations, 2 of which were installed during this reporting period
	City of Uhland	1 pet waste station, which was installed during this reporting period
Comprehensive Stormwater Assessment	City of Kyle	1 completed prior to the 2018 Update
Retrofit Stormwater Basins	City of Kyle	2 completed prior to the 2018 Update
Initiate Street Sweeping Program	City of Kyle	City sweeps ~370 miles per month
	City of Buda	City sweeps as needed
	City of Lockhart	City sweeps ~100 miles per month
Comprehensive Urban Stormwater Assessment and Illicit Discharge Survey	City of Lockhart	Completed prior to the 2018 Update
Manage Urban Waterfowl Populations	City of Lockhart	Signage placed prior to 2020 Update
Rain Gardens	City of Kyle	4 constructed prior to 2020 Update (Burleson Road)
	Caldwell County	1 constructed in 2019 (County Justice Center)
	City of Lockhart	1 constructed in 2019 (City Park)
Wastewater Management Measures		
Wastewater Upgrade (TSS Reduction)	WWTP Operators	3 upgraded prior to the 2018 Update
Wastewater Upgrade (Phosphorus Removal)	WWTP Operators	4 upgraded, 1 of which during the reporting period
Volunteer Monthly *E. coli* Monitoring	WWTP Operators	10 monitor at least monthly
Volunteer Monthly Phosphorus Monitoring	WWTP Operators	6 monitor at least monthly

Table 13 Management Measures

Sanitary Sewer Pipe Replacement	City of Kyle	47,177 feet repaired or added. During the reporting period, 277 services reporting period, MS4 YR 2 reports ~26,000 ft inspected and ~23,000 ft cleaned
	City of Lockhart	27,600 feet repaired or added. During reporting period, 277 services repaired or replaced and 47 mains repaired.
	City of Luling	Total unknown. The city approximates between 1,000 and 10,000 feet have been repaired during the reporting period
	City of Buda	21,120 feet repaired or added
Initiate Sanitary Sewer Inspection	City of Luling	1 completed prior to the 2018 Updated
Lift Station SCADA Installation	City of Kyle	13 lift stations monitored via SCADA, includes 1 at the WWTP
	City of Luling	1 completed prior to the 2018 Update
Septic System Inspection/Enforcement, or Repairs/Replacements	Caldwell County	Estimates 15 repairs/replacements and 80 inspections/enforcement
Agricultural Management Measures		
WQMP Technician	SWCD	Continually funded
Conservation Plans	SWCD/NRCS	140 conservation plans
Feral Hog Education	AgriLife Extension	Continually funded
Bounty Claim	Central Texas Feral Hog Task Force	18,189 harvested, 1413 of which were harvested during the reporting period
Targeted Water Quality Monitoring	GBRA	Continually funded
Comprehensive Stream Assessment	GBRA	Continually funded
Bacterial Source Tracking	TAMU	Completed prior to 2020 Update

Without a central database on septic information in either Hays or Caldwell County, data were not readily available to understand the scope of septic improvements needed for the WPP implementation. Information on the number of new septic permits was available through Public Records Request. From October 2021 to October 2023, Hays County reported approximately 90 new OSSF permits within the PCW while Caldwell County had approximately 65 new permits in the entire county, of which most are in the PCW.

Table 14. Outreach Activities

Outreach Activity	Entity	Progress since implementation began (2008)
Broad-Based Activities		
Texas Watershed Steward	Extension	5, 1 of which was during the reporting period
Elementary School Water Quality Project	GBRA	~9,000 schoolchildren have participated, ~3,000 of which were during the reporting period
Plum Creek Watershed Protection Brochure	GBRA	~7,300 distrusted
Displays at the Local Events	Extension/TSSWCB	~13+2, 2 of which were during reporting period
Urban Programs		
Pet Waste Program	Cities/TCEQ/Extension	5 ongoing programs
NEMO Workshops	GBRA/TCEQ/Extension	4 total (no longer a program)
Fats, Oils, and Grease Workshop	GBRA/TCEQ/Extension	Online modules created in 2018; still available
Municipal Site Assessment Visits	GBRA/TCEQ/Extension	2 completed during the previous reporting period
Urban Sector Nutrient Education	Extension	4 program events
Sports and Athletic Field Education (SAFE)	Extension	1 event (no longer a program)
Wastewater Programs		
Develop Septic System Online Training Modules	GBRA	Online program created and available through Agrilifelearn.tamu.edu
Septic System Workshops and Assistance	GBRA/ Extension	14 program events; Online training made available last reporting period (still available)
Soil and Water Testing Campaigns	Extension	12 events
Agriculture Nutrient Management Education	Extension	11 program events
Crop Management Seminars	Extension	5 program events
Agricultural Pesticide Waste Collection Days	TCEQ	1 program event (no longer a program)
Lone Star Healthy Streams (Cattle grazing)	Extension	4 program events, 1 of which was during the reporting period
Non-Domestic Animal and Wildlife Programs		
Feral Hog Management	Extension	16 program events; 2 of which were during the reporting period. Continual bounty claim event
Stream and Riparian Workshop	Extension	7 program events
Illegal Dumping Site Cleanup	GBRA/ Keep Texas Beautiful/ Cities/ Counties	19 cleanups
Community Stream Cleanup Events	GBRA/ Keep Texas Beautiful/ Cities/ Counties	28 events, 3 of which were during the reporting period
Rainwater Harvesting Education/Demonstration	Extension	7 program events
Healthy Lawns Healthy Waters	Extension	4 program events, 1 of which was during the reporting period

Table 15. Plum Creek Educational Presentations

Time of Year	Event Type / Location	County	Topic	Number of Students
10/15/2021	Watersheds and Plum Creek classroom presentation w/ model / Clear Fork Elementary (Elem) 3rd graders (Lockhart ISD)	Caldwell	Water Quality and Plum Creek	50
11/18/2021	Incredible Journey Water Cycle Game / Clear Fork Elem 5th graders/ Lockhart	Caldwell	Water Quality and Plum Creek/ Water Cycle and NPS	80
12/2/2021	Incredible Journey Water Cycle Game /Strawn Elem 5th graders/ Lockhart	Caldwell	Water Quality and Plum Creek/ Water Cycle and NPS	80
2/9/2022	Watersheds and Plum Creek classroom presentation w/ model / Negley Elem (Hays- Kyle)	Hays	Water Quality and Plum Creek	120
2/10/2022	Watersheds and Plum Creek classroom presentation w/ model / Camino Real (Hays CISD – Niederwald)	Haw	Water Quality and Plum Creek	120
2/16/2022	Watersheds and Plum Creek classroom presentation w/ model / Bluebonnet Elem (Lockhart ISD)	Caldwell	Plum Creek NPS Presentation - Watershed Model	120
2/22/2022	Watersheds and Plum Creek classroom presentation w/ model / Fuentes (Hays ISD- Kyle)	Hays	Water Quality and Plum Creek	80
2/28/2022	Watersheds and Plum Creek classroom presentation w/ model -Navarro (Lockhart ISD)	Caldwell	Water Quality and Plum Creek	80
3/2/2022	Plum Creek Water Quality Monitoring/ Bluebonnet Elem, Lockhart ISD 4th grade	Caldwell	Water Quality and Testing Samples in Classroom	120
3/2/2022	Plum Creek Water Quality Monitoring/ Navarro Elem, Lockhart ISD 4th grade	Caldwell	Water Quality and Testing Samples in Classroom	90
3/4/2022	Plum Creek Non-Point Source presentation and Stream Modeling / Bluebonnet Elem/ Lockhart State Park Program, 5th graders	Caldwell	Water Quality and Plum Creek/ NPS pollution	120
3/8/2022	Plum Creek Water Quality Monitoring/ Camino Real Elem, Hays ISD 4th grade	Hays	Water Quality and Testing Samples in Classroom	100
3/9/2022	Plum Creek Water Quality Monitoring/ Negley Elem, Hays ISD 4th grade	Hays	Water Quality and Testing Samples in Classroom	120
3/9/2022	Plum Creek Water Quality Monitoring / Fuentes Elem, Hays ISD 4th grade	Hays	Water Quality and Testing Samples in Classroom	80
4/8/2022	Plum Creek Non-Point Source presentation and Stream Modeling / Lockhart State Park / Lockhart ISD Strawn Elem 5th grade	Caldwell	Water Quality and Plum Creek/ NPS pollution	90
4/22/2022	Plum Creek Non-Point Source presentation and Stream Modeling / Plum Creek Elem / Lockhart ISD 5th grade (LSP Program)	Caldwell	Water Quality and Plum Creek/ NPS pollution	90
4/28/2022	Plum Creek Non-Point Source presentation and Stream Modeling / Navarro Elem / Lockhart ISD 5th grade (LSP Program)	Caldwell	Water Quality and Plum Creek/ NPS pollution	80

Table 15. Plum Creek Educational Presentations

4/29/2022	Plum Creek Non-Point Source presentation and Stream Modeling / Clear Fork Elem / Lockhart ISD 5th grade (LSP Program)	Caldwell	Water Quality and Plum Creek/ NPS pollution	90
5/24/2022	Plum Creek Non-Point Source presentation and Stream Modeling / Navarro Elem, 4th graders, Lockhart ISD	Caldwell	Water Quality and Plum Creek/ NPS pollution	20
3/7/2022 - 3/11/2022	Lockhart State Park - Spring Break Program	Caldwell	Plum Creek NPS/Water Quality Presentation - Stream Modeling	60
5/2/2022 - 5/6/2022	Watersheds and Plum Creek classroom presentation w/ River Basin model / Hays ISD – McCormick Middle School- 7th Grade	Hays	Water Quality and Plum Creek - River Basin Model	335
5/2/2022 - 5/6/2022	Watersheds and Plum Creek classroom presentation w/ River Basin model / Hays ISD – Barton Middle School - 7th Grade	Hays	Water Quality and Plum Creek - River Basin Model	300
10/7/2022	Lockhart State Park / Strawn Elem 5th grade students (Lockhart ISD)	Caldwell	Stream Erosion, Landforms	80
11/17/2022	Lockhart State Park / Navarro Elem 5th grade students (Lockhart ISD)	Caldwell	Stream Erosion Models	80
2/6/2023	Watersheds and Plum Creek classroom presentation w/ model / Navarro Elem / 4th grade / Lockhart ISD	Caldwell	Water Quality and Plum Creek	95
2/7/2023	Watersheds and Plum Creek classroom presentation w/ model / Negley Elem/4th grade/Hays CISD	Hays	Water Quality and Plum Creek	110
2/16/2023	Watersheds and Plum Creek classroom presentation w/ model / Pflueger Elem/ 4th grade/ Hays CISD	Hays	Water Quality and Plum Creek	100
2/22/2023	Watersheds and Plum Creek classroom presentation w/ model / Fuentes Elem/ 4th grade/Hays CISD	Hays	Water Quality and Plum Creek	100
2/27/2023	Watersheds and Plum Creek classroom presentation w/ model / Buda Elem/ 4th graders/ Hays CISD	Hays	Water Quality and Plum Creek	80
2/28/2023	Watersheds and Plum Creek classroom presentation w/ model / Bluebonnet Elem/ 4th grade/ Lockhart ISD	Caldwell	Water Quality and Plum Creek	90
3/3/2023	Plum Creek Monitoring Water Quality / Pfluger and Negley 4th graders /Hays CISD	Hays	Water Quality and Testing Samples in Classroom	280
3/6/2023	Plum Creek Monitoring Water Quality / Navarro and Bluebonnet 4th graders Lockhart CISD	Caldwell	Water Quality and Testing Samples in Classroom	200
3/8/2023	Plum Creek Monitoring Water Quality / Fuentes 4th graders / Hays CISD	Hays	Water Quality and Testing Samples in Classroom	120
3/24/2023	Lockhart State Park/ Bluebonnet Elem 5th grade/ Lockhart ISD	Caldwell	Macroinvertebrates and water quality - Plum Creek NPS	90
4/21/2023	Lockhart State Park/ Clear Fork Elem /5th grade/ Lockhart ISD	Caldwell	Macroinvertebrates and water quality - Plum Creek NPS	100
4/28/2023	Lockhart State Park/ Strawn Elem/ 5th grade	Caldwell	Macroinvertebrates and water quality - Plum Creek NPS	100

Program Coordination and Partnership Sustainability

History

The Partnership recognized early in the process that the fundamental issues associated with long-term project sustainability are extremely complex. These include concerns about how and by whom the implementation strategy will be facilitated, and how funding will be obtained and managed to support active project management and achieve project goals. To address these critical questions, the Partnership created a sustainability subcommittee to research strategies and provide information and options. Experience, input, and recommendations regarding potential approaches were obtained from numerous agencies, entities, groups, and existing watershed efforts both in Texas and across the nation.

For the first 5 years of this project, AgriLife Extension effectively facilitated partnership development and initial implementation efforts utilizing personnel located in College Station. However, it became apparent to the Partnership that there was a need to establish a full-time, locally housed watershed coordinator (WC) to actively facilitate implementation efforts. It was determined that GBRA would be the managing entity of the TSSWCB CWA §319(h) grant for a local WC to take over when the grant managed by AgriLife Extension ended. AgriLife Extension in collaboration with the GBRA and steering committee members engaged personnel and officials with each of the municipalities and counties within the watershed to build strong cooperative partnerships. This effort led to the development, signing (July 2011) and renewal (2018) of an interlocal agreement with local partner entities that provided the 40% match required for a new TSSWCB CWA §319(h) implementation grant to be administered by GBRA. Numerous meetings and presentations were conducted with City Councils, County Commissioner's Courts, and organization boards to provide project updates and information on the interlocal agreement and match structure for the new project. The 12 participating entities included Caldwell and Hays counties, the cities of Lockhart, Luling, Kyle, Uhland, and Buda, GBRA, Plum Creek Conservation District, Aqua Water Supply Corporation, Hays County Soil and Water Conservation District and the Caldwell Travis Soil and Water Conservation District. The project established a local WC position managed by GBRA and housed by Caldwell County in Lockhart.

Since 2013, a local WC has actively promoted Plum Creek WPP implementation, coordinated the Partnership, continued to build and strengthen local partnerships, and has sought external grants to facilitate implementation activities and provide the balance of funds needed to sustain the position.

At meetings held during the summer of 2013, the 12 original participating entities in the Interlocal Agreement, decided to again provide the 40% local match required for a TSSWCB CWA §319(h) implementation grant that currently supports local facilitation of the Partnership and the Plum Creek WPP. These efforts have been guided by the understanding that watershed management programs should strive to transition dependency on federal support to local sponsorship. Plum Creek is the first watershed in Texas to solidify, through an interlocal agreement, local governmental entities' commitment to jointly fund a WC for the mutual benefit of all the entities involved.

Steering Committee

The Steering Committee is composed of stakeholders from the PCW. Initial solicitation of members for equitable geographic and topical representation was conducted using three methods: 1) consultation with the County Extension Agents, Plum Creek Conservation District, Guadalupe-Blanco River Authority, Caldwell-Travis and Hays County Soil and Water Conservation Districts and local and regional governments, 2) meetings with the various stakeholder interest groups and individuals, and 3) self-nomination or requests by the various stakeholder groups or individuals. Stakeholders are defined as either those who make and implement decisions or those who are affected by the decisions made or those who have the ability to assist with implementation of the decisions. As such, members include both individuals and representatives of organizations and agencies. A variety of members serve on the Steering Committee to reflect the diversity of interests within the PCW and to incorporate the viewpoints of those who will be affected by the WPP.

Size of the Steering Committee is not strictly limited by number but rather by practicality. To effectively function as a decision-making body, the membership shall achieve geographic and topical representation. Steering Committee members are expected to participate fully in Committee deliberations. Members will identify and present insights, suggestions, and concerns from a community, environmental, or public interest perspective. Committee members are expected to work constructively and collaboratively with other members toward reaching a consensus.

Committee members will be expected to assist with the following:

- Identify the desired water quality conditions and measurable goals;
- Prioritization of programs and practices to achieve goals;
- Help develop a watershed protection plan document;
- Lead the effort to implement this plan at the local level;
- and Communicate implications of the watershed protection plan to other affected parties in the watershed.

Current Partnership and Steering Committee

The pandemic affected the Steering Committee's ability to meet in-person for the majority of the reporting period. However, virtual meetings were still held quarterly and Steering Committee participation in the Partnership continues. In addition, the Partnership renewed the Interlocal Agreement in May 2023. Here listed are the current funding partners of the Plum Creek Watershed Partnership:

- City of Uhland
- City of Kyle
- City of Buda
- City of Lockhart
- City of Luling
- Caldwell-Travis Soil and Water Conservation District
- Hays County Soil and Water Conservation District
- Plum Creek Conservation District
- Guadalupe-Blanco River Authority
- Caldwell County
- Hays County
- Aqua Water Supply Corporation

Continuing Efforts

The Plum Creek Watershed Partnership began implementation of the Plum Creek Watershed Protection Plan in February 2008, and despite major changes within the watershed, with rapid development, years of drought, and employee turnover at the city and county level, the Partnership continues to be actively engaged in implementation activities. Enthusiasm for continued implementation is evident with the increasing number of new projects within the watershed, including the implementation of low impact developments in the City of Kyle. New programs and projects include a collaboration with Dr. San Hwang, an Environmental Engineer and Associate Professor at Texas State University, and a new Texas Stream Team citizen scientist water quality monitoring group, the Plum Creek Stewards.

In addition to new projects, continued commitment from the Partnership will ensure that critical components of the WPP will continue to be implemented. The Guadalupe-Blanco River Authority will continue water quality monitoring in the watershed through a CWA Section 319(h) grant from the TSSWCB and EPA. Caldwell-Travis Soil and Water Conservation District has committed to continue implementing agricultural components of the WPP by providing technical assistance to farmers and ranchers. The project, funded through a CWA Section 319(h) grant from TSSWCB and EPA will also continue to provide financial assistance to implement agricultural BMPs. The Partnership is hopeful to see wastewater management improvements in the watershed with the renovation, maintenance and expansion of the City of Kyle WWTP.

The watershed coordinator will continue to actively promote Plum Creek WPP implementation, coordinate the Partnership, build and strengthen local partnerships, and work with partners to develop proposals for external grants to further facilitate WPP implementation.

Other Developments

Plum Creek Wetland Preserve

The Plum Creek Wetland Preserve (Preserve) was gifted to the Guadalupe-Blanco River Trust (GBRT) in 2014 from the Texas Department of Public Transportation (TXDOT) as a completed wetland mitigation site from the construction of State Highway 130. The 265-acre Preserve (Figure 37) is north of Lockhart and encompasses over 1.5 miles of Plum Creek as well as portions of Elm Creek. The site includes 21 constructed ponds and wetlands and lies entirely within a 100-year floodplain.

GBRT is a land trust and nonprofit organization whose mission is to preserve natural resources and open space. GBRT views the Preserve as an extension of its mission, with a focus on restoration and water quality by implementing the following three major goals:

1. Protect, maintain and enhance the wetland, riparian and additional wildlife habitat on the property;
2. Provide appropriate outdoor recreational opportunities while protecting the conservation values of the property; and
3. Provide scientific and educational opportunities related to wetlands, wildlife and conservation.

Given the alignment of goals between GBRT and the WPP, this restoration and conservation project is of paramount importance to the Partnership.

The Preserve Planning Committee was originally formed in 2016 and crafted initial planning documents. In 2021, GBRT was able to expand its organizational capacity by hiring a Conservation and Stewardship Manager and reviving the Preserve Planning Committee. The Master Planning Committee has held 4 meetings and has worked to address the mission statement, values, vision, and activities for the Preserve. The Plum Creek Watershed Coordinator serves on this committee. GBRT completed the Plum Creek Wetland Preserve Master Plan in January 2023.

Figure 37. Plum Creek Wetland Preserve

Region 11 Guadalupe Regional Flood Planning Group

Regional Flood Planning Groups (RFPG) are the result of Senate Bill 8 from the 86th Texas Legislature that created a state flood planning process for Texas, administered by the Texas Water Development Board (TWDB). As shown in Figure 38, TWDB designated 15 planning area regions, including the Guadalupe River Basin (Region 11). Regional groups will work across Texas to develop bottom-up approaches to flood planning, including identifying and assessing risks, establishing risk reduction goals, identifying and recommending evaluation and strategies, and flood mitigation projections. Further, RFPGs are to focus on reducing risks to life and property — and specifically avoid increasing flood risks to future Texans by keeping them out of the floodways. Region 11 held its first Planning Group Meeting on November 4, 2020 and has since held 30 Planning Group and 4 Executive Meetings at the time of this update.

The Final Guadalupe Regional Flood Plan was approved by the planning group on January 4, 2023 and was submitted to TWDB. More information is available at their website: guadaluperfpg.org.

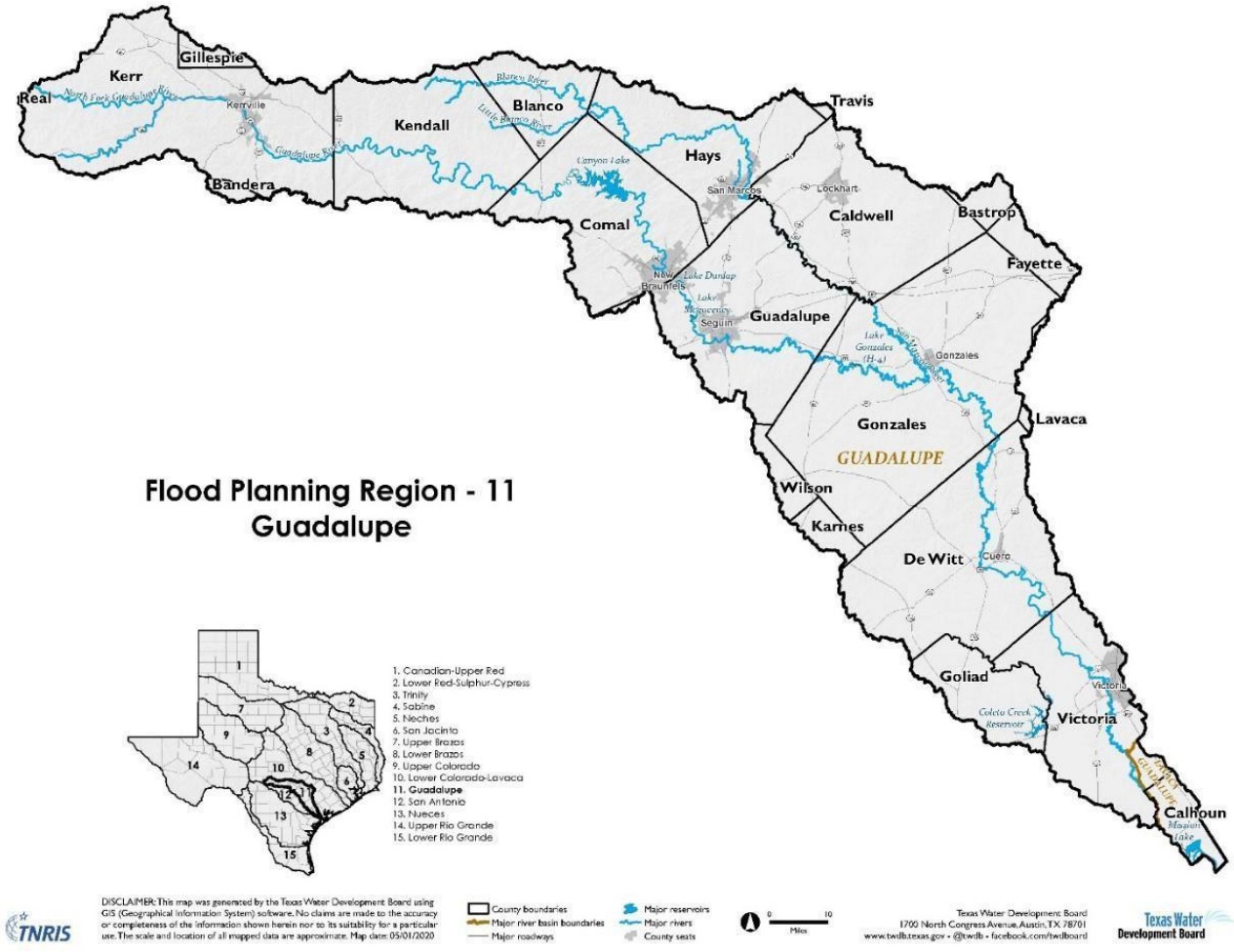

Figure 38. Flood Planning Region 11

The Great Springs Project

The Great Springs Project is working to create a greenway of contiguous protected lands between Austin and San Antonio over the Edwards Aquifer recharge zone. This green corridor will be connected by a network of spring-to-spring trails, linking four of Texas' Great Springs: Barton Springs, San Marcos Springs, Comal Springs, and San Antonio Springs. The Great Springs Project envisions unifying existing local efforts to address the most critical water, land, wildlife, and public health challenges facing the Central Texas region. More information on the Great Springs Project can be found at https://greatspringsproject.org/,

Figure 39. Conceptual map of the Great Springs Trail Source: Economics Benefit Report 2021

In the PCW, Kyle will serve as a connection for the Great Springs Project. In September of 2021, Hays Free Press reported "Kyle trail system will connect Austin to San Antonio." The article states that Kyle City Council approved the trail system in a 6 to 1 vote. The new trail system, tentatively named "The Vybe," will connect new and existing trails in the city, while featuring different "vybes" along the trail, such as shops and eateries. The article concludes by stating it is unclear when construction of "The Vybe" will commence, but it should be noted the entire Great Springs Project trail from Austin to San Antonio is expected to be completed by 2036. Descriptions of current and upcoming trails are available at https://www.cityofkyle.com/recreation/trails.

Appendix

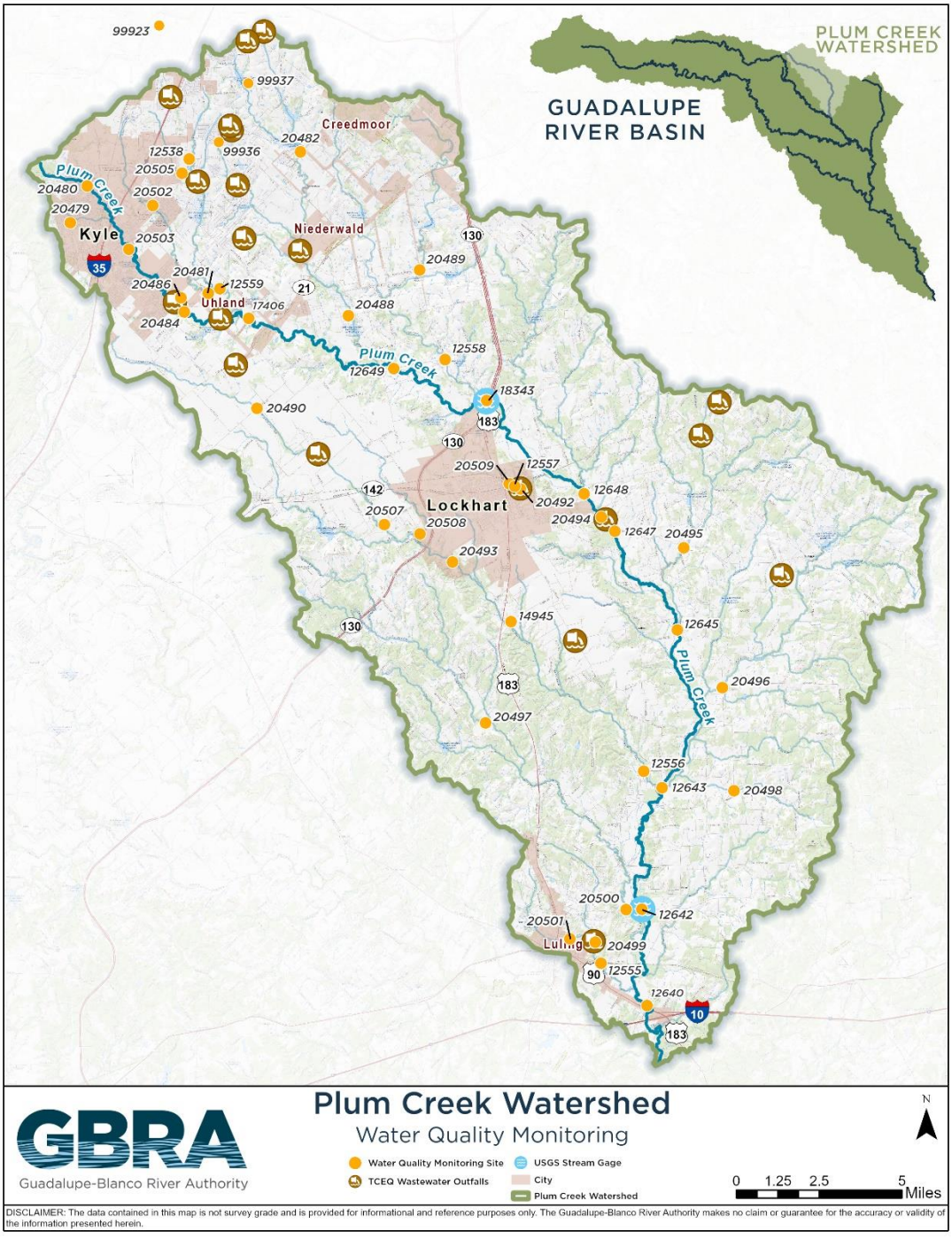

Figure 40. Water Quality Monitoring sites with TCEQ Wastewater Outfalls

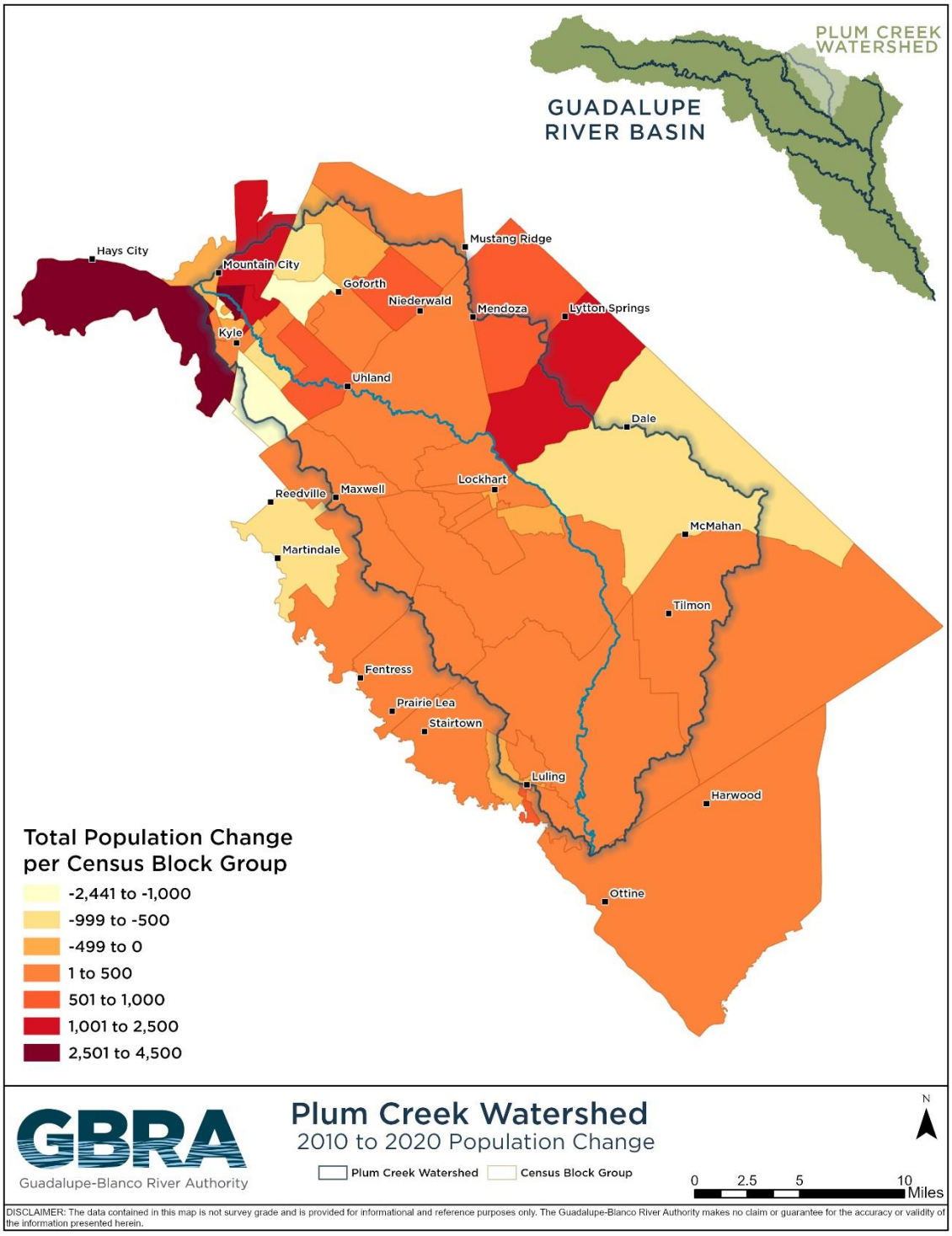

Figure 41. Population Change in the Plum Creek Watershed