

Nonpoint Source Pollution Management in Texas

2019 ANNUAL REPORT



Texas
Commission on
Environmental
Quality



Texas State
Soil & Water
Conservation
Board





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Garner State Park - Concan, Texas
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Letter from the *Executive Directors*

The *Nonpoint Source Management Program* outlines Texas' comprehensive strategy to protect and restore waters across the state impacted by nonpoint source pollution. This strategy is implemented by utilizing voluntary, regulatory, financial, and technical assistance approaches, while working with a multitude of partners, to achieve a balanced program. The United States Environmental Protection Agency (EPA) provides grant funding to Texas to implement the components and goals set forth in the *Texas Nonpoint Source Management Program*. The responsibility for implementing this program is shared between the Texas Commission on Environmental Quality (TCEQ) and the Texas State Soil and Water Conservation Board (TSSWCB).

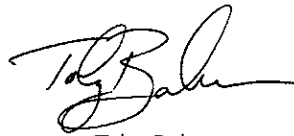
Texas has consistently worked with partners across the state to develop and implement watershed-based plans to improve water quality. At the close of fiscal year 2019, more than 30 watershed protection plans that satisfy EPA's *Nine Key Elements for Watershed Based Plans* have been accepted by the EPA. Together with partners and stakeholders, TCEQ and the TSSWCB are actively engaged in implementing voluntary management measures identified in the watershed-based plans.

We are pleased to present the *2019 Annual Report* of the state's *Nonpoint Source Management Program*. The report highlights our accomplishments in managing nonpoint source pollution and meeting the goals of the program. In partnership with the EPA and other federal, state, regional, and local watershed stakeholders, TCEQ and the TSSWCB look forward to the continued implementation of an efficient, accountable, and transparent program.

Sincerely,



Rex Isom
Executive Director
Texas State Soil and
Water Conservation Board



Toby Baker
Executive Director
Texas Commission on
Environmental Quality

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Enchanted Rock State Park - Fredericksburg, Texas
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Benbrook Lake in Fort Worth, Texas
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CHAPTER 1

INTRODUCTION

Defining Nonpoint Source Pollution

Nonpoint source pollution occurs when rainfall or snowmelt flows over land, roads, buildings, and other features of the landscape, and carries pollutants into drainage ditches, lakes, rivers, wetlands, coastal waters, and even underground sources of water. This is unlike point source pollution which results from a discharge at a specific single location. Some nonpoint source pollutants include:

- fertilizers, herbicides, and insecticides from agricultural lands and residential areas;
- oil, grease, and toxic chemicals from spills, roads, urban areas, industrial facilities, and energy production;
- sediment from construction sites, crop and forest lands, and eroding stream banks; and
- bacteria and nutrients from livestock, pet waste, wildlife, and leaking septic systems.

Nonpoint source pollution can also originate as air pollution which is deposited onto the ground and into waterways, through a process called atmospheric deposition.

What Guides Nonpoint Source Pollution Management in Texas?

Under the federal Clean Water Act (CWA) and the Texas Water Code, Texas must adopt surface water quality standards for waters in the state, assess the status of water quality, and implement actions necessary to achieve and maintain those standards. The long-term goal of the

Texas Nonpoint Source Management Program, developed under CWA Sections 319(a) and 319(b), is to protect and restore the quality of the state's water resources from the adverse effects of nonpoint source pollution. This is accomplished through cooperative implementation using the organizational tools and strategies defined below.

Partnerships

The Texas Commission on Environmental Quality (TCEQ) is the lead state agency responsible for establishing the level of water quality to be maintained in Texas. Per the Texas Water Code Chapter 26, a primary responsibility of TCEQ is the abatement of nonpoint source pollution from sources which are not agricultural or silvicultural. The Texas State Soil and Water Conservation Board (TSSWCB) is the lead agency in the state for planning, implementing, and managing programs and practices that prevent and abate agricultural and silvicultural nonpoint source pollution. TCEQ and the TSSWCB coordinate closely to jointly administer the *Texas Nonpoint Source Management Program*.

Management of nonpoint source pollution in Texas involves partnerships with many organizations to coordinate, develop, and implement the *Texas Nonpoint Source Management Program*. With the variety of nonpoint source issues across Texas, cooperation across political boundaries is essential. Many local, regional, and state agencies play an integral part in managing nonpoint source pollution. They provide information about local concerns and infrastructure and build support for the management measures that are necessary to prevent and reduce nonpoint source pollution. By coordinating with these partners to share information and resources, the state can more effectively manage its water quality protection and restoration efforts.

The Texas Nonpoint Source Management Program

The *Texas Nonpoint Source Management Program* outlines Texas' comprehensive strategy to protect and restore waters impacted by nonpoint source pollution. Nonpoint source pollution is managed through assessment, planning, implementation, and education. The state has established long- and short-term goals and objectives for guiding and tracking the progress of its nonpoint source management program. This report highlights the success in achieving these goals and objectives.

Goals for Nonpoint Source Management

LONG-TERM GOAL

The long-term goal of the *Texas Nonpoint Source Management Program* is to protect and restore water quality affected by nonpoint source pollution through implementing the following short-term goals: data collection and assessment, implementation, and education.

SHORT-TERM GOALS

Goal One—Data Collection and Assessment

Coordinate with appropriate federal, state, regional, and local entities, and stakeholder groups to target water quality assessment activities in high priority, nonpoint source-impacted watersheds, vulnerable and impacted aquifers, or areas where additional information is needed.

Goal Two—Implementation

Implement watershed protection plans and/or Total Maximum Daily Load (TMDL) implementation plans and other state, regional, and local plans/programs to reduce nonpoint source pollution by targeting implementation activities to the areas identified as impacted or potentially degraded by nonpoint source pollution with respect to use criteria.

Goal Three—Education

Conduct education and technology transfer activities to increase awareness of nonpoint source pollution and activities which contribute to the degradation of water bodies, including aquifers, by nonpoint source pollution.

The Watershed Approach

Protecting the state's streams, lakes, bays, and aquifers from the impacts of nonpoint source pollution is a complex process. Texas uses the Watershed Approach to focus efforts on the highest priority water quality issues of both surface water and groundwater. The Watershed Approach is based on the following principles:

- a geographic focus based on hydrology rather than political boundaries;
- water quality objectives based on scientific data;
- coordinated priorities and integrated solutions; and
- diverse, well-integrated partnerships.

For groundwater management, the geographic focus is on aquifers rather than watersheds. Wherever interactions between surface water and groundwater are identified, management activities will support the quality of both resources.

The Watershed Approach recognizes that to achieve restoration of impaired water bodies, solutions to water quality issues must be socially equitable, economically viable, and environmentally bearable.



FIGURE 1.1

Social, Economic, and Environmental Solutions for Water Quality Restoration

Watershed Action Planning

A major element in the Texas Nonpoint Source Management Program is the inclusion of the Watershed Action Planning (WAP) process and the Nonpoint Source Priority Watersheds Report.

The WAP process provides a framework for tracking priority water quality issues from selection through implementation. Partner agencies first review identified water quality issues, which are typically water bodies listed as impaired on the CWA 303(d) list, then determine the best strategy for addressing the issue. Strategies may include further data collection, evaluation of appropriate water quality standards, and/or development of a watershed-based plan with specific restoration activities.

Once a strategy is determined, a lead program for implementation is assigned. Restoration activities identified in watershed-based plans are eligible and prioritized for federal funding and implementation.

Management strategies to address nonpoint source water quality issues are determined through a collaborative approach

and documented in the Nonpoint Source Priority Watersheds Report. This comprehensive planning process fosters relationships and facilitates greater coordination and leveraging of resources between state and local water resource agencies.

Funding limitations, new guidelines, increasing populations, and evolving environmental policies create new challenges for the state water quality planning programs. This elevates the importance of incorporating the WAP process in the Nonpoint Source Program. The coordination process allows stakeholders the opportunity to provide a local perspective into water quality management strategies and priorities. Interagency coordination of the state's water quality programs allows for more effective development of projects, leveraging of resources, and the implementation of water quality management strategies with stakeholder support.

The WAP process integrates information from existing planning tools and from the coordination process to develop and track water quality management strategies

and implementation. As part of the WAP process, these strategies are documented and periodically updated with the cooperation of the WAP partners. Partners include the TSSWCB, the Clean Rivers Program partners (typically river authorities), and the five TCEQ Water Quality Planning Division program areas—Surface Water Quality Standards Program, Surface Water Quality Monitoring Program, Clean Rivers Program, TMDL Program, and the Nonpoint Source Program. The result of this process is a list of all water quality impairments and special interest water bodies in the state that identifies what will be done to address the impairment or concern, the party responsible for undertaking the action, and a means of tracking progress. Water quality management strategies identified through the WAP process are implemented on a continuing basis. The WAP process has helped identify and track restoration efforts, the collection of water quality data, the adoption of TMDLs, and the completion of watershed protection plans.



Garner State Park - Concan, Texas
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Blue Hole Park - Wimberly, Texas
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CHAPTER 2

PROGRESS IN IMPROVING WATER QUALITY

Section 319(h)(11) of the CWA requires that state nonpoint source annual reports include, "...to the extent that appropriate information is available, reductions in nonpoint source pollutant loading and improvements in water quality... resulting from implementation of the management program." This specifically applies to the water bodies that have previously been identified as requiring nonpoint source pollution control actions in order to "...attain or maintain applicable water quality standards or the goals and requirements of the Clean Water Act." The three primary ways of measuring improvement in water quality are through:

- measuring actual results from implementing management measures;
- calculating estimated load reductions with the help of models or other calculations; and
- coordinated priorities and integrated solutions; and long-term monitoring of the water body.

Other indicators of progress toward water quality improvements include land use modifications or behavioral changes that are associated with reductions in loadings or pollutant concentrations in water bodies. Examples include restored riparian habitat and reduced use of fertilizers and pesticides.

Reductions in Pollutant Loadings

Healthy Lawns and Healthy Waters Program

Healthy Lawns and Healthy Waters is an educational program designed to improve and protect surface water quality by enhancing awareness and knowledge of best management practices (BMPs) for residential landscapes. This program was

made possible through a partnership between Texas A&M AgriLife Extension Service's Department of Soil & Crop Sciences and the Texas Water Resources Institute (TWRI) with CWA Section 319(h) funds from TCEQ and the U.S. Environmental Protection Agency (EPA). Healthy Lawns and Healthy Waters participants learn about reducing runoff through rainwater capture, planting the appropriate turf grass species, and quantities and timing of nutrient inputs to residential lawns. Participants also receive a free soil test analysis through the Texas A&M AgriLife Extension Soil, Water and Forage Testing Laboratory to guide them in the proper application of fertilizer that is appropriate for their particular soil.

During fiscal year 2019, the Healthy Lawns Healthy Waters team delivered seven half-day training events to 134 participants in five central Texas watersheds with impairments for bacteria and concerns for nutrients. Pre- and post-evaluations were administered at the trainings to measure knowledge gained. On average, participant program test scores increased by 33 percent.



Healthy Lawns and Healthy Waters Training
(Source A&M Agrilife Extension)

Six months following the trainings, an additional evaluation was sent out to determine which BMPs have been implemented in order to quantify behavioral changes associated with reduced use of fertilizer and therefore reductions in nutrient loadings. The evaluations showed that 83 percent of respondents either installed some type of rainwater capture system or were planning installations. In addition, 37 percent of respondents indicated that they had reduced the amount of fertilizer applied. Based on the 37 percent reduction in fertilization from standard recommendation rates, the Healthy Lawns Healthy Waters team estimated the fiscal year 2019 load reductions to be:

Pollutant	Load Reduction
Nitrogen	58,607 lbs ¹
Phosphorus	19,536 lbs

¹ – pounds

Creekside Conservation Program

The LCRA Creekside Conservation Program is a partnership between the Lower Colorado River Authority (LCRA), private landowners, the United States Department of Agriculture - Natural Resources Conservation Service (NRCS), and local Soil and Water Conservation Districts (SWCD). Utilizing CWA Section 319(h) funds from the TSSWCB and the EPA, the program provides technical and financial assistance to farmers and ranchers and offers education and outreach within the project region. The goal of this cost-sharing program is to reduce sedimentation and agricultural nonpoint source pollution within the lower Colorado River watershed of Bastrop, Blanco, Burnet, Colorado, Fayette, Lampasas, Llano, Matagorda, San Saba, Travis, and Wharton counties.

During fiscal year 2019, the Creekside Conservation Program provided financial assistance to seven landowners within the project region. As a result, a variety of BMPs were implemented, and 8,089 acres of private lands were placed under conservation management plans. Conservation management plans outline specific BMPs and include practices such as prescribed grazing and upland wildlife habitat management. Notable BMPs completed through the program include 175 acres of brush management, 12,930 feet of cross fencing, 917 feet of pipeline, the installation of two water troughs, one water storage tank, and one grade stabilization structure. Using the Texas Best Management Practices Evaluation Tool, the estimated fiscal year 2019 load reductions from these BMPs are:

Pollutant	Load Reduction
Sediment	4,548.0 tons
Nitrogen	35,656.0 lbs
Phosphorus	3,949.0 lbs



Creekside Conservation Program Fence
(Source TSSWCB)



Creekside Conservation Program Partner
(Source TSSWCB)

Implementing Low Impact Development in the Cypress Creek Watershed

Cypress Creek originates in western Hays County and flows into the Blanco River. About five and a half miles upstream of the confluence, near the City of Woodcreek, is Jacob's Well, the headwaters of Cypress Creek. In 2010, a stakeholder group convened and began developing the Cypress Creek Watershed Protection Plan which was accepted by the EPA in 2015.

In fiscal year 2019, the Cypress Creek Watershed Protection Plan team completed the installation of several low impact development BMPs throughout the watershed using CWA Section 319(h) funds from TCEQ and the EPA. These projects included four rainwater harvesting systems that have a combined capacity of over 100,000 gallons of rainwater annually. The highly visible rainwater harvesting systems are located at the Wimberley Valley Watershed Association headquarters, Blue Hole Regional Park, Woodcreek Golf Course, and the Hays County Precinct Three office. Four pervious pavement projects at Blue Hole Regional Park and in downtown Wimberley were also installed which have the potential to infiltrate 122,000 gallons of rainfall per year, thereby reducing the

amount of stormwater runoff entering Cypress Creek. The estimated fiscal year 2019 load reductions from these BMPs are:

Pollutant	Load Reduction
Sediment	537 lbs
Nitrogen	1.82 lbs
Phosphorus	0.78 lbs

Implementing Agricultural Best Management Practices in the Lampasas Watershed

The Lampasas River watershed is located in portions of Hamilton, Lampasas, Burnet, and Bell counties. In Bell County, the river turns northeast and is dammed five miles southwest of Belton to form Stillhouse Hollow Lake. To address bacteria levels and reduce nonpoint source pollution in the Lampasas River, a watershed protection plan was developed.

The Lampasas River Watershed Protection Plan calls for the voluntary adoption of agriculture BMPs. The Hill Country Soil and Water Conservation District received CWA Section 319(h) funds from the TSSWCB and the EPA to provide technical and financial assistance to implement BMPs on agricultural land in the Lampasas River watershed.

In fiscal year 2019, six water quality management plans (WQMPs) were implemented on 3,196 acres. The following BMPs were installed: water well, pumping plant, pipeline, watering facility, brush control, grass planting, cross fencing, prescribed grazing, herbaceous weed control, nutrient management, and heavy use area protection. Based on the Texas Best Management Practices Evaluation Tool, the estimated fiscal year 2019 load reductions from these BMPs are:

Pollutant	Load Reduction
Sediment	70.77 tons
Nitrogen	10,557.0 lbs
Phosphorus	439.01 lbs

Water Quality Improvements

TCEQ and the TSSWCB work together to identify water quality improvements where the implementation of CWA Section 319(h) funded BMPs is a contributing factor. Once a candidate is identified, a "success story" is written and sent to the EPA for review and approval. Linking instream nonpoint source pollutant reductions to land management practices is challenging. Changes to the land can occur over varying temporal and spatial scales and contributions to the stream are

rainfall driven. As a result, changes in water quality often lag behind the implementation of nonpoint source BMPs, and many years of implementation may be needed before significant improvements in a water body are observed. Despite these challenges, Texas continues to see measurable water quality improvements.

Success Story Highlights

Urban and Rural Nonpoint Source Best Management Practices Improve Water Quality in the Upper San Antonio River

WATER QUALITY IMPROVED

The Upper San Antonio River (Segment 1911) is divided into nine assessment units (AUs) and AU 1911_02 is located southeast of the city of San Antonio in Wilson County. While this AU is downstream of a major city, the surrounding land is primarily pasture and cultivated crops. The Upper San Antonio River was listed as not meeting the contact recreation use in the 1992 Texas Integrated Report of Surface Water Quality for CWA Sections 305(b) and 303(d) (Integrated Report). Multiple state and federal agencies have worked with local stakeholders to improve water quality in the Upper San Antonio River, including TCEQ, the TSSWCB, and the United States Department of Agriculture – NRCS. The development and implementation of a watershed protection plan, nonpoint source BMPs, and local stakeholder engagement has helped reduce the concentration of bacteria in the Upper San Antonio River. Based upon instream water quality data, AU 1911_02 now meets the primary contact recreation water quality standard and was delisted in the 2016 Integrated Report.

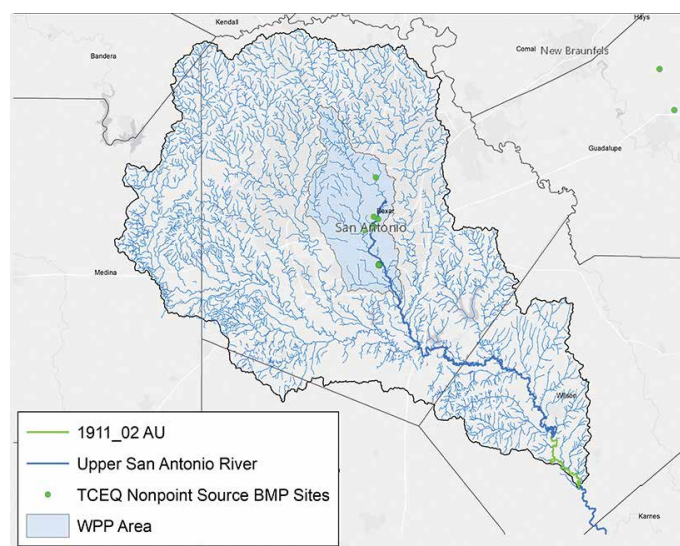


FIGURE 2.1

Map of Attoyac Bayou watershed and impaired AU 0612_01

PROBLEMS

The Upper San Antonio River was listed as impaired for elevated fecal coliform in the 1992 Integrated Report. Beginning with the 2002 Integrated Report, TCEQ transitioned from performing water body assessments using fecal coliform to using the indicator bacteria *Escherichia coli* (*E. coli*). The water quality standard for primary contact recreation in surface waters states that the geometric mean concentration of indicator bacteria should not exceed 126 colony-forming units per 100 milliliters (cfu/100 mL) of water. When first listed for *E. coli* in the 2006 Integrated Report, AU 1911_02 had a geometric mean of 184 cfu/100 mL, nearly one and a half times the water quality criteria for *E. coli*.

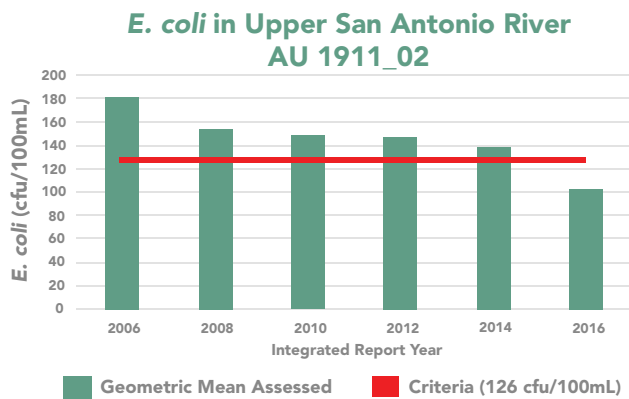


FIGURE 2.2

E. coli Data from the Upper San Antonio River

PROJECT HIGHLIGHTS

With funding from the EPA and TCEQ, the San Antonio River Authority completed a watershed protection plan in 2006, an update to the watershed protection plan in 2015 and implemented two projects from 2006 through 2018. The watershed protection plan analyses indicated that a 30 percent reduction in bacteria loading from stormwater sources was needed across the watershed, so subsequent implementation projects targeted urban and rural nonpoint sources, prioritizing low impact development and education and outreach to citizens for implementation. TCEQ also partnered with the Texas A&M Agrilife Research outreach program “Healthy Lawns Healthy Waters” to educate homeowners about rainwater management and lawn and landscaping practices through presentations, education materials, and providing free soil analysis.

An early example of watershed protection plan implementation dates to 2008 when CWA Section 319(h) funds paid for power washers to be used on the River Walk in San Antonio. This practice diverted runoff that would otherwise end up in the San Antonio River through sanitary sewers.

An example of education and outreach to citizens can be found in the highly visible BMP implementation at the San Antonio Mission Public Library. The library’s proximity to the San Antonio River made it an ideal location to demonstrate

low impact development features to the public and educate developers. The features include surface retention and infiltration structures, bioswales, stormwater roof collection systems, and rain gardens. Construction was completed in the spring of 2012 and monitoring results demonstrate a reduction in the amount of stormwater runoff and pollutants from the site into the Upper San Antonio River.

Since 2007, the TSSWCB has partnered with the Karnes and Wilson counties SWCDs and local landowners to implement BMPs on grazing land. Twelve WQMPs have been developed and certified in the watershed, covering 1,706 acres of grazing land. Management practices include prescribed grazing, range planting, alternative watering facilities, and forage and biomass planting. Education and outreach is provided by the TSSWCB and SWCDs through technical assistance to landowners.

RESULTS

The concentration of *E. coli* in the Upper San Antonio River AU 1911_02, decreased from 184 cfu/100mL to 106 cfu/100mL in the ten years between the 2006 Integrated Report and the 2016 Integrated Report. A net decrease of bacteria concentrations in the Upper San Antonio River have been observed since implementation activities began. As BMPs recommended in the watershed protection plan continue to be implemented and have more time to become established, a greater decrease in bacteria throughout the water body is expected.

PARTNERS AND FUNDING

Since 2007, watershed partners have spent approximately \$1,854,913 on water quality improvements and education and outreach efforts, combining \$1,112,948 in federal CWA Section 319(h) funds with \$741,965 matched by local entities. TCEQ and TSSWCB continue to fund implementation projects in the Upper San Antonio River watershed.

Implementing Conservation Practices and Conducting Watershed Outreach Improves Water Quality in Attoyac Bayou

WATER QUALITY IMPROVED

Local stakeholders, TWRI and the TSSWCB developed a watershed protection plan to address the bacteria impairment in the Attoyac Bayou watershed. The watershed protection plan was accepted by the EPA in 2015. Project partners used CWA Section 319(h) funds from the TSSWCB and the EPA to voluntarily implement agricultural and conservation BMPs and conduct public outreach and education. Water quality has improved, prompting TCEQ to remove Attoyac Bayou AU 0612_01 from the 2016 CWA Section 303(d) list for *E. coli*.

PROBLEM

The Attoyac Bayou is a subwatershed within the Upper Neches River watershed extending approximately 82 miles through

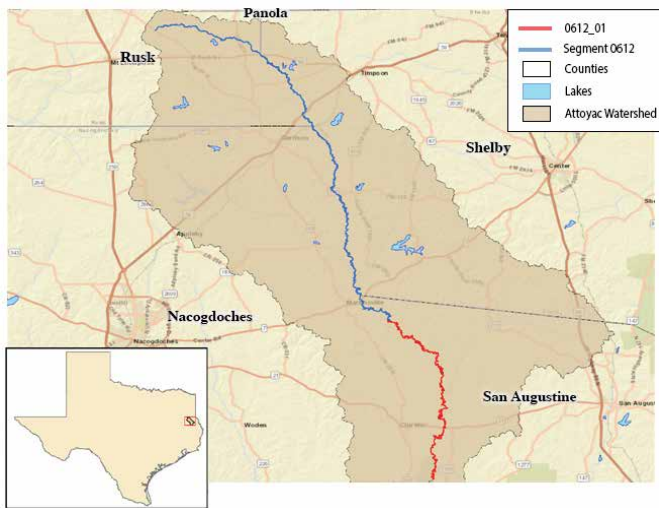


FIGURE 2.3
Map of Attoyac Bayou watershed and impaired AU 0612_01

Rusk, Nacogdoches, San Augustine, and Shelby counties before emptying into Sam Rayburn Reservoir (Figure 2.3). The Attoyac Bayou (Segment 0612) is divided into three AUs. Several rural communities can be found throughout the area, with the majority of the land in the watershed being used for cattle and poultry operations, forestry, and recreational/wildlife uses. Elevated levels of bacteria prompted TCEQ to add Attoyac Bayou to the 2004 CWA Section 303(d) list for not supporting its primary contact recreation use.

PROJECT HIGHLIGHTS

In July 2010, the TSSWCB partnered with local stakeholders and TWRI to begin developing a watershed protection plan for Attoyac Bayou. The stakeholder group that led the watershed protection plan development consisted of representatives from agricultural and silvicultural producers, wildlife interests, SWCDs, the poultry industry, Commissioner's courts (i.e., county governments), cities, and various other interests in the watershed.

Throughout the planning process, stakeholders identified and worked to holistically address pollution sources that threaten surface water resources within the watershed. Several outreach and education programs were implemented to raise awareness about water quality issues and inform local stakeholders about management practice options. From 2007 to 2014 the TSSWCB partnered with the local SWCDs to certify and implement 20 WQMPs on over 2,000 acres in the impaired watershed. These plans included alternative water sources, prescribed grazing, cross-fencing, animal mortality facilities, composting facilities and nutrient management and waste utilization.

In addition, the NRCS worked with landowners throughout the watershed to implement conservation practices on over 13,700 acres using Environmental Quality Incentives Program

funding. The conservation practices implemented included prescribed grazing, grass and range planting, nutrient management, various forestry practices, animal mortality facilities, composting facilities, conservation cover, livestock pipeline, and alternative water sources. These practices have been implemented throughout the watershed.

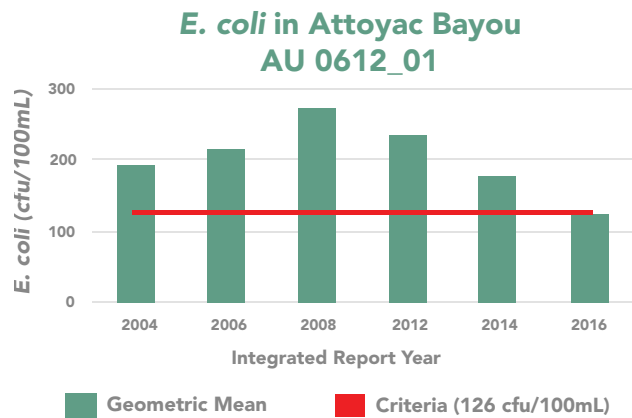


FIGURE 2.4
E. coli Data from Attoyac Bayou

RESULTS

Assessment data collected from 2007 to 2014 shows that the *E. coli* geometric mean has dropped below the geometric mean water quality criteria of 126 cfu/100 mL in the southernmost section of Attoyac Bayou (AU 0612_01). This downstream area of the bayou now supports primary contact recreation. Therefore, TCEQ removed Attoyac Bayou AU 0612_01 from the 2016 CWA Section 303(d) list.

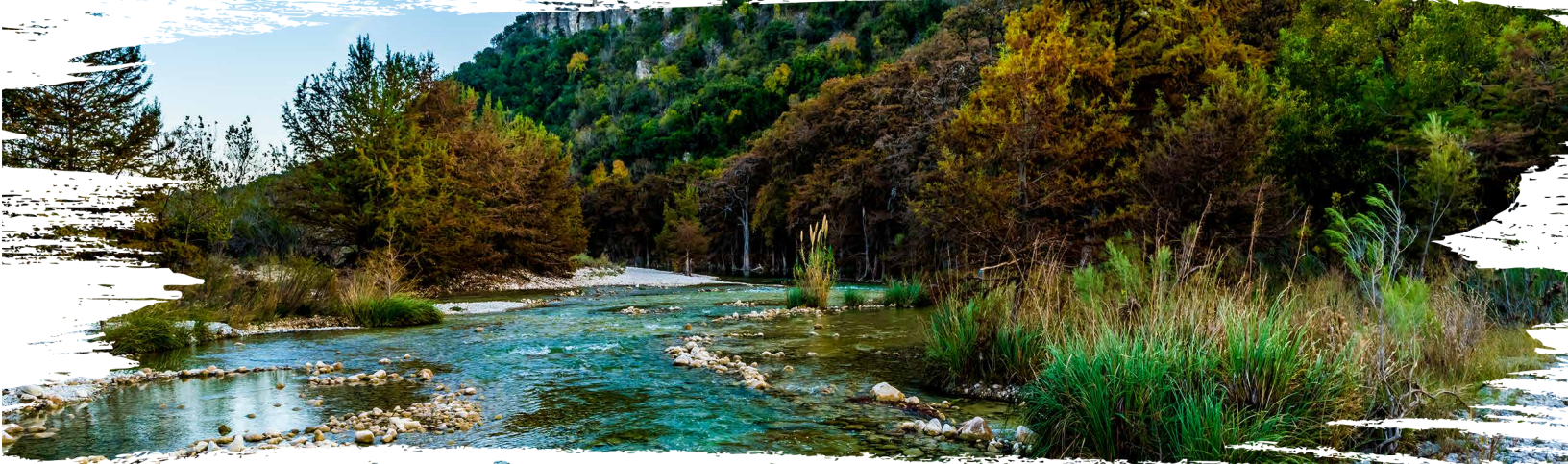
The success of this effort can be attributed to increased stakeholder awareness due to the watershed planning process and to the implementation of conservation practices. Water quality monitoring continues to track and measure interim progress to implement the Attoyac Bayou Watershed Protection Plan and ensure this restoration effort remains a success.

PARTNERS AND FUNDING

Over \$617,800 in EPA CWA Section 319(h) funds provided by the TSSWCB, combined with more than \$414,600 in non-federal matching funds from TWRI, supported efforts to develop the watershed protection plan, collect and analyze water samples, develop pollutant loading models, and facilitate stakeholder involvement in the watershed planning process.

The Nacogdoches, Piney Woods, Rusk, and Shelby SWCDs worked with landowners to provide technical assistance and voluntarily implement conservation practices. The TSSWCB and the NRCS worked through the SWCDs to provide funds (approximately \$18,000 in state funding, and \$953,000 in federal Farm Bill funding) to landowners as financial incentives to implement BMPs in the Attoyac Bayou Watershed.





Frio River at Garner State Park, Texas
(Source iStock)

CHAPTER 3

PROGRESS TOWARD MEETING THE GOALS AND OBJECTIVES OF THE TEXAS NONPOINT SOURCE MANAGEMENT PROGRAM

TCEQ and the TSSWCB have established goals and objectives for guiding and tracking the progress of nonpoint source management in Texas. The goals describe high-level guiding principles for all activities under the Texas Nonpoint Source Management Program. The objectives specify the key methods that will be used to accomplish the goals. Although not comprehensive, this chapter reports on a variety of programs and projects that directly support the goals and objectives of the *Texas Nonpoint Source Management Program*.

Clean Water Act Section 319(h) Grant Program

Section 319(h) of the CWA establishes a grant that is appropriated annually by Congress to the EPA. The EPA allocates these funds to the states to implement nonpoint source pollution reduction activities supporting the congressional goals of the CWA. TCEQ and the TSSWCB target these grant funds toward nonpoint source activities consistent with the long- and short-term goals defined in the *Texas Nonpoint Source Management Program*.

The grant funds can support a wide variety of activities including the implementation of BMPs, technical assistance, financial assistance, education, training, technology transfer, and monitoring to assess the success of nonpoint source implementation projects. In fiscal year 2019, Texas received \$7,534,000 in CWA Section 319(h) federal grant funds to utilize and award to sub-grantees across the state. In turn, sub-grantees provided

\$5,022,667 in matching funds to leverage resources used for addressing nonpoint source pollution.

Status of Clean Water Act Section 319(h) Grant-Funded Projects

In fiscal year 2019, TCEQ had 42 active CWA Section 319(h) grant-funded projects totaling approximately \$9.3 million, which addressed a wide range of nonpoint source issues (Figure 3.1). A primary focus of these projects was the development and implementation of watershed protection plans to address urban nonpoint source pollution and targeted outreach and education activities.

In fiscal year 2019, the TSSWCB had 31 active CWA Section 319(h) grant-funded projects totaling approximately \$8.2 million, which addressed both agricultural and silvicultural nonpoint source pollution (Figure 3.2). Specific projects included developing and implementing watershed protection plans, supporting targeted educational programs, and implementing BMPs to abate nonpoint source pollution from agricultural and silvicultural operations.



Crystal Clear Creek in Llano, Texas
(Source iStock)

FIGURE 3.1

TCEQ Nonpoint Source Grant Funds by Project Type in Fiscal Year 2019

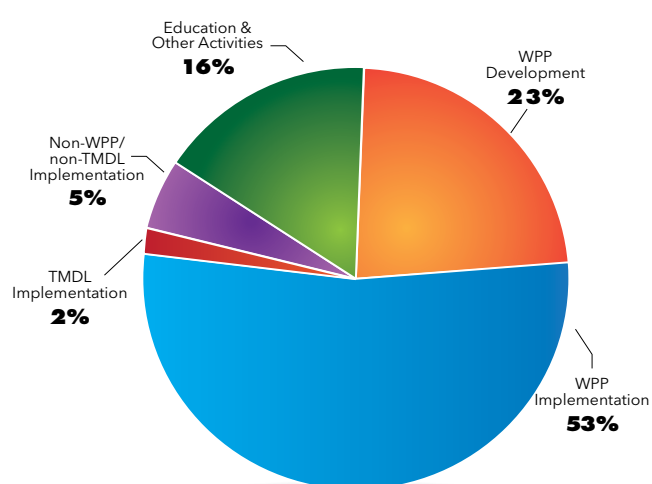
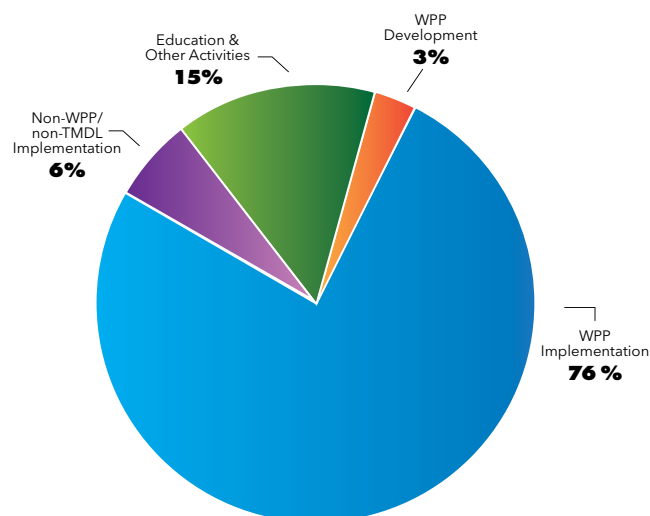


FIGURE 3.2

TSSWCB Nonpoint Source Grant Funds by Project Type in Fiscal Year 2019



Short-Term Goals and Milestones of the Texas Nonpoint Source Management Program

Goal One—Data Collection and Assessment

One of the goals of the Texas Nonpoint Source Management Program is to collect and assess water quality data. Data collection requires the coordination of appropriate federal, state, regional, and local entities as well as the private sector and citizen groups. The TCEQ's Surface Water Quality Monitoring Program, operating from the Austin central office and 16 regional offices, conducts both routine ambient monitoring and special studies. In addition, the Clean Rivers Program, which is a collaboration between TCEQ and 15 regional water agencies, collects surface water quality data throughout the state in response to both state needs and local stakeholder interests. Furthermore, TCEQ acquires water quality data from other state and federal agencies, river authorities, and municipalities after assuring the quality of the data is comparable to that of data collected by the TCEQ's programs.

Data are assessed by TCEQ to determine if a water body meets its designated uses or if water quality improvement activities are achieving their intended goals. For impaired or special interest waters, water quality data can be used in the development of watershed protection plans and TMDLs.

Data are also used to determine potential sources of pollution, the adequacy of regulatory measures, watershed improvements, and restoration plans. The data collection guides

the distribution of CWA Section 319(h) grant funds toward the development of watershed protection plans and water quality assessment activities in high priority watersheds, nonpoint source-impacted watersheds, vulnerable and impacted aquifers, or areas where additional information is needed.

Texas Integrated Report

The Integrated Report describes the status of all surface water bodies in the state evaluated for the given assessment period. TCEQ uses data collected during the most recent seven to ten-year period to assess the quality of surface water bodies in the state. The descriptions of water quality for each assessed water body in the Integrated Report represent a snapshot of conditions during the period considered in the assessment. Water bodies identified as impaired by nonpoint source pollution are given priority for CWA Section 319(h) grant funds. The assessment guidance includes methods to determine use attainment for water quality standards. The guidance document is developed by TCEQ with the input of an external advisory workgroup. The 2016 Integrated Report was approved by TCEQ in October 2018 and by the EPA in August 2019. The assessment methods for the 2016 Integrated Report are detailed in the *2016 Guidance for Assessing and Reporting Surface Water Quality in Texas* (available online at https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/16txir/2016_guidance.pdf).

WATER QUALITY STATUS CATEGORIES

The Integrated Report assigns each assessed water body to one of five categories in order to report water quality status and

potential management options to the public, the EPA, state agencies, federal agencies, municipalities, and environmental groups. These categories indicate the status of a water body and describe how the state will approach identified water quality problems. Table 3.1 defines the five categories and shows the number of water bodies assigned to each assessment category in the 2016 Integrated Report.

TABLE 3.1
Number of Water Bodies Assigned to Each Assessment Category in the 2016 Integrated Report

Category	Definition	Number of Water Bodies
1	All designated uses are supported, no use is threatened.	83
2	Available data and/or information indicate that some, but not all of the designated uses are supported.	335
3	Insufficient or unreliable available data and/or information to make a use support determination.	128
4	The standard is not supported for one or more designated uses but does not require the development of a TMDL.	127
5	The water body does not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants. Category 5 is the CWA Section 303(d) list of impaired waters.	398
Total		1071

The 303(d) list of impaired waters (Category 5 of the Integrated Report) identifies waters that do not meet Texas Surface Water Quality Standards. It is an important management tool produced as part of the Integrated Report and must be approved by the EPA. Water bodies on the 303(d) list of impaired waters are those that require action to restore water quality. An impairment occurs when a water body or a portion of that water body called an assessment unit, does

not meet the water quality criteria to protect a specific use. The same assessment unit can have multiple impairments. For example, a water body may not meet the criteria for both dissolved oxygen and bacteria; this is considered two impairments. This explains why the total number of impairments in Table 3.3 is greater than the number of water bodies in Category 5 in Table 3.1. Since a water body has multiple uses, it may fall into different categories for different uses. In that case, the overall category for the water body is the one with the highest category number.

The Integrated Report further divides Category 5 water bodies into subcategories, also shown in Table 3.2, to reflect additional options for addressing impairments:

- Water bodies in Category 5a have a TMDL underway, scheduled, or to be scheduled.
- Water bodies in Category 5b require a review of the water quality standards for the water body to be conducted before a management strategy is selected.
- Water bodies in Category 5c require additional data and information to be collected or evaluated before a management strategy is selected

TABLE 3.2
Category 5 subcategories in the 2016 Integrated Report

Category	Definition
5	5a—TMDLs are underway, scheduled, or will be scheduled for one or more parameters.
	5b—A review of the standards for one or more parameters will be conducted before a management strategy is selected, including the possible revision to the Texas Surface Water Quality Standards.
	5c—Additional data or information will be collected and/or evaluated for one or more parameters before a management strategy is selected.

SUMMARY OF THE 2016 INTEGRATED REPORT

The water quality of 1452 water bodies was reviewed for the 2016 Integrated Report. Sufficient data was available to assess uses for 1071 water bodies which resulted in 574 impairments (Table 3.3). Of the 1452 water bodies, 398 were classified as Category 5 water bodies (Table 3.1). The number of water bodies classified as Category 5 was a slight decrease from the 2014 303(d) list of impaired waters, which included 401 Category 5 water bodies. The total number of impairments decreased from 589 to 574 (Table 3.3).

SUMMARY OF IMPAIRMENTS ON THE 2016 INTEGRATED REPORT

Impairments identified in the 2016 Integrated Report have been grouped by the parameter and the use of the water body affected (Table 3.3). Elevated levels of bacteria represent the majority of the listed impairments, followed by low dissolved oxygen. Many of these bacteria impairments may be the result of urban and agricultural nonpoint source pollution.

2018 AND 2020 INTEGRATED REPORTS

The Commission approved the First and Second Submission of the 2018 Integrated Report on June 26, 2019 and September 27, 2019 respectively. EPA approved the First Submission of the 2018 Integrated Report in July 2019, and the Second Submission is

TABLE 3.3
Summary of Impairments in the 2014 Versus 2016 Integrated Report

Impairment Group	Media	2014 Number of Impairments	2016 Number of Impairments	Use
Bacteria	in water	243	223	recreation
	in water	2	2	general
	in shellfish	8	10	oyster waters
	in water	2	2	recreational beaches
Dissolved oxygen	in water	96	95	aquatic life
Toxicity	in ambient water	2	2	aquatic life
	in ambient sediment	6	6	
Organics	in water	0	0	fish consumption, aquatic life
	in fish or shellfish	114	110	
Metals (except mercury)	in water	6	12	fish consumption, oyster waters, aquatic life
	in fish or shellfish	0	0	
Mercury	in water	1	1	fish consumption, oyster waters, aquatic life
	in fish or shellfish	24	24	
Dissolved solids (chloride)	in water	17	18	general
Dissolved solids (sulfate)	in water	12	16	general
Total dissolved solids	in water	18	17	general
Temperature	in water	1	0	general
pH	in water	17	16	general
Nitrate	in water	0	0	general, public water supply
Excessive Algal Growth	in water	0	2	general
Biological	habitat, macrobenthic or fish community	20	18	aquatic life
Totals		589	574	

pending EPA review. TCEQ convened an external Guidance Advisory Workgroup for the 2020 Integrated Report in May 2019 to present information on proposals and gather input on the water quality assessment methods. The 2020 Integrated Report process is currently underway.

Continuous Water Quality Monitoring

TCEQ has a network of continuous water quality monitoring sites on priority water bodies. The agency maintains 30-45 sites in its Continuous Water Quality Monitoring Network (CWQMN). The number and locations of sites varies from year to year. In fiscal year 2019, TCEQ had 35 active sites as seen in Figure 3.3. At these sites, instruments measure basic water quality conditions every 15 minutes. The CWQMN monitoring data may be used by TCEQ or other organizations to make water resource management decisions, target field investigations, evaluate the effectiveness of water quality management programs such as TMDL implementation plans and watershed protection plans, characterize existing conditions, and evaluate spatial and temporal trends. Site information and data are available online at https://www.tceq.texas.gov/waterquality/monitoring/swqm_realtime.html.

The El Morillo Drain, located in Mexico near the Rio Grande, was constructed to divert water high in total dissolved solids from agricultural fields, a potential nonpoint source, to the Gulf of Mexico. When the drain overflows the saline waters enter the Rio Grande. When saline waters bypass the drain and

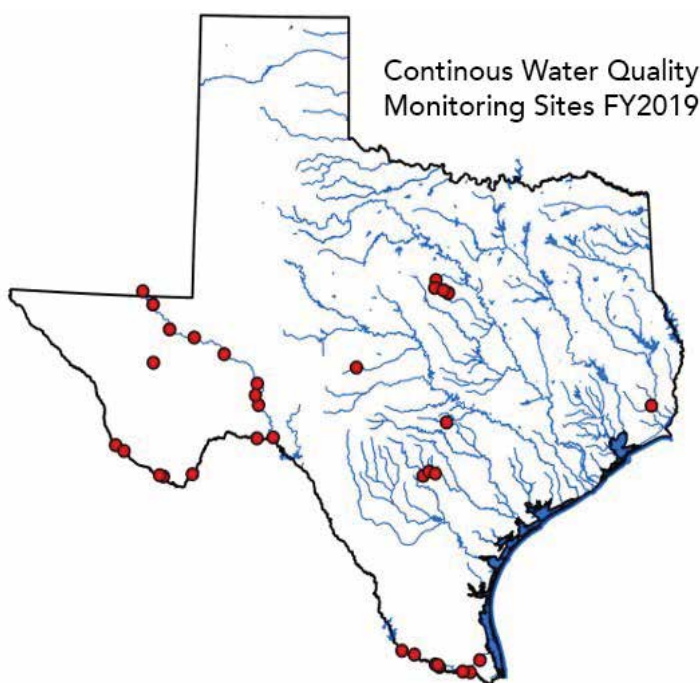
enter the Rio Grande, it can cause an increase in total dissolved solids which may negatively impact water users downstream. High levels of total dissolved solids in irrigation water can reduce agricultural productivity and damage young plants.



CWQMN Station (Source Chuck Dvorsky, TCEQ)

FIGURE 3.3

Active Continuous Water Quality Monitoring Stations in Fiscal Year 2019



CWQMN station, C791, approximately 2.5 miles upstream of the El Morillo Drain, and CWQMN station C792, which was re-established in fiscal year 2019 and located approximately 2.5 miles downstream, document the impact of any flows bypassing the El Morillo Drain and entering the Rio Grande. These CWQMN stations provide an example of how data from the network is used to monitor water quality.

Texas Stream Team Monitoring

Texas Stream Team at The Meadows Center for Water and the Environment at Texas State University (Meadows Center) is a statewide network of citizen scientists and partner organizations that is dedicated to monitoring water quality through data collection, stakeholder engagement, and watershed education. Data collected by citizen scientists help watershed coordinators and stakeholders to better understand the environmental conditions of their local waters. The Meadows Center receives CWA Section 319(h) funds from TCEQ and the EPA to administer the program.

Texas Stream Team citizen scientists are certified under a training process to collect water quality parameters from assigned sites along rivers, lakes, and streams. In fiscal year 2019, Texas Stream Team and its partners conducted 82 trainings across the state, training over 590 volunteers in water quality monitoring. Texas Stream Team also developed instructional videos to provide continued guidance for new and existing citizen scientists after they have received official certification. Additionally, after the methods were approved

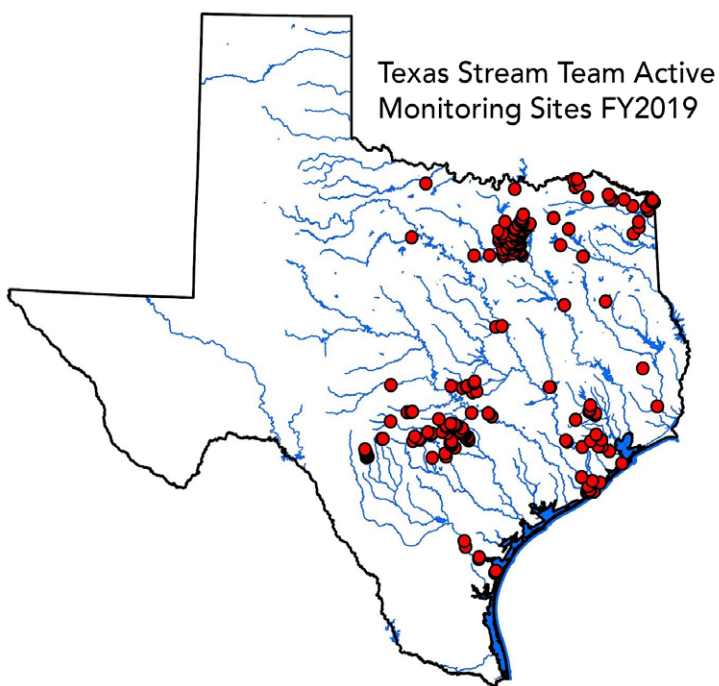
in the Texas Stream Team Quality Assurance Project Plan in September 2018, Texas Stream Team introduced a new training this fiscal year; macroinvertebrate bioassessment.

In fiscal year 2019, citizen scientists volunteered 2,718 hours of their time and conducted 1,806 monitoring events at 279 active stations on rivers, lakes, and streams across Texas. Many of these monitoring events took place on water bodies where there is a watershed protection plan such as the Upper Cibolo Creek and Cypress Creek, or where a TMDL is being implemented such as the Arroyo Colorado and Carters Creek.

In addition to water quality monitoring, Texas Stream Team staff and partners provided watershed education on nonpoint source pollution and other water quality issues. The Meadows Center uses its location at Spring Lake to offer watershed education to visitors and educational activities to visiting students from schools across the state. In fiscal year 2019, Texas Stream Team gave seven presentations to 1,002 students at Spring Lake. In addition, Texas Stream Team staff held 28 education and outreach events around the state which reached an additional 3,138 people.

Texas Stream Team was honored at the TCEQ's 2019 Texas Environmental Excellence Awards in the Civic/Community category for bringing together numerous partners and thousands of citizen scientists to monitor and protect water quality across Texas. For more information visit <https://www.meadowscenter.txstate.edu/Service/TexasStreamTeam.html>.

FIGURE 3.4
Active Texas Stream Team Monitoring Sites in Fiscal Year 2019



Goal Two—Implementing Programs to Reduce Nonpoint Source Pollution

The second goal of the *Texas Nonpoint Source Management Program* is to implement activities that prevent and reduce nonpoint source pollution in surface water, groundwater, wetlands, and coastal areas. The objective of this goal is to implement watershed protection plans, TMDL implementation plans, the Texas Groundwater Protection Strategy, and TSSWCB-certified water quality management plans, as well as implement BMPs on agricultural and silvicultural lands, and other identified priorities.

Implementation Project Highlights

IMPLEMENTING THE DRY COMAL CREEK AND COMAL RIVER WATERSHED PROTECTION PLAN

In 2010, concentrations of *E. coli* in Dry Comal Creek exceeded the limit for primary contact recreation resulting in the inclusion of the creek on the 2010 303(d) list of impaired waters. In 2014, the Dry Comal Creek and Comal River Watershed Partnership, composed of the City of New Braunfels, the Guadalupe-Blanco River Authority, the Edwards Aquifer Authority, local stakeholders, and technical advisors, was formed. The Partnership was subsequently awarded CWA Section 319(h) funds from TCEQ and the EPA to develop the Dry Comal Creek and Comal River Watershed Protection Plan which was accepted by the EPA in 2018. Analysis of *E. coli* loading across the watershed and stakeholder knowledge identified overabundant urban deer and non-native avian wildlife as the largest contributors of *E. coli*. Although the watershed protection plan provides recommended BMPs for a range of sources, including livestock, on-site sewage facilities, pet waste, and stormwater, stakeholders recommended that initial implementation resources focus on managing the overabundance of urban wildlife within the watershed.

Do-Not-Feed Wildlife Ordinance

The most critical BMP identified by stakeholders was a Do-Not-Feed Wildlife Ordinance. To ensure that the ordinance's introduction and passage were well-received by the community, the City of New Braunfels and the Texas Parks and Wildlife Department (TPWD) held four wildlife management workshops at which the City presented the negative impacts of overabundant wildlife and the TPWD presented urban wildlife management options. The Do-Not-Feed Wildlife Ordinance, having received public buy-in before its introduction to City Council, was passed in fiscal year 2019. Since its adoption, the Watershed Partnership has designed a strategic Do-Not-Feed Wildlife Campaign to communicate the negative impacts of overabundant wildlife to New Braunfels residents using CWA Section 319(h) funds from TCEQ and the EPA. Large signs, as well as a smaller signs and decals, have been installed throughout city parks which are popular destinations for both residents and visitors and are home to



Presentation to Youth in the Watershed (Source City of New Braunfels)

many of the over abundant urban wildlife. For more information on the Do-Not-Feed Wildlife Ordinance visit <http://www.nbtexas.org/2303/Ordinance-Prohibiting-the-Feeding-of-Wil>.

Engaging Youth in Protecting the Watershed

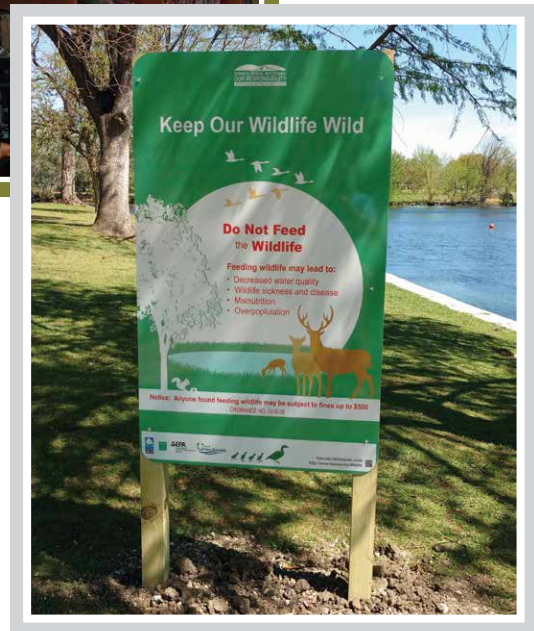
The second most critical BMP identified by stakeholders was educating youth in the watershed. The Watershed Partnership has developed educational presentations for elementary, middle, and high school level classes and in fiscal year 2019 presented them to over 850 students. The presentations explain the importance of healthy watersheds and outline steps the students can take to improve the water quality in their community. The presentations encourage students to stop feeding wildlife and to help prevent a wide range of nonpoint source pollutants. The Watershed Partnership is also collaborating with the science coordinators at New Braunfels and Comal Independent School Districts to add lesson plans about watershed protection to the curriculum.

Maintaining Focus on a Wide-Range of Pollutant Sources

To address pet waste, the Watershed Partnership coordinated with local homeowner associations, apartment complexes, and the City of New Braunfels Parks Department to arrange for the installation of pet waste stations in common areas. The Watershed Partnership also collaborated with Comal County to prevent illegal dumping, improve stormwater quality, and provide septic system training. For more information about the Dry Comal Creek and Comal River Watershed Protection Plan and implementation activities visit <http://www.nbtexas.org/1914/Watershed-Protection-Planning>.

IMPLEMENTING THE LAVON LAKE WATERSHED PROTECTION PLAN

Lavon Lake is a vital resource for North Texas, providing municipal water supply, flood control, wildlife habitat, and opportunities for recreation. Approximately 1.7 million North Texas residents rely on Lavon Lake as their primary drinking water



Do-Not-Feed Wildlife Ordinance Sign (Source City of New Braunfels)

supply. After two major tributaries to the lake, Wilson Creek and the East Fork Trinity River, were identified as impaired on the 2014 303(d) list, the North Texas Municipal Water District and Texas A&M AgriLife Extension Service helped establish the Lavon Lake Watershed Partnership to develop a watershed protection plan. The watershed protection plan, which was accepted by EPA in 2017, was made possible through state funds from the TSSWCB.

With continued funding from the TSSWCB, educational programs were delivered in the watershed to support implementation of the Lavon Lake Watershed Protection Plan. These programs included the Texas Watershed Stewards and Texas Well Owner Network (TWON) programs, stream ecosystem and restoration workshops, and Homeowner Maintenance of Septic System workshops. Furthermore, a workshop covering a range of water quality related topics for new landowners was delivered in coordination with Texas A&M AgriLife Extension Service.

Prior to development of the Lavon Lake Watershed Protection Plan, several cities in the watershed organized recurring stream cleanup events which are ongoing. However, additional efforts are now being made by the Lavon Lake Cleanup Group, which was created in response to significant shoreline litter accumulation and illegal dumping. Members of

the Lavon Lake Watershed Partnership, including North Texas Municipal Water District and the U.S. Army Corps of Engineers, provided support to the group, which held three cleanup events during fiscal year 2019.

In addition to education and cleanup events, the Collin County SWCD secured funding from the TSSWCB to support development of water quality management plans, a key implementation strategy identified in the Lavon Lake Watershed Protection Plan. The funds have allowed the Collin County SWCD to hire a District Technician to work with landowners in the watershed to provide technical and financial resources for developing water quality management plans.

IMPLEMENTING THE LAMPASAS RIVER WATERSHED PROTECTION PLAN

The Lampasas River was placed on the 2002 303(d) list of impaired waters, and in response, the Lampasas River Watershed Partnership was formed in 2009 and initiated the development of a watershed protection plan. Local stakeholders worked to identify the potential sources of pollutants and developed the watershed protection plan, which was approved by the Partnership. The plan was accepted by the EPA in 2013 and the Partnership immediately pursued opportunities for implementation funding. Texas A&M AgriLife Research–Temple has provided facilitation for many implementation projects within the watershed. With funding provided by TSSWCB, many educational programs have been brought to the watershed including TWON workshops, Homeowner Maintenance of Septic System workshops, Lone Star Healthy Streams workshops, a soil testing campaign, and Urban Riparian and Stream Restoration workshops.

During fiscal year 2019, Texas A&M AgriLife Research–Temple completed development of a watershed wide geodatabase of septic systems within the watershed. With CWA Section 319(h) grant funds from TCEQ and the EPA, Texas A&M AgriLife Research–Temple worked with local officials within the watershed, including county judges, commissioners and designated representatives to gather existing data on septic system permits and to geolocate these systems as well as those that may have been installed before permits were required. The Partnership identified this as a priority for addressing contributions from potentially failing septic systems.

The Hill Country Soil and Water Conservation District utilized CWA Section 319(h) funds from the TSSWCB and the EPA to hire a District Technician to provide technical assistance to landowners within the watershed. In fiscal year 2019, the District Technician developed six water quality management plans which encompass 3,196 acres of managed lands.

Total Maximum Daily Loads and Implementation Plans

The TMDL Program develops targets for reducing pollution and helps communities build plans to improve water quality in local waterways. TMDL implementation plans may be developed

concurrently with TMDLs to leverage resources and increase the pace at which Texas improves impaired waterways. In fiscal year 2019, the TMDL Program continued to implement the CWA Section 303(d) Vision. The CWA Section 303(d) Vision enhances overall efficiency of the CWA Section 303(d) Program and focuses attention on priority waters. The CWA Section 303(d) Vision provides states flexibility in using available tools such as TMDLs, TMDL implementation plans, watershed protection plans, or other TMDL alternatives to attain water quality restoration and protection. In fiscal year 2019 the TCEQ Nonpoint Source Program, the TMDL Program, and the TSSWCB coordinated and worked with stakeholders to develop three watershed protection plans in five watersheds: Mission, Aransas, Arenosa, Garcitas, and Carancahua Bay.

Stakeholders provide local expertise for identifying site-specific problems, targeting areas for attention, and determining what management measures will be most effective. Ultimately, it is stakeholders who implement the plans to improve water quality in the rivers, lakes, and bays and achieve long-term success. Several TMDL implementation plans that address nonpoint sources of pollution are supported by CWA Section 319(h) funds from TCEQ and the EPA.

Texas Coastal Management Program

The Texas Coastal Management Program coordinates coastal management between local, state, and federal entities that manage coastal resource use. The Texas Coastal Management Program's mission is to ensure the long-term economic and ecological productivity of the coast. The Texas General Land Office administers the Texas Coastal Management Program and is advised by members of the Coastal Coordination Advisory Committee which includes staff from TCEQ, TSSWCB, TPWD, and the Texas Department of Transportation (TxDOT).

The Coastal Nonpoint Pollution Control Program was established in 1990 by Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA). This program establishes a set of management measures for states to use to control coastal nonpoint source runoff from five main sources: urban, forestry, agriculture, hydromodification, and marinas. Details of these management measures are included in the Texas Coastal Nonpoint Source Pollution Control Program. The program, which describes how the State will implement the management measures required under CZARA, must receive approval from both the EPA and the National Oceanic and Atmospheric Administration (NOAA).

The majority of the required management measures have been approved and in fiscal year 2019, Texas submitted remaining program measurement measures to satisfy all outstanding urban area management measures and they are pending approval by NOAA and the EPA. These management measures involve septic system inspections, urban runoff, and run-off from non-TxDOT roads, highways, and bridges.

The outstanding urban management measures are discussed in more detail in the following sections.

SEPTIC SYSTEMS

The Texas Coastal Nonpoint Source Pollution Control Program is implementing several projects to help satisfy CZARA requirements to inspect septic systems in the coastal zone. In fiscal year 2019, Texas A&M AgriLife Extension secured CWA Section 319(h) funds from TCEQ and the EPA to update the Coastal On-site Sewage Inventory (COSSI) database. The COSSI database stores septic system information such as location, age, type, permit information, and inspections. This database helps the state efficiently direct funding and resources to designated areas.

In fiscal year 2019, the State finalized a strategy to implement the septic system inspection management measure. The strategy includes a five-pronged approach;

1. *inspections completed through Authorized Agents and maintenance contracts,*
2. *inspections completed under watershed-based plans,*
3. *point-of-sale real estate inspections,*
4. *contracting directly with septic system inspectors using CWA Section 319(h) funds, and*
5. *encouraging homeowners and Authorized Agents to report the maintenance of septic systems.*

Education and outreach to homeowners on septic system care and maintenance will be a large part of this effort. Using this strategy, the state estimates that the required amount of inspections will be obtained within a 15-year timeframe.

MULTI-MANAGEMENT MEASURE PROGRAM AND THE COASTAL STORMWATER MANAGEMENT MANUAL

In fiscal year 2019, Texas continued work on an inventory of urban runoff management practices currently used in the coastal zone to determine areas where CZARA management measures are not met. Based on this information, Texas developed a comprehensive implementation plan that is designed to obtain compliance with the CZARA requirements to address urban runoff from developing areas, existing development, construction sites, general sources, and non-TxDOT roads, highways, and bridges. The multi-management measure program will concentrate on community officials with jurisdictional responsibilities for managing urban runoff and non-TxDOT roads, highways, and bridges, land owners, land developers, engineers, financiers, and other local land development professionals and interest groups to emphasize the goal of institutionalizing the use of sustainable stormwater management practices.

Texas also developed a guidance manual for Sustainable Stormwater Drainage on the Texas Coast to provide additional guidance and resources to coastal communities.

Estuary Programs in Texas

GALVESTON BAY ESTUARY PROGRAM

The Galveston Bay Estuary Program (GBEP) is one of 28 National Estuary Programs in the United States and works with local stakeholders to provide comprehensive ecosystem management through collaborative partnerships to ensure preservation of the bay's multiple uses. Specifically, the GBEP is charged with implementing *The Galveston Bay Plan*—a Comprehensive Conservation Management Plan for Galveston Bay. The second edition of the plan was approved by TCEQ Commissioners in fiscal year 2019 and focuses on identifying new issues facing Galveston Bay that were not addressed by the original plan in 1995 or Strategic Action Plan. The updated Galveston Bay plan addresses nonpoint source pollution through development and implementation of watershed protection plans, nonpoint source pollution outreach and education, structural and nonstructural water quality BMPs, and workshops designed to enhance technical understanding and expand the use of BMPs.

We Back the Bay!

In fiscal year 2019, the GBEP participated in an advisory capacity for the *We Back the Bay!* K-12 education program created by Artist Boat. The advisory group also included partners from the Houston-Galveston Area Council, the Asakura Robinson landscape architecture firm, and the Environmental Institute of Houston at the University of Houston – Clear Lake.

The project goals are to build awareness of the causes and impacts of nonpoint source pollution on Galveston Bay, develop critical thinking skills in students, create actions to increase water conservation, and reduce stormwater run-off from school campuses. *We Back the Bay!* also builds on a regional outreach effort, called *Back the Bay*, created and coordinated by the GBEP to promote a connection between Galveston Bay and the public.

We Back the Bay! spans the entire environmental education curriculum and is aligned with Texas Essential Knowledge and Skills. Five schools were selected through a competitive application process, and each school was awarded \$4,550 to design and implement a WaterSmart landscape on their campus. The schools also had to spend 10 percent of their awarded budget on outreach for their project using *Back the Bay* messaging.

The program provided science teachers from five schools with training on the causes and consequences of poor water quality and the basics of building a WaterSmart landscape. Students participated in a two-hour Eco-Art Workshop in their classroom where they were introduced to the vocabulary and skills necessary for an Eco-Art Kayak Adventure, a four-hour guided tour of the Coastal Heritage Preserve in Galveston. Following the workshop and adventure, students worked together to design a WaterSmart landscape for their campus with guidance from their teacher and the advisory team. After all designs were approved, students installed their landscape.

Each of the schools created a rain garden for their campus, and one school, Dickinson High School, also incorporated a rainwater harvesting cistern to water the plants in the rain garden. The Dickinson High School students used the 10 tips from the *Back the Bay* website to create artistic images on their water cistern.

The program goals were evaluated using pre- and post-evaluations of knowledge, observations, and interviews with students during site visits, and evaluation of the WaterSmart landscape plans. Evaluation data showed increased knowledge levels and demonstrated that by participating in the program, students were more willing to pick up litter, participate in community trash clean-ups, plant native plants, and conserve water.

Artist Boat received additional funding from the EPA to continue this program with 10 more schools in the lower Galveston Bay watershed through 2019 and 2020. The GBEP will continue to serve on the advisory group and help get the *Back the Bay* message out to more students in the region.

COASTAL BEND BAYS AND ESTUARIES PROGRAM

The Coastal Bend Bays and Estuaries Program (CBBEP) is another one of the 28 National Estuary Programs that works with local government, stakeholders, conservation groups, industry, and resource managers to improve water quality and restore critical habitats. The CBBEP targets nonpoint source pollution issues by conducting research projects to determine

sources of pollution. In addition, the CBBEP participates in the development and implementation of watershed protection plans and TMDL implementation plans. Other CBBEP priorities include land conservation and management and education through the Delta Discovery program.

CBBEP continues to focus efforts on investigating sources of nutrients and pesticides that may periodically be found in high concentrations in bay systems by partnering with the City of Corpus Christi and Texas A&M Agrilife Extension Service to sample soils and runoff to identify areas of concern. The information will be used to focus outreach efforts to deter practices that may lead to the introduction of elevated pollutants and nutrients in runoff and improve water quality.

Additionally, CBBEP continues working with the Center for Coastal Studies at Texas A&M University – Corpus Christi to expand their water quality sampling and outreach activities to the rural areas of the Oso Bay watershed, specifically the colonias. Coordination between urban and rural watershed communities and building a strong relationship with the colonias community is vital for the Oso Bay Watershed TMDL implementation plan that was submitted to TCEQ for review and approval in fiscal year 2019.

A riparian evaluation project for all three Baffin Bay tributaries was initiated by CBBEP in fiscal year 2019. Healthy and functional riparian areas have been shown to improve water quality by removing nutrients, improving dissolved oxygen, storing sediments, regulating temperatures, and buffering flood energies. In addition, riparian corridors are effective in reducing pathogens such as coliform and cryptosporidium. The loss of riparian function equates to a loss in water quality treatment capability which can contribute directly to a decline in water quality. The riparian evaluation will ultimately help determine priority areas for restoration and conservation easements in the Baffin Bay watershed.

Also in fiscal year 2019, CBBEP partnered with a property owner of approximately 240 acres in the Baffin Bay watershed that has expressed an interest in improving water quality in Petronilla Creek and Baffin Bay. By restoring an area of the property that has previously been used for agriculture to wetlands and/or grasslands, the area can start to provide ecosystem services such as supporting wildlife and improving water quality by reducing nonpoint source pollution. CBBEP implemented Phase 1 to identify concepts for restoration of the land which will be quantified, based upon water needs and potential water quality benefit, and to determine the feasibility of wetlands and the size of wetlands that can be supported. For more information visit <http://www.cbbep.org/>.

Texas Groundwater Protection Committee

Groundwater is a major source of water in Texas. Texans use groundwater for drinking, livestock, irrigating crops, and mining and industrial processes. Groundwater also serves as habitat for plants and animals, some of which are endangered species. The Texas Groundwater Protection



Dickinson High School Students
Building the Rain Garden
on their Campus (Source Artist Boat)

Committee (TGPC) was established by the Texas Legislature in 1989 as an interagency committee to manage this essential resource. The TGPC consists of nine state entities and an association of groundwater districts. The TGPC strives to improve interagency coordination and continues developing and updating the comprehensive groundwater protection strategy for the state. The TGPC also identifies areas where new programs could be created, or existing programs could be enhanced, to provide added protection.

Two subcommittees, the Groundwater Issues Subcommittee and the longstanding Public Outreach and Education Subcommittee, execute the majority of the TGPC's responsibilities. Both the Groundwater Issues Subcommittee and the main TGPC have standing agenda items at every meeting for discussion of nonpoint source pollution issues. The Groundwater Issues Subcommittee oversees the cooperative groundwater monitoring program for pesticides in groundwater, which monitors aquifer conditions for select pesticides of interest.

Because contamination of groundwater is easier to prevent than it is to clean up, the TGPC emphasizes groundwater awareness in its outreach and education efforts. Targeting primarily rural Texans, the Public Outreach and Education Subcommittee worked with partner agency Texas A&M AgriLife Extension Service to develop Fact Sheets and Frequently Asked Questions that include nonpoint source pollution information and management practices. During nine statewide events that occurred in fiscal year 2019, the TGPC distributed several thousand Fact Sheets and displayed information on groundwater protection. The TGPC supported Texas A&M AgriLife Extension Service in conducting several educational events for water well owners and disseminating literature while screening water well samples from nine counties for basic groundwater quality data. For more information visit the TGPC's website at <https://tgpc.texas.gov/>.

Clean Water State Revolving Fund Loans for Nonpoint Source Projects

Another tool available in Texas for addressing nonpoint source pollution is the Clean Water State Revolving Fund, which is administered by the Texas Water Development Board. The Clean Water State Revolving Fund is a financing program authorized under the federal CWA and is partially capitalized by an annual grant from the EPA. This program provides funding assistance in the form of up to 30-year loans at interest rates lower than the market offers, as well as a limited amount of funds which do not have to be repaid. The funds that do not have to be repaid are available to disadvantaged communities as well as for green projects. Although most of the funds finance publicly owned wastewater treatment and collection systems, the Texas Water Development Board can also use the Clean Water State Revolving Fund for nonpoint source pollution abatement and stormwater projects. Funds are available to cities, counties, groundwater conservation districts, Soil and Water Conservation

Districts, and other public agencies, as well as to nonprofit organizations, mainly water supply and/or sewer service corporations.

A water quality-based priority system is used to rank potential applicants and fund projects, including nonpoint source projects. To be eligible, a nonpoint source project must be an identified practice within a water quality management plan, TMDL implementation plan, or watershed protection plan; a nonpoint source management activity that has been identified in the *Texas Groundwater Protection Strategy*; or a BMP identified in the *Texas Nonpoint Source Management Program* or the National Estuary Program. All applications are initiated with the Texas Water Development Board, and then reviewed by a TCEQ staff person in cooperation with Councils of Government participating in the CWA Section 604(b) Grant to ensure conformance with the Texas Water Quality Management Plan. Loans can be used for planning, designing, acquiring, and constructing wastewater treatment facilities, wastewater recycling and reuse facilities, and collection systems. Other activities eligible for funding assistance include agricultural, rural, and urban runoff control; estuary improvement; nonpoint source education; and wet weather flow control, including stormwater management activities.

Staff members from the Texas Water Development Board (TWDB), TCEQ, and the TSSWCB meet regularly to coordinate efforts to identify water bodies that are impacted by nonpoint source pollutants and to identify potential applicants for Clean Water State Revolving Fund assistance. They also identify potential candidates for Green Project Reserve funding, which can provide some loan forgiveness if low impact development practices are constructed.

Goal Three—Education

The third goal of the *Texas Nonpoint Source Management Program* is to conduct education and technology transfer activities to raise awareness of nonpoint source pollution and activities that contribute to the degradation of water bodies by nonpoint source pollution. Education is a critical aspect of managing nonpoint source pollution. Public outreach and technology transfer are integral components of every watershed protection plan, TMDL, and TMDL implementation plan. This section highlights some of the nonpoint source education and public outreach activities conducted in fiscal year 2019.

Texas Well Owner Network

TWON is an educational training program developed by the Texas A&M AgriLife Extension Service in the Departments of Soil & Crop Sciences and Biological & Agricultural Engineering in partnership with the Texas Water Resources Institute. TWON educates well owners about water quality BMPs to protect their wells and surface waters from contaminants. TWON works with project partners to support watershed protection planning and implementation efforts.

There are more than one million private water wells in Texas that provide water to citizens in rural areas and to those living on small acreages in the rural-urban interface. Public drinking water supplies are monitored through requirements of the federal Safe Drinking Water Act. However, private well owners are responsible for monitoring the water quality of their wells.

TWON training is delivered via “Well Educated,” a four to six-hour course, and “Well Informed,” an hour-long presentation. The “Well Educated” training course covers aquifers, household wells, improving and protecting water resources, groundwater resources, septic system maintenance, well maintenance and construction, water quality, and water treatment. The “Well Informed” presentation focuses on wellhead protection and recommendations for remediating well contamination. Well owners can bring in water samples to test for fecal coliform bacteria, nitrate-nitrogen, and salinity through both programs.

In fiscal year 2019, seven “Well Educated” and 13 “Well Informed” training events were conducted. These events resulted in education and water well screenings for 801 participants. Results from pre- and post-evaluations showed an average increased participant knowledge of 30 percent. Most participants indicated that they were satisfied with the trainings, and more than 96 percent of participants stated they intend to adopt changes. Furthermore, results from six-month follow-up evaluations indicated that 90 percent of well owners voluntarily removed hazardous material from their well house. For participants whose septic tanks needed pumping, 58 percent had pumped their septic tanks within six months following the program, with an additional 25 percent planning to pump out their system. Additionally, 75 percent of participants said they had shared TWON educational materials with other well owners. To find out when TWON is coming to your watershed visit <http://twon.tamu.edu/>.



TWON Meeting
(Source TSSWCB)

Riparian Restoration at Milby Park

In fiscal year 2019 the Student Conservation Association, Inc., in partnership with the City of Houston Parks and Recreation Department, used CWA Section 319(h) funds from TCEQ and the EPA to hire interns and student crews to perform environmental conservation work at Milby Park, located in the Sims Bayou Tidal watershed in Houston. Milby Park is a 67-acre public park with a 2,000-foot boundary along Sims Bayou Tidal surrounded by an industrial area. This park was selected for riparian zone restoration to improve ecosystem services and water quality.

Interns, crews, and volunteers removed invasive plants, planted native vegetation, and hauled away debris from flooding and human activities. Seventy-five trees were planted during these events. Educational signage was installed at the park to inform visitors about nonpoint source pollution and the importance of healthy riparian zones.

In addition to performing restoration work at the park, interns and student crew members were taught leadership skills and environmental conservation principles. Interns completed the Texas Watershed Stewards training provided by Texas A&M AgriLife Extension and performed water quality monitoring under the Texas Stream Team program at Milby Park. Project interns also led 18 water science education programs during after-school programs held at other Houston parks. For more information, visit: <https://www.thesca.org/serve/program/houston-tx>.

Texas Watershed Stewards

Texas Watershed Stewards is a one-day training program designed to increase citizen understanding of watershed processes and foster increased local participation in watershed management and watershed protection planning activities across the state. The program is tailored to, and delivered in, target watersheds undergoing TMDLs or watershed protection plan development or implementation.

During fiscal year 2019, nine workshops were conducted across the state. Participants have included landowners, agricultural producers, city personnel and officials, business owners, state and federal environmental agency staff, public schools and universities, environmental and engineering professionals, and other watershed residents for a total of 4,673 trained Texas Watershed Stewards since the inception of the program in 2007. Pre- and post-evaluations collected at each event are used alongside six-month post evaluations to determine the effectiveness of Texas Watershed Stewards workshops. Pre- and post-evaluation data showed that attendees water quality knowledge increased by 33 percent. Moreover, 98 percent of attendees reported the Texas Watershed Stewards program enabled them to be a better steward of their watershed. Results from the six-month post-evaluations showed that 38 percent of respondents had participated in at least one community cleanup; 37 percent



Riparian Restoration in Milby Park (Source Student Conservation Association)



TWON Sampling (Source TSSWCB)



Milby Park Invasive Species Removal (Source Student Conservation Association)

participated in local planning/zoning decisions; and 52 percent indicated they had communicated with their elected officials regarding water quality issues. Furthermore, 88 percent of respondents reported that they monitor their individual actions that might impact water quality more closely now than they had before. A final figure of notable importance is that 81 percent of respondents have either adopted or maintained one or more BMPs that have a positive impact on water quality.

The Texas Watershed Stewards program is sponsored by the Texas A&M AgriLife Extension Service and the TSSWCB and made possible through CWA Section 319(h) funds from the TSSWCB and the EPA.

Urban Stream Processes and Restoration Program

TWRI and the Texas A&M AgriLife Research and Extension Center in Dallas were awarded CWA Section 319(h) funds from TCEQ and the EPA to conduct Urban Stream Processes and Restoration education programs across the state and a stream restoration demonstration located on Geronimo Creek in Seguin.

Trainings are geared toward water professionals interested in performing urban stream restoration. The goal of the program is to help attendees understand stream functions such as: the impacts of development on urban streams, how to recognize healthy versus degraded stream systems, how to assess and classify streams, and learning the difference between natural and traditional restoration techniques. Workshops were held around urban centers in coordination with EPA-accepted watershed protection plans. In fiscal year 2019 trainings were held in College Station, San Antonio, Belton, and Pearland. A total of 69 people attended the trainings. Evaluations were given at the end of the trainings to assess program satisfaction, knowledge gained, and willingness to adopt techniques learned at the course. One hundred percent of respondents who completed the post-training evaluation were mostly or completely satisfied with the course.

Also, 36 percent of respondents believed they would benefit economically from the information they learned at the course. On average, there was a 51 percent increase in the level of understanding of course topics from the beginning to the end of the program. Most respondents, 66 percent, said they would take action based on the information learned during the course.

The stream restoration demonstration project is located at the Irma Lewis Seguin Outdoor Learning Center in Seguin. The demonstration and control sites are along the banks of Geronimo Creek. The goal of the demonstration site is to show the benefits of streambank revegetation on bank erosion and total suspended solid levels within the creek. Monitoring was conducted quarterly during storm events. Water samples, cross-sectional surveys, and streambank erosion pins were used to measure the benefits of revegetation activities when compared to a control site with no restoration. Preliminary results show that while both sites did accumulate total suspended solids during storm events, the restored site had an average smaller percent increase (13 percent) in sediment leaving the site than the increase at the control site (18 percent). For upcoming trainings and overall progress of the demonstration site visit: <http://twri.tamu.edu/our-work/engaging-educating/urban-riparian-stream-restoration-program/>.





Big Bend National Park
(Source iStock)

CHAPTER 4

DEVELOPING AND IMPLEMENTING WATERSHED PROTECTION PLANS

TCEQ and the TSSWCB apply the Watershed Approach to managing nonpoint source pollution by supporting the development and implementation of watershed protection plans. These plans are developed through local stakeholder groups who coordinate activities and resources to manage water quality. In Texas, watershed protection plans facilitate the restoration of impaired water bodies and the protection of threatened waters before they become impaired. These voluntary stakeholder-driven plans give the decision-making power to the local groups most vested in the goals specified in the plans. Bringing groups of people together through watershed planning efforts combines scientific and regulatory water quality factors with social and economic considerations. While watershed protection plans can take many forms, the development of plans funded by CWA Section 319(h) grants must follow guidelines issued by the EPA. These guidelines can be found in the *Nonpoint Source Program and Grants Guidelines for States and Territories*, <https://www.epa.gov/nps/319-grant-program-states-and-territories>.

As of fiscal year 2019, there were 31 watershed protection plans in Texas accepted by the EPA. TCEQ and the TSSWCB facilitate the development and implementation of watershed protection plans throughout Texas by providing technical assistance and/or funding through grants to regional and local planning agencies and, thereby, to local stakeholder groups. A significant portion of the funding under CWA Section 319(h) is dedicated to the development and implementation of watershed protection plans in areas where nonpoint source pollution has contributed to the impairment of water quality. In Texas, watershed protection plans may also be developed

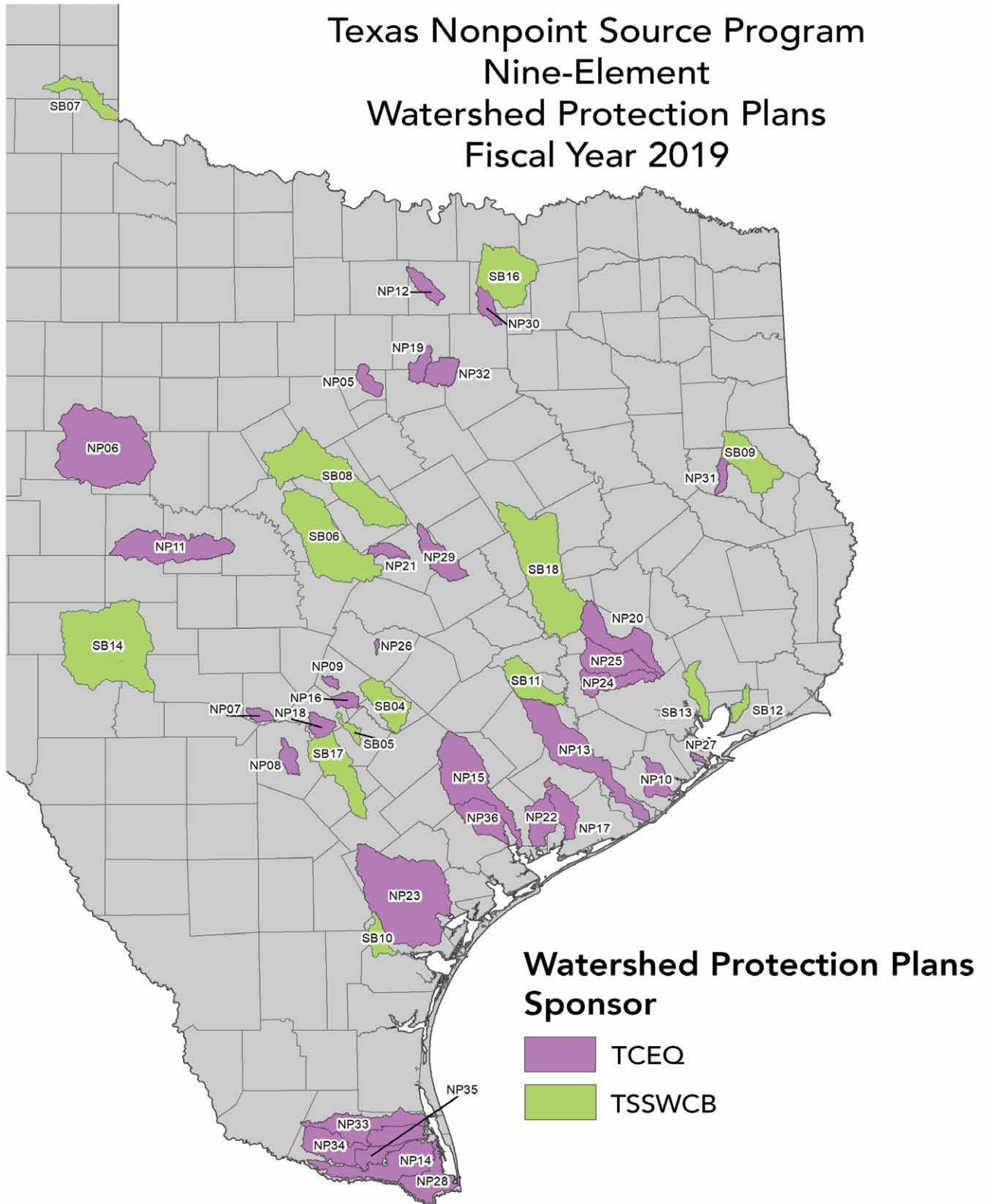
by third parties independent from TCEQ and the TSSWCB. However, only EPA accepted watershed protection plans are eligible for CWA Section 319(h) funding.

Figure 4.1 shows the location of watershed protection plans that are EPA accepted, under development or being implemented at the end of fiscal year 2019. Table 4.1 lists the watershed protection plans found in Figure 4.1, and identifies which are EPA accepted. Neither the map nor table



West Fork San Jacinto Stakeholders at Work
(Source H-GAC)

FIGURE 4.1
 Map of Watershed Protection Plans Accepted, Implemented, or Under Development



are intended to be a comprehensive list of all the watershed planning efforts currently underway in Texas because there may be other local planning efforts not funded by CWA Section 319(h) funds.

For more information on watershed protection plans in Texas visit <https://www.tceq.texas.gov/waterquality/nonpoint-source/mgmt-plan/watershed-pp.html> or <https://www.tsswcb.texas.gov/programs/texas-nonpoint-source-management-program/watershed-protection-plan-program>.

TABLE 4.1
Watershed Protection Plans Accepted, Implemented, or Under Development*

ID	TSSWCB WPPs
SB09*	Attoyac Bayou
SB07*	Buck Creek
SB13*	Cedar Bayou
SB12*	Double Bayou
SB05*	Geronimo and Alligator Creeks
SB16*	Lavon Lake
SB06*	Lampasas River
SB08*	Leon River
SB10*	Lower Nueces River
SB17	Mid and Lower Cibolo Creek
SB11*	Mill Creek
SB18*	Navasota River
SB04*	Plum Creek
SB14*	Upper Llano River
ID	TCEQ WPPs
NP36	Arenosa and Garcitas Creeks
NP14*	Arroyo Colorado
NP10*	Bastrop Bayou
NP29	Big Elm Creek
NP11*	Brady Creek
NP22*	Carancahua Bay
NP06*	Colorado River Below EV Spence Reservoir
NP24	Cypress Creek (Segment 1009)
NP09*	Cypress Creek (Segment 1815)
NP18*	Dry Comal/Comal River
NP12*	Hickory Creek
NP34	Hidalgo Main
NP27	Highland Bayou
NP32	Joe Pool Lake
NP31	La Nana Bayou

table continued on next page

TABLE 4.1
Watershed Protection Plans Accepted, Implemented, or Under Development*
(continued)

ID	TSSWCB WPPs
NP19*	Lake Arlington/Village Creek
NP05*	Lake Granbury
NP15*	Lavaca River
NP28	Lower Laguna Madre/Brownsville Ship Channel
NP23	Mission and Aransas Rivers
NP21*	Nolan Creek
NP35	North Floodway
NP30	Rowlett Creek
NP33	Raymondville Drain
NP13*	San Bernard River
NP26	Shoal Creek
NP25	Spring Creek
NP17*	Tres Palacios Creek
NP07*	Upper Cibolo Creek
NP08*	Upper San Antonio River
NP16*	Upper San Marcos River
NP20	West Fork of San Jacinto River

Watershed Protection Plan Highlights

Geronimo and Alligator Creeks Watershed Protection Plan

In 2008, the Guadalupe-Blanco River Authority and Texas A&M AgriLife Extension Service received CWA Section 319(h) funds from the TSSWCB and the EPA to develop a watershed protection plan for the Geronimo and Alligator Creeks watershed. The Geronimo and Alligator Creeks Watershed Partnership was formed in 2010 to address the elevated levels of bacteria and nitrate-nitrogen. The plan was accepted by the EPA in 2012. The Partnership is currently working toward full implementation of the watershed protection plan.

AGRICULTURAL BEST MANAGEMENT PRACTICE IMPLEMENTATION

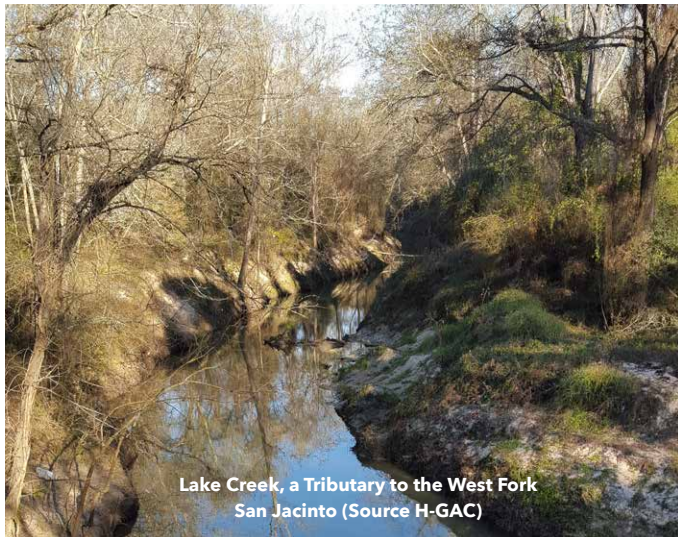
The Comal-Guadalupe Soil and Water Conservation District Technician has been working with local agricultural producers to implement BMPs in the watershed. In fiscal year 2019, five requests for assistance were processed, three water

quality management plans were developed, and BMPs were implemented on 279 acres. Some of the BMPs included: brush management, forage and biomass planting, conservation crop rotation, crop residue management, grassed waterways, and prescribed grazing.

EDUCATION AND OUTREACH ACTIVITIES

In 2018, Guadalupe County Commissioners were awarded a grant from Texas Wildlife Services to establish a feral hog program that included a bounty program, workshops, webinars and trapping supplies to landowners. In fiscal year 2019, the County Commissioners decided to continue the program through local funds. Since the inception of the program, there have been a total of 500 hogs removed through the bounty program. In response to the program's success, the County Commissioners have decided to continue to fund the program.

The Geronimo and Alligator Creeks Watershed Partnership has been offering Homeowner Maintenance of Septic System workshops since 2014. In fiscal year 2019, Texas A&M AgriLife Extension Service conducted a Homeowner Maintenance of Septic System workshop in Seguin.



Lake Creek, a Tributary to the West Fork San Jacinto (Source H-GAC)

This class certified 62 homeowners to maintain their aerobic septic systems.

In fiscal year 2019, the Healthy Lawns Healthy Waters Program provided homeowners the latest information on rainwater harvesting, turf management, and irrigation practices. Door prizes included a 55-gallon rain barrel, tree seedlings, and other items. Attendees also submitted soil samples for a free soil analysis as part of the program.

WATERSHED IMPLEMENTATION ACTIVITIES

The Geronimo and Alligator Creeks Watershed Protection Plan includes management measures such as riparian forests and herbaceous buffers to reduce pollutant loads in the watershed. The Texas Water Resources Institute received CWA Section 319(h) funds from TCEQ and EPA to implement a stream restoration demonstration site at the Irma Seguin Outdoor Learning Center in the Geronimo and Alligator Creeks watershed.

The 7th Annual Geronimo and Alligator Creeks Clean Up event held in fiscal year 2019 was attended by 99 volunteers. Volunteers worked to remove 3,640 pounds of trash and debris from 11 miles of roadside and creek banks, which is nearly twice the amount from previous years. Local businesses, church groups, major corporations, landowners, homeowners, and school groups were among the list of sponsors and attendees.

West Fork San Jacinto River and Lake Creek Watershed Protection Plan

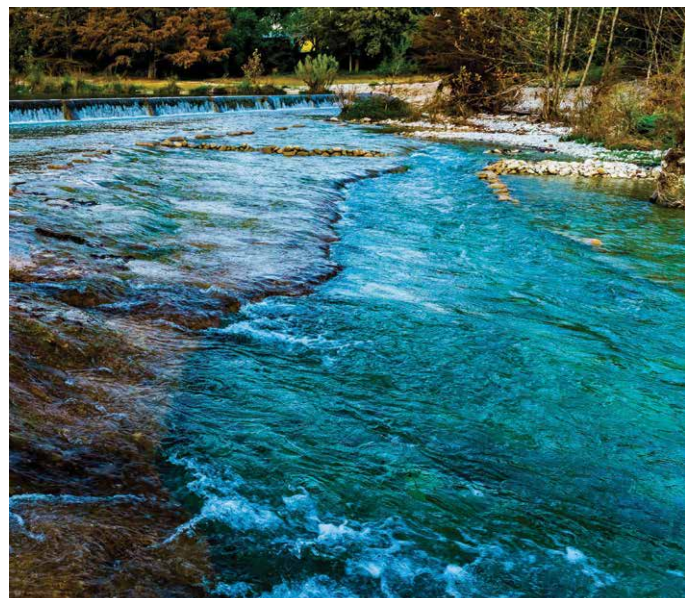
The West Fork San Jacinto River and Lake Creek watersheds contain over 1,200 square miles of drainage area between Lake Conroe and Lake Houston in the northern part of the greater Houston region. Popular for its recreational waterways and supporting a diverse ecology, the watersheds are a vital source of drinking water to the area. The historically rural lands and small urban centers in the watersheds of the West Fork and its northernmost tributary segment, Lake Creek, are

developing rapidly as growth spreads northward. Portions of the West Fork San Jacinto River and Lake Creek are impaired for contact recreation, have elevated levels of nutrients, and have periodic issues with low dissolved oxygen. Local concern over water quality issues and future degradation led the Houston-Galveston Area Council and other local partners to propose the development of a watershed protection plan.

DEVELOPMENT OF THE WATERSHED PROTECTION PLAN

With CWA Section 319(h) funds from TCEQ and the EPA, the Houston-Galveston Area Council worked with the West Fork Watersheds Partnership from 2015 to 2018 to develop a watershed protection plan. In addition to the contact recreation impairment and concerns identified in the formal assessments, local stakeholders also considered the impacts of sediment, trash, mining operations in the riparian areas of the watershed, and future growth. Using modeling efforts and local knowledge, the partnership identified goals to improve water quality.

To address these growing water quality challenges, the partnership identified a mix of management measures that included remediating failing septic systems, addressing sanitary sewer overflows, reducing pet waste, implementing voluntary efforts with agricultural producers, maintaining or restoring riparian buffer areas, and a comprehensive education and outreach component. Emphasis was placed on respect for private property and on incorporating adjacent programs and efforts like forestry BMPs which can improve water quality. Because of efficiencies in the planning process, the partnership was able to capitalize on its momentum and begin early implementation efforts during fiscal year 2019, including a series of education and outreach efforts. The Houston-Galveston Area Council is continuing to support local partners with implementation efforts, as the project fully transitions from planning to action.



Emerald Frio River in Texas (Source iStock)





Wildflower field in Ellis, Texas
(Source iStock)

ABBREVIATIONS

AU Assessment Unit

BMP Best Management Practice

CBBEF Coastal Bend and Bays Estuary Program

COSSI Coastal On-site Sewage Inventory

CWA Clean Water Act

CWQMN TCEQ Continuous Water Quality Monitoring Network

CZARA Coastal Zone Act Reauthorization Amendments

cfu/100 ml Colony forming units per 100 milliliters of water

E. coli *Escherichia coli*

EPA U.S. Environmental Protection Agency

GBEP TCEQ Galveston Bay Estuary Program

H-GAC Houston-Galveston Area Council

Integrated Report *Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)*

lbs Pounds

LCRA Lower Colorado River Authority

Meadows Center The Meadows Center for Water and the Environment at Texas State University

NOAA National Oceanic and Atmospheric Administration

NRCS Natural Resources Conservation Service

SWCD Soil and Water Conservation Districts

TCEQ Texas Commission on Environmental Quality

TGPC Texas Groundwater Protection Committee

TMDL Total Maximum Daily Load

TPWD Texas Parks and Wildlife Department

TSSWCB Texas State Soil and Water Conservation Board

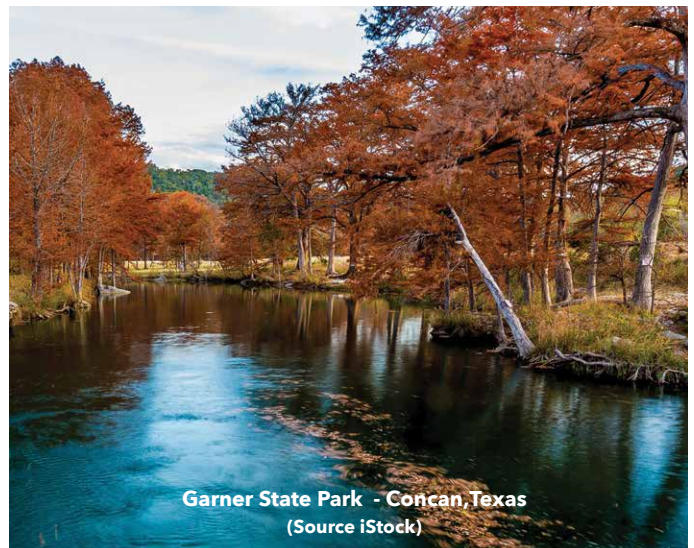
TWON Texas Well Owner Network

TWRI Texas Water Resources Institute

TxDOT Texas Department of Transportation

WAP Watershed Action Planning

WQMP Water Quality Management Plan



Garner State Park - Concan, Texas
(Source iStock)





Tonkawa Waterfall in Crawford, Texas
(Source iStock)

APPENDIX A

Texas Nonpoint Source Management Program Milestones

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2019 ¹ Estimate	2019 Actual	Comments
LT/2	Nonpoint Source Management Program Updates	The state will update the Management Program in accordance with applicable EPA guidance	Management Program updates	0	0	Next update scheduled for 2022
LT/2	Nonpoint Source Performance Partnership Grant (PPG) End of Year Report	The state will produce End of Year Report for PPG activities completed by TCEQ	PPG End of Year Reports	1	1	
LT/7	Nonpoint Source Annual Report	The state will produce the Nonpoint Source Annual Report in accordance with applicable EPA guidance	Nonpoint Source Annual Report	1	1	The Fiscal Year 2018 Nonpoint Source Annual Report was completed in January 2019. The Fiscal Year 2019 Nonpoint Source Annual Report is due to EPA in January 2020
LT/5	Implementation of Coastal Nonpoint Source Pollution Control Management Measures	Applicable Management Measure	Nonpoint Source Annual Report and the Texas General Land Office Reporting Mechanisms for implementation	new for 2019	0	Program management measures were submitted to NOAA and EPA in June of 2019. NOAA and EPA review is ongoing.

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Texas Nonpoint Source Management Program Milestones *(continued)*

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2019 ¹ Estimate	2019 Actual	Comments
LT/2-5	Section 319(h) Grant Program Solicitation	The state will conduct individual TCEQ and TSSWCB solicitations for Section 319(h) grant funding	Grant Solicitation documentation	2	2	One from each agency
LT/2-5	Section 319(h) Grant Program Application	The state will prepare individual TCEQ and TSSWCB grant program applications and submit them to EPA for Section 319(h) grant funding	Grant Application documentation	2	2	One from each agency
LT/2	Section 319(h) Grant Program Reporting	The state will report grant funded activities to the Grants Reporting and Tracking System (GRTS) in accordance with EPA guidance	GRTS updates	4	4	Two semi-annual updates from each agency
ST2/A	Priority Watersheds Report Updates	The state will update the Priority Watersheds Report	Priority Watersheds Report Updates	0	1	Used in the fiscal year 2019 Section 319(h) grant solicitation
ST3/C,D	Watershed Training	The state will provide training to watershed professionals to ensure quality and consistency in the development and implementation of watershed protection efforts	Texas Watershed Planning Short Course	1	1	
ST3/A,B,F,G	Watershed Education	The state will provide watershed education to help citizens participate in programs designed to address water quality issues	Texas Watershed Steward Program (number of workshops)	8	9	
ST3/C,D	Watershed Training	The state will provide a forum to facilitate the transfer of information between watershed professionals in the state	Texas Watershed Coordinator Roundtable	2	2	
ST3/B,F,G	Volunteer Monitoring	The state will provide support for local volunteer monitoring groups. These groups provide water quality data to the state water quality planning program and gain insight into resolving water quality issues	Texas Stream Team Participation (numbers of stations monitored)	250	279	

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Texas Nonpoint Source Management Program Milestones *(continued)*

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2019 ¹ Estimate	2019 Actual	Comments
ST1/B	Quality Assurance	The state will ensure that monitoring procedures are in compliance with EPA-approved TCEQ and TSSWCB Quality Management Plans	Annual Quality Management Plan updates	2	2	One from each agency
ST1/C	Watershed Characterization	The state will support the implementation of projects designed to evaluate watershed characteristics and produce the information needed for watershed and water quality models	Watershed characterization projects	2	6	
ST2/A,C	Watershed Coordination	The state will support watershed coordination projects which facilitate the implementation of WPPs	Watershed coordination projects	12	10	
ST1/D	Develop WPPs	The state will support projects which provide for the development of WPPs which satisfy applicable EPA guidance	WPP development projects	4	8	
ST2/D	Implement WPPs	The state will support projects which provide for the implementation of management measures specified in WPPs which satisfy applicable EPA guidance	WPP implementation projects	42	46	
ST1/D	Develop TMDLs and implementation plans	The state will support projects which provide for the development of TMDLs and implementation plans which satisfy applicable state, federal, and program regulations and guidance	TMDL and implementation plan development projects	0	0	
ST2/D	Implement TMDLs and implementation plans	The state will support projects which provide for the implementation of management measures specified in TMDLs and implementation plans which satisfy applicable state, federal, and program regulations and guidance	TMDL implementation plan implementation projects	3	3	

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Texas Nonpoint Source Management Program Milestones *(continued)*

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2019 ¹ Estimate	2019 Actual	Comments
AT2/B,C	Load Reductions	The state will support projects which provide for the reduction of loadings of nonpoint source pollutants	Nonpoint source load reduction projects	16	25	
ST2/B,C	Load Reductions (Nitrogen)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ ²	89,910.29 lbs/yr	Numbers reflect projects with load reductions reported in fiscal year 2019
ST2/B,C	Load Reductions (Phosphorus)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ ²	20,733.14 lbs/yr	Numbers reflect projects with load reductions reported in fiscal year 2018
ST2/B,C	Load Reductions (Sediment)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ ²	9,698.0 tons/yr	Numbers reflect projects with load reductions reported in fiscal year 2019
ST1/E	Effectiveness Monitoring	The state will support projects which provide for the collection and analysis of water quality and other watershed information for evaluating the effectiveness of BMPs	Effectiveness monitoring projects	10	12	Numbers reflect active projects

¹ Estimates are from the 2017 Texas Nonpoint Source Management Program report

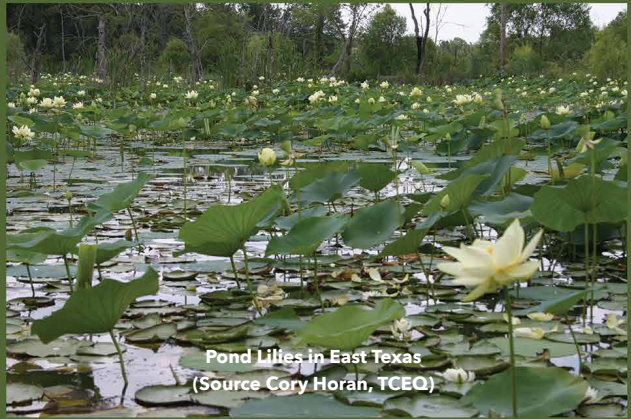
² RQ – Reportable Quantity



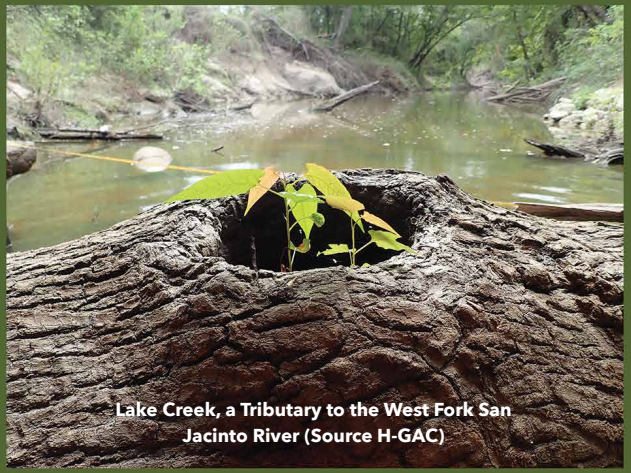
Boat Dock on Lake Conroe
(Source H-GAC)



W.G. Jones State Forest
(Source H-GAC)



Pond Lilies in East Texas
(Source Cory Horan, TCEO)



Lake Creek, a Tributary to the West Fork San Jacinto River
(Source H-GAC)



Hamilton Pool - Dripping Springs, Texas
(Source iStock)



Hamilton Pool - Dripping Springs, Texas
(Source iStock)



Garner State Park - Concan, Texas
(Source iStock)

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